

For Swiss Type Automatic Lathes MS plus End Mill Series

MP2ES/3ES/4EC

New
Products

Enhanced Burr Reduction and Fracture Resistance to Solve Typical Swiss Lathe Machining Problems



For Swiss Type Automatic Lathes
MS plus End Mill Series

MP2ES/3ES/4EC

Provides Stable Machining and Resists Edge Chipping Even when Overused

New Tough Substrate

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

Cutting Edge Geometry

The optimised rake angle suppresses burrs.

Improved Cutting Edge

To improve the fracture resistance of the cutting edge, a small gash land is used on diameters of 6mm and larger.

Ideal Tool Length

Cutting edge and overall length optimised for the restricted space available in Swiss type automatic lathes.

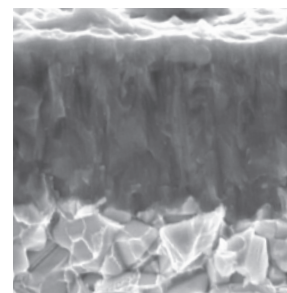
(Al, Ti, Cr)N Multilayer Coating (MS plus)

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

Original coating technology can create multi-layers of (Al, Ti)N and (Al,Cr)N. This enables successful machining of a wider range of workpiece materials.

Properties of MS plus coating

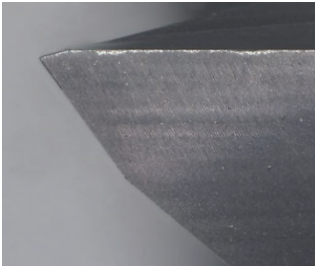
| | (Al,Ti,Cr)N multilayer | (Al,Ti)N | (Al,Cr)N |
|----------------------------|------------------------|----------|----------|
| Hardness (HV) | 3200 | 2800 | 3100 |
| Oxidation Temperature (°C) | 1100 | 800 | 1100 |
| Adhesion (N) | 100 | 80 | 80 |



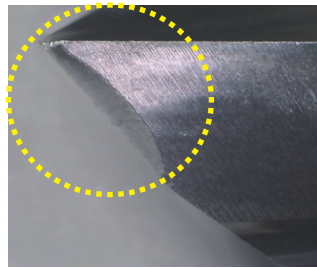
Cutting Performance

Comparison of Fracture Resistance - Machining SUS304

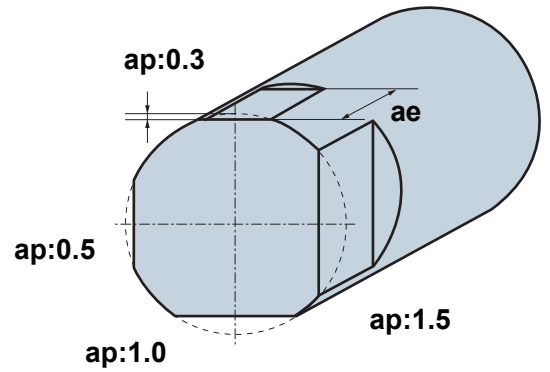
A round stainless steel bar is machined effectively due to the tough cemented carbide substrate and the gashed land providing improved fracture resistance.



MP3ES
After machining
2 components



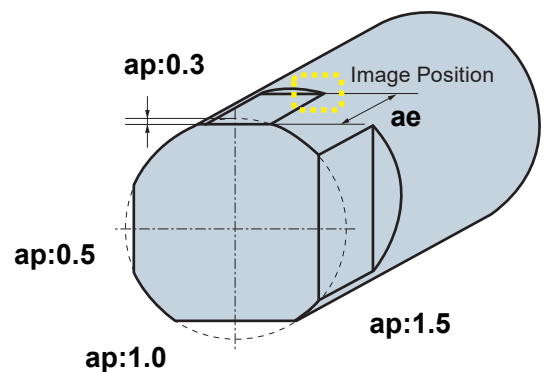
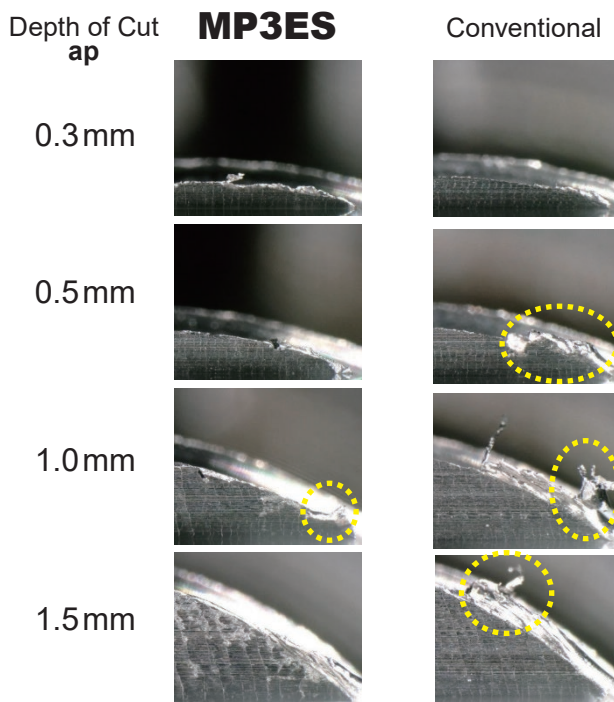
Conventional
After machining
1 component



<Cutting Conditions>
 Workpiece Material : JIS SUS304
 Tool : MP3ESD0800S08(ø8)
 Cutting Speed : $v_c = 50$ m/min
 Feed Rate : $f = 150$ mm/min
 Feed per Tooth : $f_r = 0.025$ mm/t.
 Depth of Cut : $a_p = 0.3-1.5$ mm
 $a_e = 6.0$ mm
 Cutting Mode : Wet Cutting (Oil)
 Machine : Small Automatic Lathe
 Tool Post : Gang Type Tool Post

Comparison of Burr Generation - Machining SUS304

The optimised cutting edge shape suppresses the occurrence of burrs.



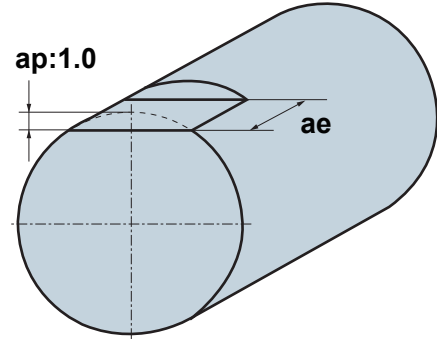
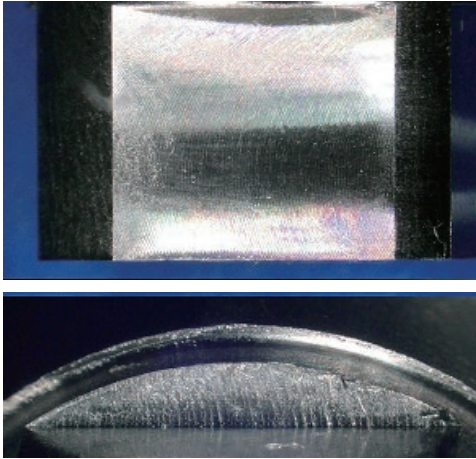
<Cutting Conditions>
 Workpiece Material : JIS SUS304
 Tool : MP3ESD0800S08(ø8)
 Cutting Speed : $v_c = 50$ m/min
 Feed Rate : $f = 150$ mm/min
 Feed per Tooth : $f_r = 0.025$ mm/t.
 Depth of Cut : $a_p = 0.3-1.5$ mm
 $a_e = 6.0$ mm
 Cutting Mode : Wet Cutting (Oil)
 Machine : Small Automatic Lathe
 Tool Post : Gang Type Tool Post

Cutting Performance

Comparison of Surface Finishes - Machining SUS304

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

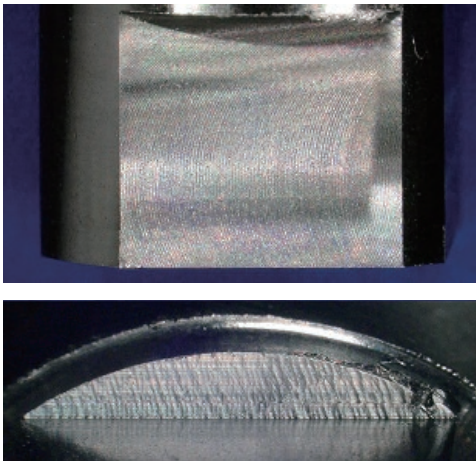
MP3ES
Ra 0.21 μm



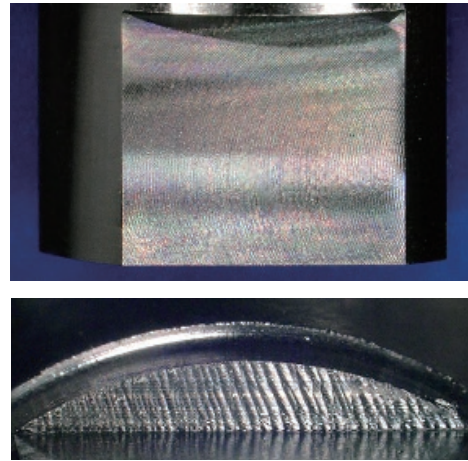
<Cutting Conditions>

Workpiece Material : JIS SUS304
Tool : MP3ESD0800S08($\phi 8$)
Cutting Speed : $v_c = 50 \text{ m/min}$
Feed Rate : $f = 150 \text{ mm/min}$
Feed per Tooth : $f_r = 0.025 \text{ mm/t.}$
Depth of Cut : $a_p = 1.0 \text{ mm}$
 $a_e = 6.0 \text{ mm}$
Cutting Mode : Wet Cutting (Oil)
Machine : Small Automatic Lathe
Tool Post : Gang Type Tool Post

Conventional A
Ra 0.62 μm

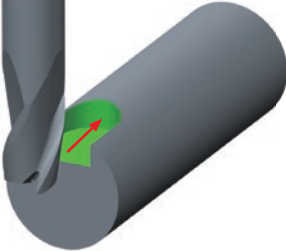
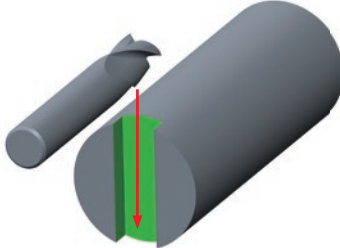
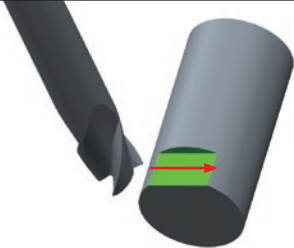
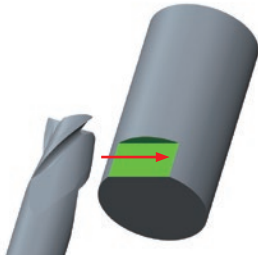


Conventional B
Ra 0.75 μm



End Mill Selection for Use on Swiss Type Lathes

① Select the appropriate number of flutes according to the application

| Cuttig Mode | Type | MP2ES | MP3ES | MP4EC |
|----------------------------|---|---------|---------|---------|
| | Flutes | 2 Flute | 3 Flute | 4 Flute |
| External Diameter Slotting |  | ⊙ | ○ | × |
| End Face Slotting |  | ⊙ | ○ | × |
| External Diameter Facing |  | △ | ⊙ | ○ |
| Shoulder Milling |  | △ | ○ | ⊙ |

② Selection of Tools Other Than Dedicated Small Swiss Types

End mills with an overall length (LF=50 mm or less) can also be used. Select the tool according to the application and workpiece material.

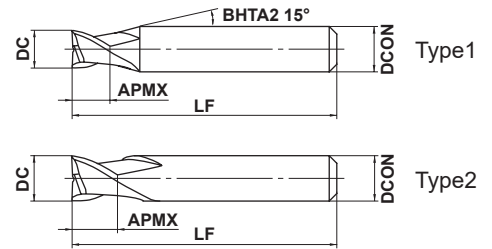
For Swiss Type Automatic Lathes MS plus End Mill Series

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 | Aluminium Alloy |
| ○ | ○ | ○ | | ○ | ○ | ○ | |



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

● 2 flute end mill.

| Order Number | DC | APMX | LF | DCON | (mm) | | |
|---------------|----|------|----|------|--------|-------|------|
| | | | | | * 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.

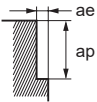
● : Inventory maintained in Japan.

Recommended Cutting Conditions

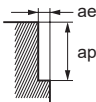
Side Milling

(mm)

| Dia. DC | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Alloy steel, Tool steel, Pre-hardened steel | | | | Austenitic stainless steel, Titanium alloy | | | |
|------------|------------------------------------|-----------------------|--------------------|--------------------|--|-----------------------|--------------------|--------------------|---|-----------------------|--------------------|--------------------|
| | | | | | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae |
| 3 | 10000 | 600 | 3 | 0.6 | 7000 | 400 | 3 | 0.6 | 6000 | 300 | 3 | 0.6 |
| 4 | 7500 | 600 | 4 | 0.6 | 5200 | 400 | 4 | 0.6 | 4500 | 300 | 4 | 0.6 |
| 5 | 6000 | 600 | 5 | 0.6 | 4200 | 400 | 5 | 0.6 | 3600 | 300 | 5 | 0.6 |
| 6 | 5000 | 600 | 6 | 0.6 | 3500 | 400 | 6 | 0.6 | 3000 | 300 | 6 | 0.6 |
| 7 | 4500 | 560 | 7 | 0.6 | 3200 | 360 | 7 | 0.6 | 2700 | 280 | 7 | 0.6 |
| 8 | 4000 | 520 | 8 | 0.6 | 2800 | 350 | 8 | 0.6 | 2400 | 260 | 8 | 0.6 |
| 10 | 3200 | 450 | 10 | 0.6 | 2200 | 300 | 10 | 0.6 | 1900 | 230 | 10 | 0.6 |

| | | | | | | | | | | | | |
|--------------|---|--|--|--|--|--|--|--|--|--|--|--|
| Depth of cut |  | | | | | | | | | | | |
|--------------|---|--|--|--|--|--|--|--|--|--|--|--|

| Dia. DC | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Copper, Copper Alloy | | | |
|------------|------------------------------------|-----------------------|--------------------|--------------------|------------------------------------|-----------------------|--------------------|--------------------|
| | | | | | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae |
| 3 | 5000 | 120 | 3 | 0.2 | 13000 | 780 | 3 | 0.6 |
| 4 | 4000 | 120 | 4 | 0.2 | 9500 | 760 | 4 | 0.6 |
| 5 | 3200 | 120 | 5 | 0.2 | 7600 | 760 | 5 | 0.6 |
| 6 | 2700 | 120 | 6 | 0.2 | 6400 | 770 | 6 | 0.6 |
| 7 | 2300 | 110 | 7 | 0.2 | 5500 | 680 | 7 | 0.6 |
| 8 | 2000 | 110 | 8 | 0.2 | 4800 | 620 | 8 | 0.6 |
| 10 | 1600 | 100 | 10 | 0.2 | 3800 | 530 | 10 | 0.6 |

| | | | | | | | | |
|--------------|---|--|--|--|--|--|--|--|
| 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

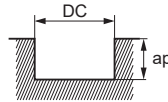
Recommended Cutting Conditions

■ Slotting

(mm)

| Dia. DC | 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 | | |
|------------|---|-----------------------|--------------------|--|-----------------------|--------------------|--|-----------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap |
| 3 | 10000 | 600 | 0.6 | 7000 | 400 | 0.6 | 6000 | 300 | 0.6 |
| 4 | 7500 | 600 | 0.6 | 5200 | 400 | 0.6 | 4500 | 300 | 0.6 |
| 5 | 6000 | 600 | 0.6 | 4200 | 400 | 0.6 | 3600 | 300 | 0.6 |
| 6 | 5000 | 600 | 0.6 | 3500 | 400 | 0.6 | 3000 | 300 | 0.6 |
| 7 | 4500 | 560 | 0.6 | 3200 | 360 | 0.6 | 2700 | 280 | 0.6 |
| 8 | 4000 | 520 | 0.6 | 2800 | 350 | 0.6 | 2400 | 260 | 0.6 |
| 10 | 3200 | 450 | 0.6 | 2200 | 300 | 0.6 | 1900 | 230 | 0.6 |

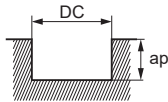
Depth of cut



DC:Dia.

| Dia. DC | Hardened steel (45–55HRC) AISI H13 | | | Copper, Copper Alloy | | |
|------------|---------------------------------------|-----------------------|--------------------|------------------------------------|-----------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap |
| 3 | 5000 | 120 | 0.2 | 13000 | 780 | 0.6 |
| 4 | 4000 | 120 | 0.2 | 9500 | 760 | 0.6 |
| 5 | 3200 | 120 | 0.2 | 7600 | 760 | 0.6 |
| 6 | 2700 | 120 | 0.2 | 6400 | 770 | 0.6 |
| 7 | 2300 | 110 | 0.2 | 5500 | 680 | 0.6 |
| 8 | 2000 | 110 | 0.2 | 4800 | 620 | 0.6 |
| 10 | 1600 | 100 | 0.2 | 3800 | 530 | 0.6 |

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.

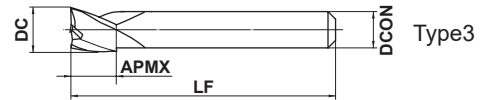
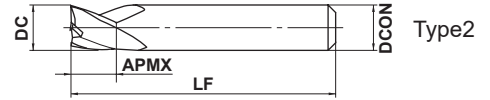
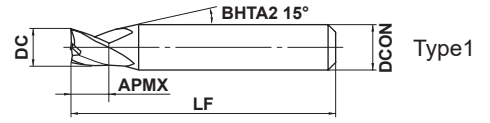
Note 4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

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 | Aluminium Alloy |
| ○ | ○ | ○ | | ○ | ○ | ○ | |



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

● 3 flute end mill.

| Order Number | DC | APMX | LF | DCON | * (mm) | | Type |
|---------------|----|------|----|------|--------|-------|------|
| | | | | | No.F | Stock | |
| 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.

● : Inventory maintained in Japan.

MP3ES

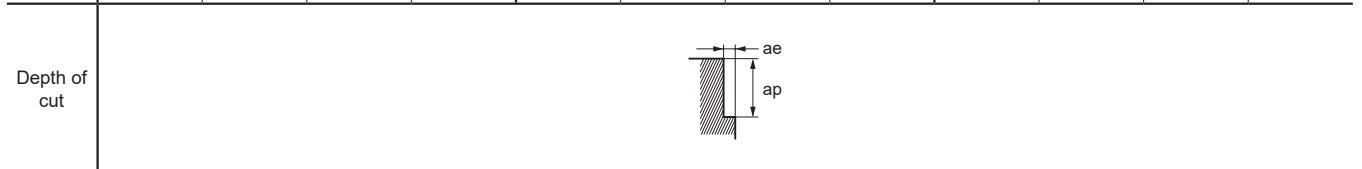
End mill, 3 flute, For swiss type lathe

Recommended Cutting Conditions

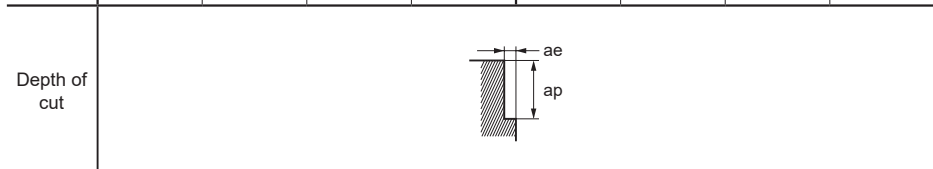
Side Milling

(mm)

| Dia. DC | Carbon steel, Cast iron, Alloy steel (-30HRC) | | | | Alloy steel, Tool steel, Pre-hardened steel | | | | Austenitic stainless steel, Titanium alloy | | | |
|------------|--|-----------------------|--------------------|--------------------|--|-----------------------|--------------------|--------------------|---|-----------------------|--------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae |
| 3 | 10000 | 720 | 3 | 0.6 | 7000 | 480 | 3 | 0.6 | 6000 | 360 | 3 | 0.6 |
| 4 | 7500 | 720 | 4 | 0.6 | 5200 | 480 | 4 | 0.6 | 4500 | 360 | 4 | 0.6 |
| 5 | 6000 | 720 | 5 | 0.6 | 4200 | 480 | 5 | 0.6 | 3600 | 360 | 5 | 0.6 |
| 6 | 5000 | 720 | 6 | 0.6 | 3500 | 480 | 6 | 0.6 | 3000 | 360 | 6 | 0.6 |
| 7 | 4500 | 670 | 7 | 0.6 | 3200 | 440 | 7 | 0.6 | 2700 | 340 | 7 | 0.6 |
| 8 | 4000 | 620 | 8 | 0.6 | 2800 | 420 | 8 | 0.6 | 2400 | 310 | 8 | 0.6 |
| 9 | 3500 | 580 | 9 | 0.6 | 2500 | 380 | 9 | 0.6 | 2100 | 290 | 9 | 0.6 |
| 10 | 3200 | 540 | 10 | 0.6 | 2200 | 360 | 10 | 0.6 | 1900 | 280 | 10 | 0.6 |
| 12 | 2700 | 490 | 12 | 0.6 | 1900 | 320 | 12 | 0.6 | 1600 | 250 | 12 | 0.6 |



| Dia. DC | Hardened steel (45-55HRC) | | | | Copper, Copper Alloy | | | |
|------------|------------------------------------|-----------------------|--------------------|--------------------|------------------------------------|-----------------------|--------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae |
| 3 | 5000 | 140 | 3 | 0.2 | 13000 | 940 | 3 | 0.6 |
| 4 | 4000 | 140 | 4 | 0.2 | 9500 | 910 | 4 | 0.6 |
| 5 | 3200 | 140 | 5 | 0.2 | 7600 | 910 | 5 | 0.6 |
| 6 | 2700 | 140 | 6 | 0.2 | 6400 | 920 | 6 | 0.6 |
| 7 | 2300 | 130 | 7 | 0.2 | 5500 | 820 | 7 | 0.6 |
| 8 | 2000 | 130 | 8 | 0.2 | 4800 | 740 | 8 | 0.6 |
| 9 | 1800 | 130 | 9 | 0.2 | 4200 | 700 | 9 | 0.6 |
| 10 | 1600 | 120 | 10 | 0.2 | 3800 | 640 | 10 | 0.6 |
| 12 | 1300 | 120 | 12 | 0.2 | 3200 | 580 | 12 | 0.6 |



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.

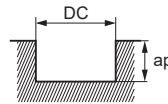
Note 4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

■ Slotting

(mm)

| Dia. DC | 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 | | |
|------------|---|-----------------------|--------------------|--|-----------------------|--------------------|--|-----------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap |
| 3 | 10000 | 720 | 0.6 | 7000 | 480 | 0.6 | 6000 | 360 | 0.6 |
| 4 | 7500 | 720 | 0.6 | 5200 | 480 | 0.6 | 4500 | 360 | 0.6 |
| 5 | 6000 | 720 | 0.6 | 4200 | 480 | 0.6 | 3600 | 360 | 0.6 |
| 6 | 5000 | 720 | 0.6 | 3500 | 480 | 0.6 | 3000 | 360 | 0.6 |
| 7 | 4500 | 670 | 0.6 | 3200 | 440 | 0.6 | 2700 | 340 | 0.6 |
| 8 | 4000 | 620 | 0.6 | 2800 | 420 | 0.6 | 2400 | 310 | 0.6 |
| 9 | 3500 | 580 | 0.6 | 2500 | 380 | 0.6 | 2100 | 290 | 0.6 |
| 10 | 3200 | 540 | 0.6 | 2200 | 360 | 0.6 | 1900 | 280 | 0.6 |
| 12 | 2700 | 490 | 0.6 | 1900 | 320 | 0.6 | 1600 | 250 | 0.6 |

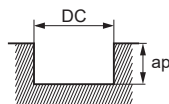
Depth of cut



DC:Dia.

| Dia. DC | Hardened steel (45–55HRC) AISI H13 | | | Copper, Copper Alloy | | |
|------------|---------------------------------------|-----------------------|--------------------|------------------------------------|-----------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap |
| 3 | 5000 | 140 | 0.2 | 13000 | 940 | 0.6 |
| 4 | 4000 | 140 | 0.2 | 9500 | 910 | 0.6 |
| 5 | 3200 | 140 | 0.2 | 7600 | 910 | 0.6 |
| 6 | 2700 | 140 | 0.2 | 6400 | 920 | 0.6 |
| 7 | 2300 | 130 | 0.2 | 5500 | 820 | 0.6 |
| 8 | 2000 | 130 | 0.2 | 4800 | 740 | 0.6 |
| 9 | 1800 | 130 | 0.2 | 4200 | 700 | 0.6 |
| 10 | 1600 | 120 | 0.2 | 3800 | 640 | 0.6 |
| 12 | 1300 | 120 | 0.2 | 3200 | 580 | 0.6 |

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.

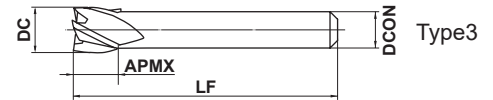
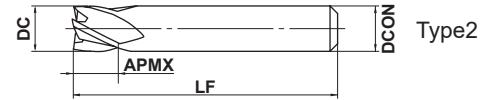
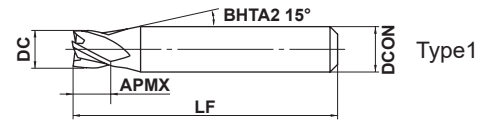
For Swiss Type Automatic Lathes MS plus End Mill Series

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 | Aluminium Alloy |
| ○ | ○ | ○ | | ○ | ○ | ○ | |



| | | | | |
|----------------------|-----------------------|--------------|--|--|
| $3 \leq DC \leq 12$ | DC=14 | | | |
| 0.010 - 0.030 | 0.010 - 0.040 | | | |
| $4 \leq DCON \leq 6$ | $7 \leq DCON \leq 10$ | DCON=12 | | |
| 0 - 0.008 | 0 - 0.009 | 0 - 0.011 | | |

● 4 flute end mill.

| 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.

APMX = Length of Cut

LF = Overall Length

DCON = Shank Dia.

● : Inventory maintained in Japan.

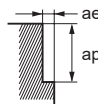
Recommended Cutting Conditions

Side Milling

(mm)

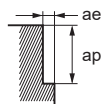
| Dia. DC | Carbon steel, Cast iron, Alloy steel (–30HRC) AISI 1050, AISI No 35 B, AISI P20 | | | | Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 | | | | Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V | | | |
|------------|---|-----------------------|--------------------|--------------------|--|-----------------------|--------------------|--------------------|--|-----------------------|--------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae |
| 3 | 10000 | 900 | 3 | 0.6 | 7000 | 600 | 3 | 0.6 | 6000 | 450 | 3 | 0.6 |
| 3.5 | 8500 | 900 | 3.5 | 0.6 | 6000 | 600 | 3.5 | 0.6 | 5100 | 450 | 3.5 | 0.6 |
| 4 | 7500 | 900 | 4 | 0.6 | 5200 | 600 | 4 | 0.6 | 4500 | 450 | 4 | 0.6 |
| 5 | 6000 | 900 | 5 | 0.6 | 4200 | 600 | 5 | 0.6 | 3600 | 450 | 5 | 0.6 |
| 6 | 5000 | 900 | 6 | 0.6 | 3500 | 600 | 6 | 0.6 | 3000 | 450 | 6 | 0.6 |
| 7 | 4500 | 840 | 7 | 0.6 | 3200 | 540 | 7 | 0.6 | 2700 | 420 | 7 | 0.6 |
| 8 | 4000 | 780 | 8 | 0.6 | 2800 | 520 | 8 | 0.6 | 2400 | 390 | 8 | 0.6 |
| 9 | 3500 | 720 | 9 | 0.6 | 2500 | 480 | 9 | 0.6 | 2100 | 360 | 9 | 0.6 |
| 10 | 3200 | 680 | 10 | 0.6 | 2200 | 450 | 10 | 0.6 | 1900 | 340 | 10 | 0.6 |
| 12 | 2700 | 620 | 12 | 0.6 | 1900 | 410 | 12 | 0.6 | 1600 | 310 | 12 | 0.6 |
| 14 | 2300 | 550 | 14 | 0.6 | 1600 | 350 | 14 | 0.6 | 1400 | 280 | 14 | 0.6 |

Depth of cut



| Dia. DC | Hardened steel (45–55HRC) AISI H13 | | | | Copper, Copper Alloy | | | |
|------------|---------------------------------------|-----------------------|--------------------|--------------------|------------------------------------|-----------------------|--------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Width of Cut ae |
| 3 | 5000 | 180 | 3 | 0.2 | 13000 | 1200 | 3 | 0.6 |
| 3.5 | 4500 | 180 | 3.5 | 0.2 | 11000 | 1200 | 3.5 | 0.6 |
| 4 | 4000 | 180 | 4 | 0.2 | 9500 | 1100 | 4 | 0.6 |
| 5 | 3200 | 180 | 5 | 0.2 | 7600 | 1100 | 5 | 0.6 |
| 6 | 2700 | 180 | 6 | 0.2 | 6400 | 1100 | 6 | 0.6 |
| 7 | 2300 | 160 | 7 | 0.2 | 5500 | 1000 | 7 | 0.6 |
| 8 | 2000 | 160 | 8 | 0.2 | 4800 | 940 | 8 | 0.6 |
| 9 | 1800 | 150 | 9 | 0.2 | 4200 | 860 | 9 | 0.6 |
| 10 | 1600 | 140 | 10 | 0.2 | 3800 | 810 | 10 | 0.6 |
| 12 | 1300 | 120 | 12 | 0.2 | 3200 | 730 | 12 | 0.6 |
| 14 | 1200 | 120 | 14 | 0.2 | 2700 | 650 | 14 | 0.6 |

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

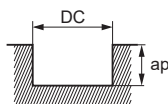
Recommended Cutting Conditions

Slotting

(mm)

| Dia. DC | 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 | | |
|------------|---|-----------------------|--------------------|--|-----------------------|--------------------|--|-----------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap |
| 3 | 10000 | 900 | 0.6 | 7000 | 600 | 0.6 | 6000 | 450 | 0.6 |
| 3.5 | 8500 | 900 | 0.6 | 6000 | 600 | 0.6 | 5100 | 450 | 0.6 |
| 4 | 7500 | 900 | 0.6 | 5200 | 600 | 0.6 | 4500 | 450 | 0.6 |
| 5 | 6000 | 900 | 0.6 | 4200 | 600 | 0.6 | 3600 | 450 | 0.6 |
| 6 | 5000 | 900 | 0.6 | 3500 | 600 | 0.6 | 3000 | 450 | 0.6 |
| 7 | 4500 | 840 | 0.6 | 3200 | 540 | 0.6 | 2700 | 420 | 0.6 |
| 8 | 4000 | 780 | 0.6 | 2800 | 520 | 0.6 | 2400 | 390 | 0.6 |
| 9 | 3500 | 720 | 0.6 | 2500 | 480 | 0.6 | 2100 | 360 | 0.6 |
| 10 | 3200 | 680 | 0.6 | 2200 | 450 | 0.6 | 1900 | 340 | 0.6 |
| 12 | 2700 | 620 | 0.6 | 1900 | 410 | 0.6 | 1600 | 310 | 0.6 |
| 14 | 2300 | 550 | 0.6 | 1600 | 350 | 0.6 | 1400 | 280 | 0.6 |

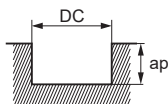
Depth of cut



DC: Dia.

| Dia. DC | Hardened steel (45-55HRC) AISI H13 | | | Copper, Copper Alloy | | |
|------------|---------------------------------------|-----------------------|--------------------|------------------------------------|-----------------------|--------------------|
| | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap | Revolution (min ⁻¹) | Feed rate (mm/min) | Depth of Cut ap |
| 3 | 5000 | 180 | 0.2 | 13000 | 1200 | 0.6 |
| 3.5 | 4500 | 180 | 0.2 | 11000 | 1200 | 0.6 |
| 4 | 4000 | 180 | 0.2 | 9500 | 1100 | 0.6 |
| 5 | 3200 | 180 | 0.2 | 7600 | 1100 | 0.6 |
| 6 | 2700 | 180 | 0.2 | 6400 | 1100 | 0.6 |
| 7 | 2300 | 160 | 0.2 | 5500 | 1000 | 0.6 |
| 8 | 2000 | 160 | 0.2 | 4800 | 940 | 0.6 |
| 9 | 1800 | 150 | 0.2 | 4200 | 860 | 0.6 |
| 10 | 1600 | 140 | 0.2 | 3800 | 810 | 0.6 |
| 12 | 1300 | 120 | 0.2 | 3200 | 730 | 0.6 |
| 14 | 1200 | 120 | 0.2 | 2700 | 650 | 0.6 |

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

A series of horizontal dashed lines for writing, spanning the width of the page.



For Swiss Type Automatic Lathes
MS plus End Mill Series

MP2ES/3ES/4EC

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.

 **MITSUBISHI MATERIALS CORPORATION**

MITSUBISHI MATERIALS CORPORATION

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<http://www.mitsubishicarbide.com/en/>
(Tools specifications subject to change without notice.)