MITSUBISHI MATERIALS

MP2ES/3ES/4EC

FRACTURE RESISTANCE & BURR REDUCTION TO COMBAT PROBLEMS COMMONLY ENCOUNTERED WITH SMALL SWISS TYPE AUTOMATIC LATHES



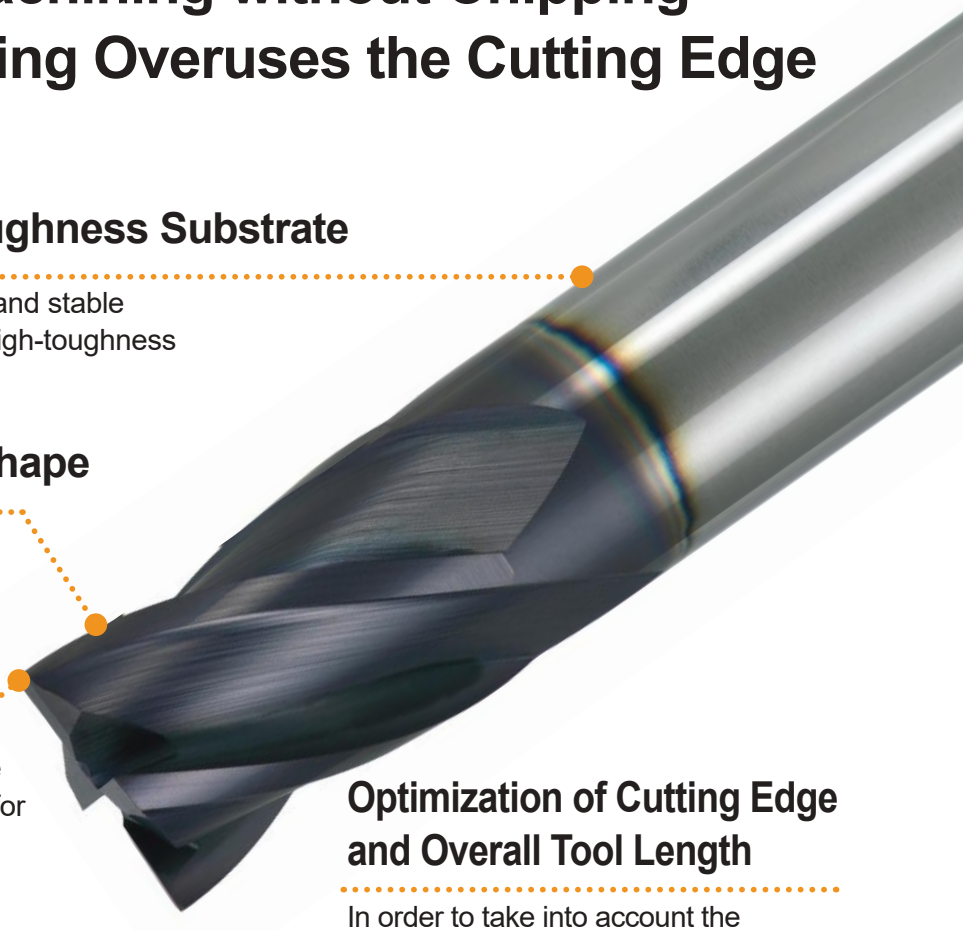


TOOL NEWS **B205A-F**

For Swiss Type Automatic Lathes
MS plus End Mill Series

MP2ES/3ES/4EC

Achieves Stable Machining without Chipping Even when Machining Overuses the Cutting Edge



Adoption of New High-Toughness Substrate

Fracture resistance is greatly improved and stable machining is accomplished by using a high-toughness carbide substrate.

Optimized Cutting Edge Shape

The optimized rake angle suppresses burrs.

Improved Cutting Edge Machining

To improve the fracture resistance of the cutting edge, a small gash land is used for Ø6mm or greater.

Optimization of Cutting Edge and Overall Tool Length

In order to take into account the protrusion of the small Swiss Type Automatic Lathes, the cutting edge and overall tool length have been optimized.

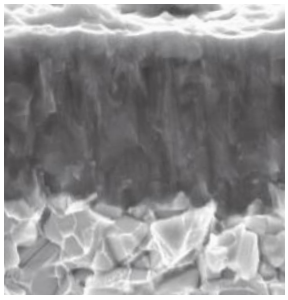
(Al, Ti, Cr)N Multilayer Coating (MS plus)

Suitable coating for a broad range of workpiece materials such as carbon steels and stainless steels.

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

Properties of MS plus coating

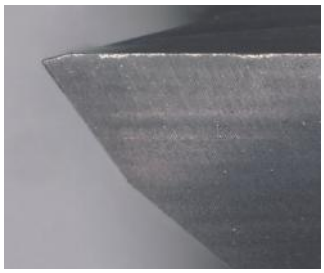
	(Al,Ti,Cr)N multilayer	(Al,Ti)N	(Al,Cr)N
Hardness (HV)	**3200**	2800	3100
Oxidation Temperature (F°)	**2.012**	1.472	2.012
Adhesion (N)	**100**	80	80



Cutting Performance

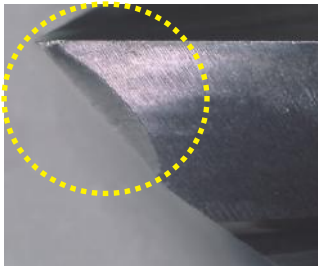
Machining 304 - Comparison of Fracture Resistance

The round, stainless steel bar is machined using a D-cut. The adoption of the high toughness cemented carbide and gash land provides highly improved fracture resistance.



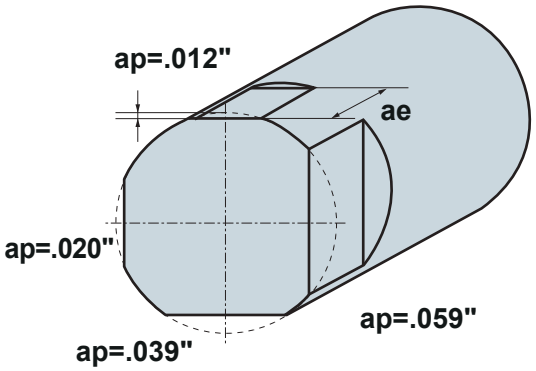
MP3ES

After machining of 2 pieces



Conventional

After machining 1 piece
Fracture of the tip of the tool.

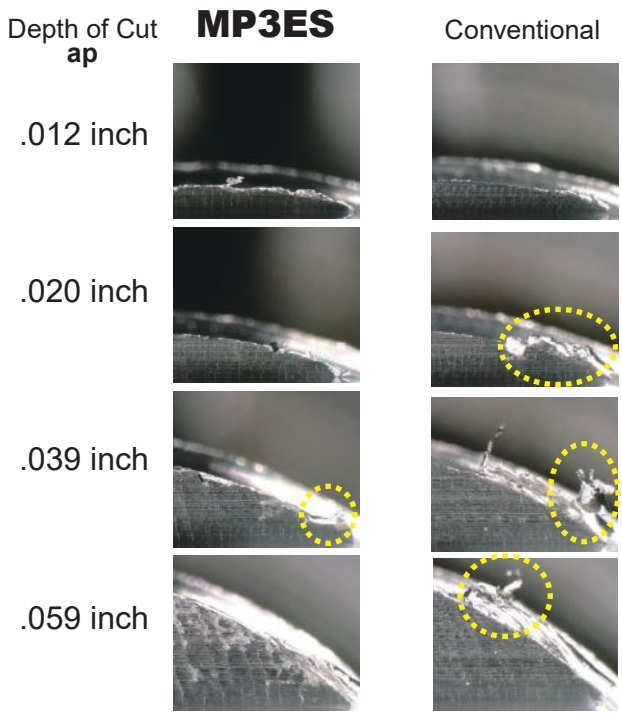


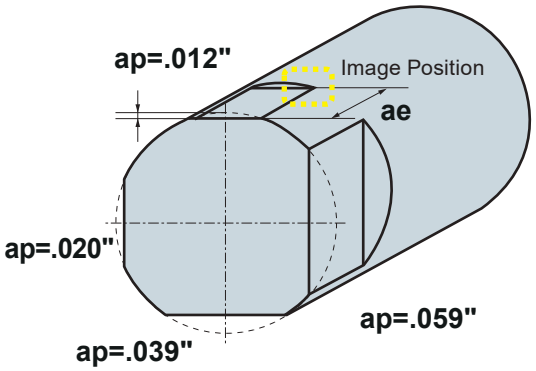
<Cutting Conditions>

Workpiece Material	: AISI 304
Tool	: MP3ESD0800S08
Cutting Speed	: vc = 165 SFM
Feed Rate	: f = 5.9 IPM
Feed per Tooth	: fr = .0010 inch
Depth of Cut	: ap = .012-.059 inch ae = .236
Cutting Mode	: Wet Cutting (Oil)
Machine	: Small Automatic Lathe
Tool Post	: Gang Type Tool Post

Machined 304 - Comparison of Burr Generation

The optimized cutting edge shape suppresses the occurrence of burrs.





<Cutting Conditions>

Workpiece Material	: AISI 304
Tool	: MP3ESD0800S08
Cutting Speed	: vc = 165 SFM
Feed Rate	: f = 5.9 IPM
Feed per Tooth	: fr = .0010 inch
Depth of Cut	: ap = .012-.059 inch ae = .236
Cutting Mode	: Wet Cutting (Oil)
Machine	: Small Automatic Lathe
Tool Post	: Gang Type Tool Post

Cutting Performance

Machined 304 - Comparison of Surface Finishes

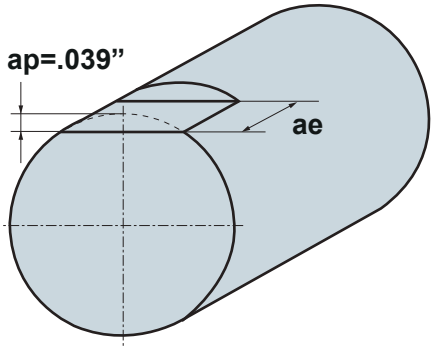
The surface finish is greatly improved due to the improved chatter resistance.

MP3ES

Ra .008 µ-inch







<Cutting Conditions>

Workpiece Material	: JIS SUS304
Tool	: MP3ESD0800S08
Cutting Speed	: vc = 165 SFM
Feed Rate	: f = 5.9 IPM
Feed per Tooth	: fr = .0010 inch
Depth of Cut	: ap = .039 inch ae = .236
Cutting Mode	: Wet Cutting (Oil)
Machine	: Small Automatic Lathe
Tool Post	: Gang Type Tool Post

Conventional A

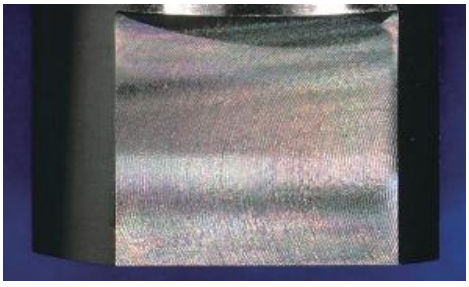
Ra .024 µ-inch





Conventional B

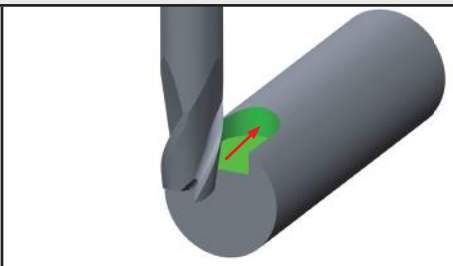
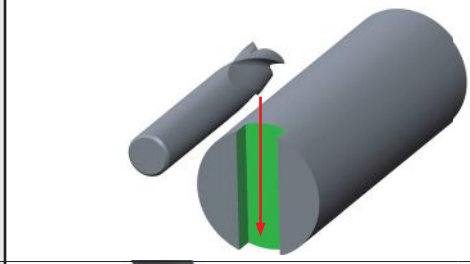
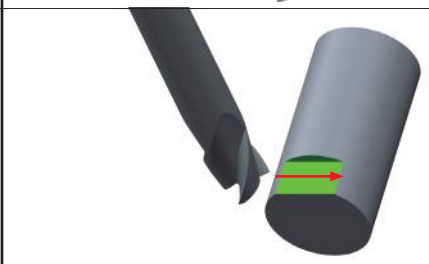
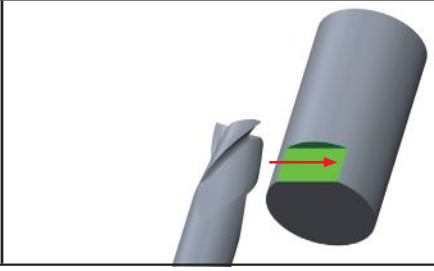
Ra .030 µ-inch





Selection of End Mill for Swiss Type Lathe

① The number of Flutes must be selected according to the type of machining.

Cuttig Mode		Type	MP2ES	MP3ES	MP4EC
		Flutes	2 Flute	3 Flute	4 Flute
Slotting of External			◎	○	×
Slotting of Facing			◎	○	×
Face Milling			△	◎	○
Shoulder Milling			△	○	◎

② Selecting Tools Other Than Small Swiss Type Automatic Lathe End Mills

End Mills with an overall tool length of LF=50 mm or less can be used even with small Swiss Type automatic lathe end mills. Select the necessary tools according to the workpiece material and machining method (such as every 0.1 or radius).

For Swiss Type Automatic Lathes MS plus End Mill Series

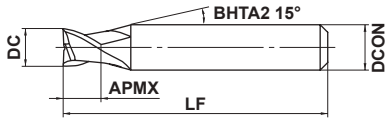
MP2ES NEW

End mill, 2 flute, For swiss type lathe

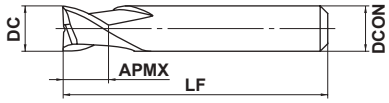


Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy	Copper Alloy	Aluminum Alloy
◎	◎	○		○	○	○	





Type1



Type2

	3≤DC≤10				
	- 0.010 - 0.030				
h6	4≤DCON≤6	7≤DCON≤10			
	0 - 0.008	0 - 0.009			

●2 flute end mill.

(mm)

Order Number	DC	APMX	LF	DCON	* No.F	Stock	Type
MP2ESD0300S04	3	4.5	50	4	2	●	1
MP2ESD0400S04	4	6	50	4	2	●	2
MP2ESD0500S06	5	7.5	50	6	2	●	1
MP2ESD0600S06	6	9	50	6	2	★	2
MP2ESD0700S07	7	10.5	50	7	2	★	2
MP2ESD0800S08	8	12	50	8	2	★	2
MP2ESD1000S10	10	15	50	10	2	●	2

* Number of Flutes

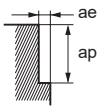
DC = Dia.
APMX = Length of Cut
LF = Overall Length
DCON = Shank Dia.

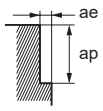
● : **USA Stock** ★ : **Stocked in Japan**

Recommended Cutting Conditions

■ Side Milling

(inch)

Workpiece Material		Carbon steel, Cast iron, Alloy steel (—30HRC) AISI 1050, AISI No 35 B, AISI P20				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V			
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**
(mm)	(inch)												
3	**.118**	10000	23.6	.118	.024	7000	15.7	.118	.024	6000	11.8	.118	.024
4	**.157**	7500	23.6	.157	.024	5200	15.7	.157	.024	4500	11.8	.157	.024
5	**.197**	6000	23.6	.197	.024	4200	15.7	.197	.024	3600	11.8	.197	.024
6	**.236**	5000	23.6	.236	.024	3500	15.7	.236	.024	3000	11.8	.236	.024
7	**.276**	4500	22.0	.276	.024	3200	14.2	.276	.024	2700	11.0	.276	.024
8	**.315**	4000	20.5	.315	.024	2800	13.8	.315	.024	2400	10.2	.315	.024
10	**.394**	3200	17.7	.394	.024	2200	11.8	.394	.024	1900	9.1	.394	.024
Depth of Cut													

Workpiece Material		Hardened steel (45—55HRC) AISI H13				Copper, Copper Alloy			
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**
(mm)	(inch)								
3	**.118**	5000	4.7	.118	.008	13000	30.7	.118	.024
4	**.157**	4000	4.7	.157	.008	9500	29.9	.157	.024
5	**.197**	3200	4.7	.197	.008	7600	29.9	.197	.024
6	**.236**	2700	4.7	.236	.008	6400	30.3	.236	.024
7	**.276**	2300	4.3	.276	.008	5500	26.8	.276	.024
8	**.315**	2000	4.3	.315	.008	4800	24.4	.315	.024
10	**.394**	1600	3.9	.394	.008	3800	20.9	.394	.024
Depth of Cut									

Note 1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
Note 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
Note 3) When drilling, please set the feed rate at 1/3 or below the values above.
Note 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.

For Swiss Type Automatic Lathes MS plus End Mill Series

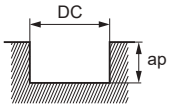
MP2ES

End mill, 2 flute, For swiss type lathe

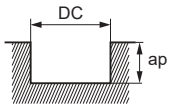
Recommended Cutting Conditions

■Slotting

(inch)

Workpiece Material		Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**
(mm)	(inch)									
3	**.118**	10000	23.6	.024	7000	15.7	.024	6000	11.8	.024
4	**.157**	7500	23.6	.024	5200	15.7	.024	4500	11.8	.024
5	**.197**	6000	23.6	.024	4200	15.7	.024	3600	11.8	.024
6	**.236**	5000	23.6	.024	3500	15.7	.024	3000	11.8	.024
7	**.276**	4500	22.0	.024	3200	14.2	.024	2700	11.0	.024
8	**.315**	4000	20.5	.024	2800	13.8	.024	2400	10.2	.024
10	**.394**	3200	17.7	.024	2200	11.8	.024	1900	9.1	.024
Depth of Cut										

DC:Dia.

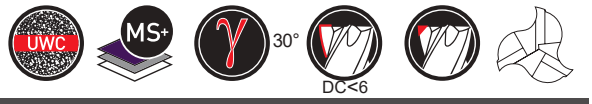
Workpiece Material		Hardened steel (45−55HRC) AISI H13			Copper, Copper Alloy		
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**
(mm)	(inch)						
3	**.118**	5000	4.7	.008	13000	30.7	.024
4	**.157**	4000	4.7	.008	9500	29.9	.024
5	**.197**	3200	4.7	.008	7600	29.9	.024
6	**.236**	2700	4.7	.008	6400	30.3	.024
7	**.276**	2300	4.3	.008	5500	26.8	.024
8	**.315**	2000	4.3	.008	4800	24.4	.024
10	**.394**	1600	3.9	.008	3800	20.9	.024
Depth of Cut							

DC:Dia.

Note 1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
Note 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
Note 3) When drilling, please set the feed rate at 1/3 or below the values above.
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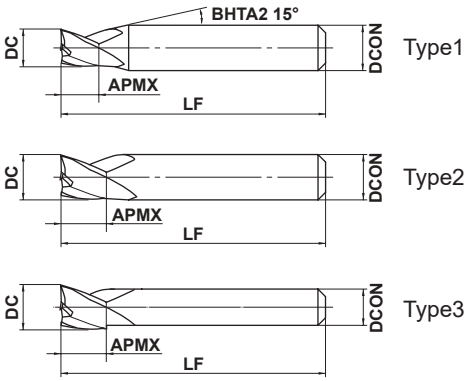
MP3ES NEW

End mill, 3 flute, For swiss type lathe



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





3≤DC≤12				
- 0.010 - 0.030				

4≤DCON≤6	7≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

●3 flute end mill.

(mm)

Order Number	DC	APMX	LF	DCON	* No.F	Stock	Type
MP3ESD0300S04	3	4.5	50	4	3	●	1
MP3ESD0400S04	4	6	50	4	3	★	2
MP3ESD0500S06	5	7.5	50	6	3	●	1
MP3ESD0600S06	6	9	50	6	3	★	2
MP3ESD0700S07	7	10.5	50	7	3	●	2
MP3ESD0800S08	8	12	50	8	3	★	2
MP3ESD0900S10	9	13.5	50	10	3	★	1
MP3ESD1000S10	10	15	50	10	3	●	2
MP3ESD1200S10	12	15	50	10	3	●	3
MP3ESD1200S12	12	15	50	12	3	★	2

* Number of Flutes

DC = Dia.
APMX = Length of Cut
LF = Overall Length
DCON = Shank Dia.

● : USA Stock ★ : Stocked in Japan

For Swiss Type Automatic Lathes MS plus End Mill Series

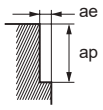
MP3ES

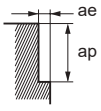
End mill, 3 flute, For swiss type lathe

Recommended Cutting Conditions

■Side Milling

(inch)

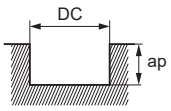
Workpiece Material		Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V			
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**
(mm)	(inch)												
3	**.118**	10000	28.3	.118	.024	7000	18.9	.118	.024	6000	14.2	.118	.024
4	**.157**	7500	28.3	.157	.024	5200	18.9	.157	.024	4500	14.2	.157	.024
5	**.197**	6000	28.3	.197	.024	4200	18.9	.197	.024	3600	14.2	.197	.024
6	**.236**	5000	28.3	.236	.024	3500	18.9	.236	.024	3000	14.2	.236	.024
7	**.276**	4500	26.4	.276	.024	3200	17.3	.276	.024	2700	13.4	.276	.024
8	**.315**	4000	24.4	.315	.024	2800	16.5	.315	.024	2400	12.2	.315	.024
9	**.354**	3500	22.8	.354	.024	2500	15.0	.354	.024	2100	11.4	.354	.024
10	**.394**	3200	21.3	.394	.024	2200	14.2	.394	.024	1900	11.0	.394	.024
12	**.472**	2700	19.3	.472	.024	1900	12.6	.472	.024	1600	9.8	.472	.024
Depth of Cut													

Workpiece Material		Hardened steel (45−55HRC) AISI H13				Copper, Copper Alloy			
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**
(mm)	(inch)								
3	**.118**	5000	5.5	.118	.008	13000	37.0	.118	.024
4	**.157**	4000	5.5	.157	.008	9500	35.8	.157	.024
5	**.197**	3200	5.5	.197	.008	7600	35.8	.197	.024
6	**.236**	2700	5.5	.236	.008	6400	36.2	.236	.024
7	**.276**	2300	5.1	.276	.008	5500	32.3	.276	.024
8	**.315**	2000	5.1	.315	.008	4800	29.1	.315	.024
9	**.354**	1800	5.1	.354	.008	4200	27.6	.354	.024
10	**.394**	1600	4.7	.394	.008	3800	25.2	.394	.024
12	**.472**	1300	4.7	.472	.008	3200	22.8	.472	.024
Depth of Cut									

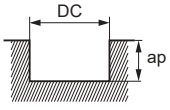
Note 1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
Note 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
Note 3) When drilling, please set the feed rate at 1/3 or below the values above.
Note 4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

■Slotting

(inch)

Workpiece Material		Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**
(mm)	(inch)									
3	**.118**	10000	28.3	.024	7000	18.9	.024	6000	14.2	.024
4	**.157**	7500	28.3	.024	5200	18.9	.024	4500	14.2	.024
5	**.197**	6000	28.3	.024	4200	18.9	.024	3600	14.2	.024
6	**.236**	5000	28.3	.024	3500	18.9	.024	3000	14.2	.024
7	**.276**	4500	26.4	.024	3200	17.3	.024	2700	13.4	.024
8	**.315**	4000	24.4	.024	2800	16.5	.024	2400	12.2	.024
9	**.354**	3500	22.8	.024	2500	15.0	.024	2100	11.4	.024
10	**.394**	3200	21.3	.024	2200	14.2	.024	1900	11.0	.024
12	**.472**	2700	19.3	.024	1900	12.6	.024	1600	9.8	.024
Depth of Cut										

DC:Dia.

Workpiece Material		Hardened steel (45−55HRC) AISI H13			Copper, Copper Alloy		
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**
(mm)	(inch)						
3	**.118**	5000	5.5	.008	13000	37.0	.024
4	**.157**	4000	5.5	.008	9500	35.8	.024
5	**.197**	3200	5.5	.008	7600	35.8	.024
6	**.236**	2700	5.5	.008	6400	36.2	.024
7	**.276**	2300	5.1	.008	5500	32.3	.024
8	**.315**	2000	5.1	.008	4800	29.1	.024
9	**.354**	1800	5.1	.008	4200	27.6	.024
10	**.394**	1600	4.7	.008	3800	25.2	.024
12	**.472**	1300	4.7	.008	3200	22.8	.024
Depth of Cut							

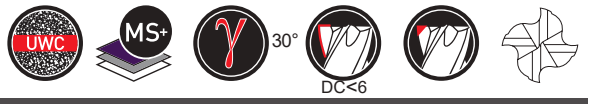
DC:Dia.

Note 1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
Note 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
Note 3) When drilling, please set the feed rate at 1/3 or below the values above.
Note 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.

For Swiss Type Automatic Lathes MS plus End Mill Series

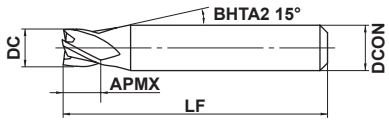
MP4EC NEW

End mill, 4 flute, For swiss type lathe

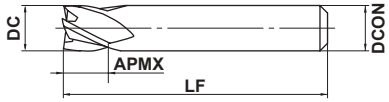


Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy	Copper Alloy	Aluminum Alloy
◎	◎	○		○	○	○	

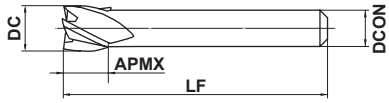




Type1



Type2



Type3

3≤DC≤12	DC=14			
- 0.010 - 0.030	- 0.010 - 0.040			
4≤DCON≤6	**7≤DCON≤10**	**DCON=12**		
0 - 0.008	0 - 0.009	0 - 0.011		

●4 flute end mill.

(mm)

Order Number	DC	APMX	LF	DCON	* No.F	Stock	Type
MP4ECD0300S04	3	4.5	50	4	4	●	1
MP4ECD0350S04	3.5	5	50	4	4	★	1
MP4ECD0400S04	4	6	50	4	4	●	2
MP4ECD0500S06	5	7.5	50	6	4	●	1
MP4ECD0600S06	6	9	50	6	4	●	2
MP4ECD0700S07	7	10.5	50	7	4	★	2
MP4ECD0800S07	8	12	50	7	4	★	3
MP4ECD0800S08	8	12	50	8	4	●	2
MP4ECD0900S10	9	13.5	50	10	4	●	1
MP4ECD1000S07	10	15	50	7	4	★	3
MP4ECD1000S10	10	15	50	10	4	●	2
MP4ECD1200S10	12	15	50	10	4	●	3
MP4ECD1200S12	12	15	50	12	4	★	2
MP4ECD1400S10	14	15	50	10	4	●	3

* Number of Flutes

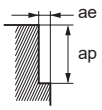
DC = Dia. **LF** = Overall Length
APMX = Length of Cut **DCON** = Shank Dia.

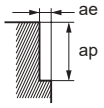
● : USA Stock ★ : Stocked in Japan

Recommended Cutting Conditions

Side Milling

(inch)

Workpiece Material		Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V			
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**
(mm)	(inch)												
3	**.118**	10000	35.4	.118	.024	7000	23.6	.118	.024	6000	17.7	.118	.024
3.5	**.138**	8500	35.4	.138	.024	6000	23.6	.138	.024	5100	17.7	.138	.024
4	**.157**	7500	35.4	.157	.024	5200	23.6	.157	.024	4500	17.7	.157	.024
5	**.197**	6000	35.4	.197	.024	4200	23.6	.197	.024	3600	17.7	.197	.024
6	**.236**	5000	35.4	.236	.024	3500	23.6	.236	.024	3000	17.7	.236	.024
7	**.276**	4500	33.1	.276	.024	3200	21.3	.276	.024	2700	16.5	.276	.024
8	**.315**	4000	30.7	.315	.024	2800	20.5	.315	.024	2400	15.4	.315	.024
9	**.354**	3500	28.3	.354	.024	2500	18.9	.354	.024	2100	14.2	.354	.024
10	**.394**	3200	26.8	.394	.024	2200	17.7	.394	.024	1900	13.4	.394	.024
12	**.472**	2700	24.4	.472	.024	1900	16.1	.472	.024	1600	12.2	.472	.024
14	**.551**	2300	21.7	.551	.024	1600	13.8	.551	.024	1400	11.0	.551	.024
Depth of cut													

Workpiece Material		Hardened steel (45−55HRC) AISI H13				Copper, Copper Alloy			
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Width of Cut **ae**
(mm)	(inch)								
3	**.118**	5000	7.1	.118	.008	13000	47.2	.118	.024
3.5	**.138**	4500	7.1	.138	.008	11000	47.2	.138	.024
4	**.157**	4000	7.1	.157	.008	9500	43.3	.157	.024
5	**.197**	3200	7.1	.197	.008	7600	43.3	.197	.024
6	**.236**	2700	7.1	.236	.008	6400	43.3	.236	.024
7	**.276**	2300	6.3	.276	.008	5500	39.4	.276	.024
8	**.315**	2000	6.3	.315	.008	4800	37.0	.315	.024
9	**.354**	1800	5.9	.354	.008	4200	33.9	.354	.024
10	**.394**	1600	5.5	.394	.008	3800	31.9	.394	.024
12	**.472**	1300	4.7	.472	.008	3200	28.7	.472	.024
14	**.551**	1200	4.7	.551	.008	2700	25.6	.551	.024
Depth of cut									

Note 1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
Note 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
Note 3) When drilling, please set the feed rate at 1/3 or below the values above.
Note 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.

MP4EC

End mill, 4 flute, For small automatic lathes

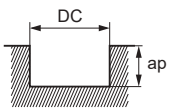
Recommended Cutting Conditions

■Slotting

(inch)

Workpiece Material		Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**
(mm)	(inch)									
3	**.118**	10000	35.4	.024	7000	23.6	.024	6000	17.7	.024
3.5	**.138**	8500	35.4	.024	6000	23.6	.024	5100	17.7	.024
4	**.157**	7500	35.4	.024	5200	23.6	.024	4500	17.7	.024
5	**.197**	6000	35.4	.024	4200	23.6	.024	3600	17.7	.024
6	**.236**	5000	35.4	.024	3500	23.6	.024	3000	17.7	.024
7	**.276**	4500	33.1	.024	3200	21.3	.024	2700	16.5	.024
8	**.315**	4000	30.7	.024	2800	20.5	.024	2400	15.4	.024
9	**.354**	3500	28.3	.024	2500	18.9	.024	2100	14.2	.024
10	**.394**	3200	26.8	.024	2200	17.7	.024	1900	13.4	.024
12	**.472**	2700	24.4	.024	1900	16.1	.024	1600	12.2	.024
14	**.551**	2300	21.7	.024	1600	13.8	.024	1400	11.0	.024

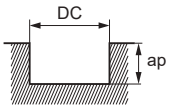
Depth of Cut



DC:Dia.

Workpiece Material		Hardened steel (45−55HRC) AISI H13			Copper, Copper Alloy		
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**	Revolution (min^{-1})	Feed rate (IPM)	Depth of Cut **ap**
(mm)	(inch)						
3	**.118**	5000	7.1	.008	13000	47.2	.024
3.5	**.138**	4500	7.1	.008	11000	47.2	.024
4	**.157**	4000	7.1	.008	9500	43.3	.024
5	**.197**	3200	7.1	.008	7600	43.3	.024
6	**.236**	2700	7.1	.008	6400	43.3	.024
7	**.276**	2300	6.3	.008	5500	39.4	.024
8	**.315**	2000	6.3	.008	4800	37.0	.024
9	**.354**	1800	5.9	.008	4200	33.9	.024
10	**.394**	1600	5.5	.008	3800	31.9	.024
12	**.472**	1300	4.7	.008	3200	28.7	.024
14	**.551**	1200	4.7	.008	2700	25.6	.024

Depth of Cut



DC:Dia.

Note 1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
Note 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
Note 3) When drilling, please set the feed rate at 1/3 or below the values above.
Note 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.

Memo

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Fax: 248.308.2627

FOR YOUR SAFETY

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

www.mmc-carbide.com/us

Tools specifications subject to change without notice.

B205A-F-US-2021.4v2