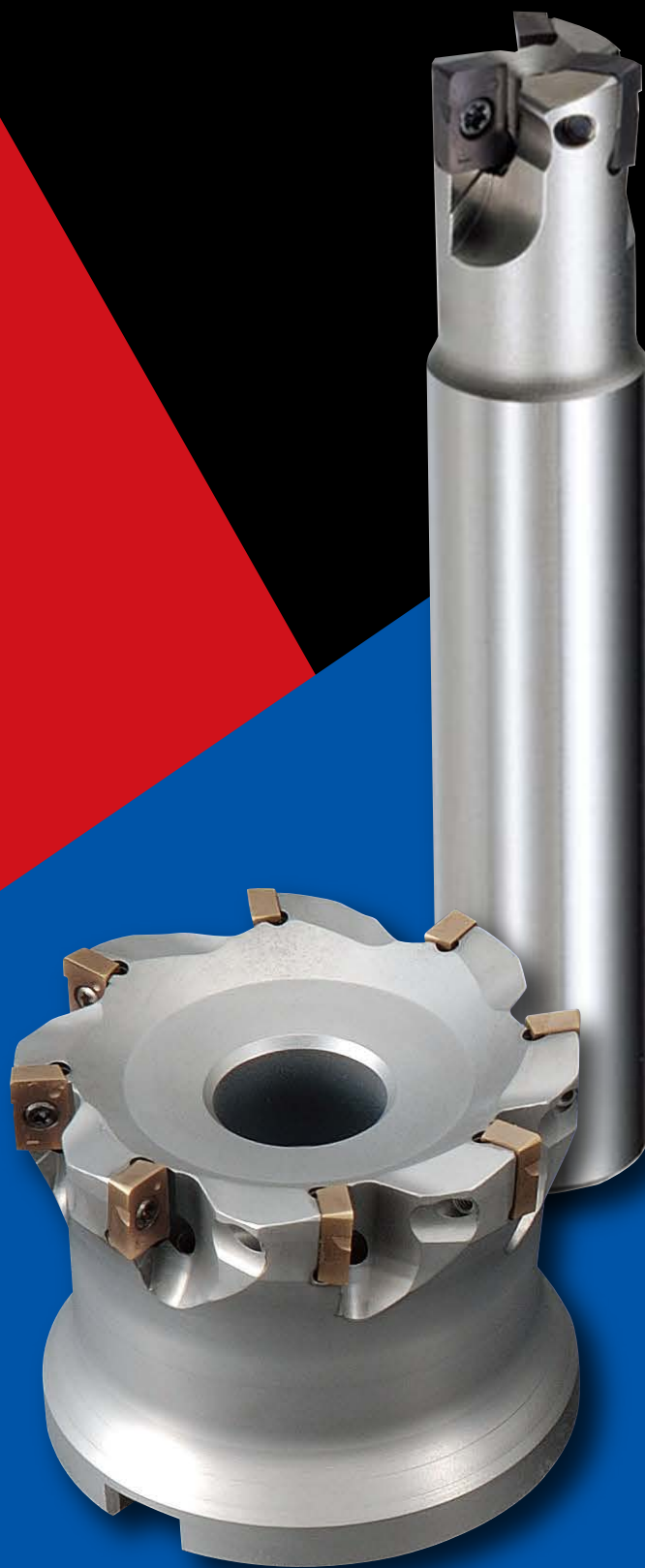


ASPV type

Polish Mill V type ASPV

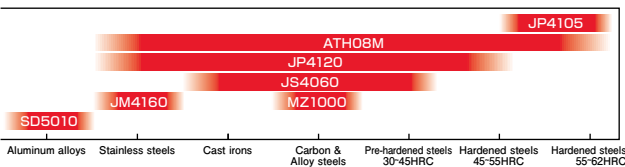


MOLDINO Tool Engineering, Ltd.

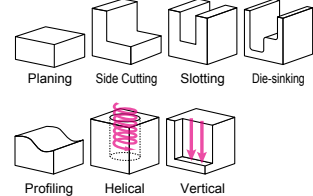
New Product News | No.1211E-15 | 2026-2

**Provides good bottom finishing and can also perform standing wall finishing.
Multi-function end mill**

A cutting tool with multi-flute specifications to speed up finishing



Cutting Applications

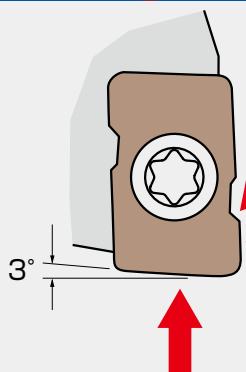


Features

- Ideal cutter for applications finishing structural parts of bottom, side, etc.
- Multi-flute specifications enable higher feed rates for more efficient finishing.
- Vertical machining in which cutting feed is in the direction of the machine's main axis can also be performed.
- Comprehensive lineup of insert materials enables machining of a wide range of materials from carbon steels to hardened steels, as well as aluminum, etc.
- For small machines, use in combination with the modular mill arbor BT30 creates a high-rigidity system and improves machining stability.
- Use in combination with a carbide shank improves machining accuracy when machining with long overhangs.
- In addition to improving durability by using special steel in the cutter body, a PVD coating is applied to the modular type and bore type holder to improve abrasion resistance.

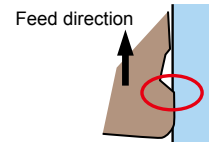
Construction

This insert has 3 cutting edges.



1 Cutting edge for reciprocating machining

Used as the cutting edge when performing reciprocating finishing vertical machining.



2 Peripheral cutting edge

Used as the peripheral cutting edge when performing side machining.

3

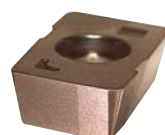
Face cutting edge

Used when bottom finishing.



Insert with minor cutting edge

MPHW0603○○ZEL-0.5
MPHW0603○○ZEL-1.5



minor cutting edge enables feed rate to be increased.

Insert without minor cutting edge

MPHW0603○○ZEL



For bottom machining, suitable for long overhang (L/D= 5 or more) machining or for handling low rigidity in main axis direction.

※For vertical machining, inserts without minor cutting edge are recommended.

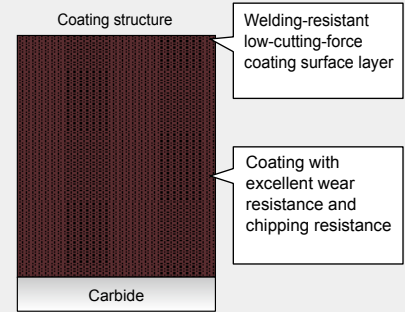
Features of AJ Coating series

- Employs an AlTiN layer with a new composition created by increasing the Al content of conventional layers.
- Excellent wear resistance, chipping resistance, and heat resistance!

New technology!!

- The new layer with high Al content employs a new composition and optimizes the structure to improve wear resistance and chipping resistance!
- Employs a low-friction-effect coating with excellent welding resistance as the top-most surface layer. This reduces welding to the work and decreases cutting force!

Layer structure AJ Coating



PVD Technology

Grade for machining pre-hardened or hardened materials JP4120

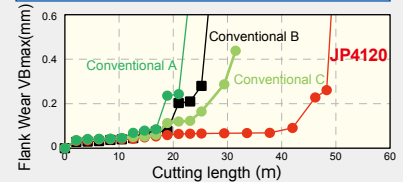
Features

- Employs a fine carbide substrate with an excellent balance between wear resistance and toughness and the new "AJ Coating" to provide improved wear resistance and chipping resistance.
- Highly versatile with excellent wear resistance and chipping resistance when machining steel materials with hardnesses of 30 to 50 HRC.

Strong fields

- Exhibits excellent cutting performance when machining pre-hardened or hardened steels with hardnesses of 30 to 50 HRC.
- Exhibits excellent wear resistance even on difficult-to-cut diecast tool steel or precipitation-hardened stainless steels, or for finishing.

Cutting performance



Work material : P21(40HRC)
 Tool : ASRT5063R-4
 Insert : WDNW140520
 Cutting conditions :
 $V_c=90\text{m/min}$ $f_z=0.8\text{mm/t}$
 $a_p \times a_e=1 \times 44\text{mm}$
 Dry
 ※Single-flute cutting

PVD Technology

Grade for machining stainless-steel materials JM4160

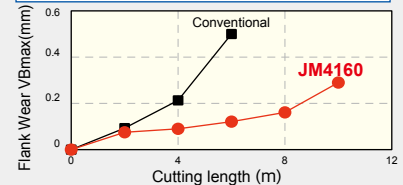
Features

- Employs a carbide substrate with high toughness and the new "AJ Coating" to improve wear resistance and chipping resistance when machining stainless-steel materials.
- Employs AJ Coating with excellent welding resistance to reduce the welding to work material that occurs when machining stainless steel materials.

Strong fields

- Provides long tool life for general processing of stainless-steel materials.

Cutting performance



Work material : SUS304
 Tool : ASRS2032R-5
 Insert : EPMT0603EN-8LF
 Cutting conditions :
 $V_c=180\text{m/min}$ $f_z=0.5\text{mm/t}$
 $a_p \times a_e=0.8 \times 21\text{mm}$
 Wet
 ※Single-flute cutting

PVD Technology

Grade for machining high-hardness materials JP4105

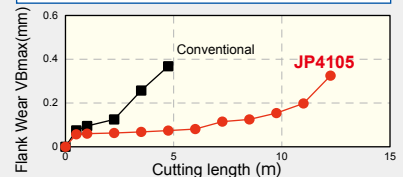
Features

- Employs an ultra-fine cemented carbide substrate and the new "AJ Coating" to improve wear resistance.
- Excellent wear resistance when machining high hardness materials of 50HRC or higher.

Strong fields

- Hardened steels (50 to 60 HRC): SKD11, SKD61, SKH, SUS420, etc.

Cutting performance

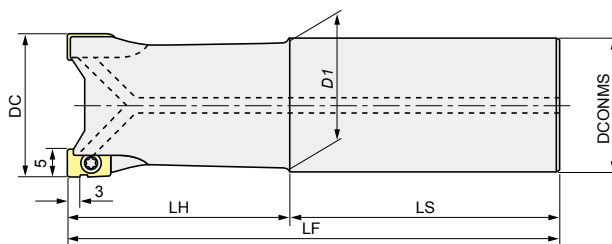


Work material : SKD11(61HRC)
 Tool : ASRS2032-5
 Insert : EPNW0603TN-8
 Cutting conditions :
 $V_c=80\text{m/min}$ $f_z=0.2\text{mm/t}$
 $a_p \times a_e=0.5 \times 21\text{mm}$
 Dry
 ※Single-flute cutting

Straight Shank Type

ASPVS2○○○R-○

Numeric figure in a circle ○.

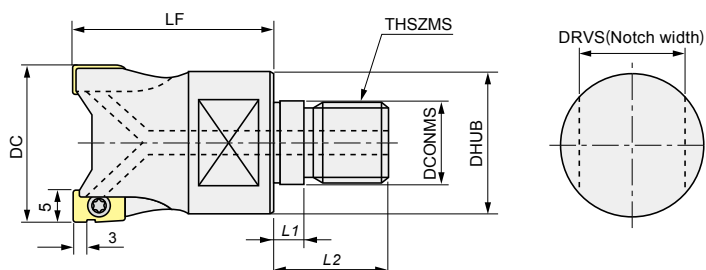


	Item code	Stock	No. of flute	Size (mm)						Inserts
				DC	LF	DCONMS	D1	LH	LS	
Shank type	ASPVS2016R-2	●	2	16	100	16	14.5	30	70	MPHW0603○○ZEL MPHW06030○ZEL-○○ MPHW0603○○ZFL MPNW0603○○ZEL
	ASPVS2020R-3	●	3	20	110	20	18	30	80	
	ASPVS2025R-4	●	4	25	120	25	23	40	80	
	ASPVS2030R-4	●	4	30	150	32	28	50	100	
	ASPVS2032R-5	●	5	32	150	32	30	50	100	
	ASPVS2035R-5	●	5	35	150	32	31	50	100	
	ASPVS2040R-6	●	6	40	170	32	31	50	120	

Modular Type

ASPVM20○○R-○

Numeric figure in a circle ○.



	Item code	Stock	No. of flute	Size (mm)								Inserts
				DC	LF	DCONMS	THSZMS	DHUB	L1	L2	DRVS	
Modular	ASPVM2016R-2	●	2	16	25	8.5	M8	12.8	5.5	17	10	MPHW0603○○ZEL MPHW06030○ZEL-○○ MPHW0603○○ZFL MPNW0603○○ZEL
	※ ASPVM2018R-2	●	2	18	25	8.5	M8	14.5	5.5	17	10	
	ASPVM2020R-2	●	2	20	30	10.5	M10	17.8	5.5	19	15	
	ASPVM2020R-3	●	3	20	30	10.5	M10	17.8	5.5	19	15	
	※ ASPVM2022R-3	●	3	22	30	10.5	M10	17.8	5.5	19	15	
	ASPVM2025R-4	●	4	25	35	12.5	M12	20.8	5.5	22	17	
	※ ASPVM2028R-4	●	4	28	35	12.5	M12	23	5.5	22	17	
	ASPVM2030R-4	●	4	30	40	17	M16	28.8	6	23	22	
	ASPVM2032R-3	●	3	32	40	17	M16	28.8	6	23	22	
	ASPVM2032R-5	●	5	32	40	17	M16	28.8	6	23	22	
	※ ASPVM2035R-5	●	5	35	40	17	M16	28.8	6	23	22	
	※ ASPVM2040R-6	●	6	40	40	17	M16	28.8	6	23	22	

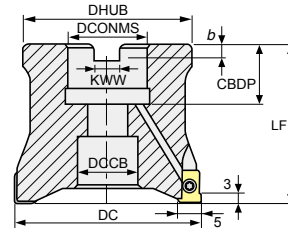
[Note] When ※ and carbide shank are used together as a set, there is no interference.

Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".

Bore Type

ASPVB2 $\circ$ $\circ$ $\circ$ R(M)- $\circ$

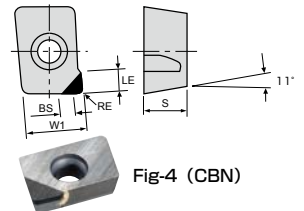
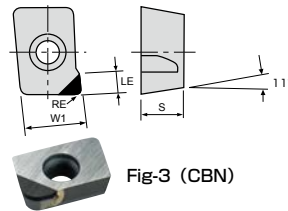
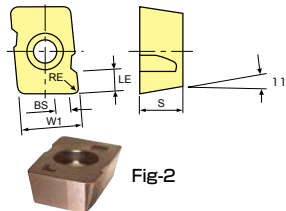
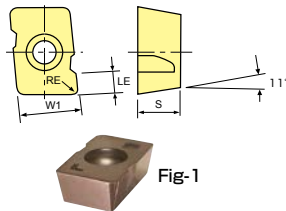
Numeric figure in a circle $\circ$.



Item code	Stock	No. of flute	Size (mm)								Inserts
			DC	DHUB	LF	CDBP	KWW	b	DCONMS	DCCB	
Inside diameter inch size											
ASPVB2050R-7	●	7	50	47	50	19	8.4	5	22.225	17	MPHW0603 $\circ$ $\circ$ ZEL
ASPVB2063R-8	●	8	63	60	50	19	8.4	5	22.225	17	MPHW0603 $\circ$ $\circ$ ZEL- $\circ$
Inside diameter mm size											
ASPVB2050RM-7	●	7	50	47	50	20	10.4	6.3	22	17	MPHW0603 $\circ$ $\circ$ ZFL
ASPVB2063RM-8	●	8	63	60	50	20	10.4	6.3	22	17	MPNW0603 $\circ$ $\circ$ ZEL

[Note] Arbor screw is not included.

Inserts



P	Carbon steels	■	□		□	■	■	■										
M	SUS, etc.	■	■	■				□										
K	FC・FCD Cast irons	■	□		□			■		■								
N	Aluminum alloys																■	
S	Titanium alloys	■	□					■										
H	Hardened steels	■	□					□										
Item code		Tolerance class	AJ Coating			JS Coating	Coated Cermet	TH Coating	CBN	DLC Coating	Size (mm)					Shape		
			JP4105	JP4120	JM4160	JS4060	MZ1000	ATH08M	BH250	SD5010	W1	BS	S	LE	RE			
MPHW060302ZEL		H					●				6.35	—	3.18	3	0.2	Fig-1		
MPHW060302ZEL-0.5							●				6.35	0.5	3.18	3	0.2	Fig-2		
MPHW060304ZEL			●				●	●			6.35	—	3.18	3	0.4	Fig-1		
MPHW060304ZEL-0.5			●				●	●			6.35	0.5	3.18	3	0.4	Fig-2		
MPHW060304ZFL										●	6.35	—	3.18	3	0.4	Fig-1		
MPHW060308ZEL			●	●			●	●			6.35	—	3.18	3	0.8	Fig-2,4		
MPHW060308ZEL-1.5			●	●			●	●	●		6.35	1.5	3.18	3	0.8	Fig-2,4		
MPHW060308ZFL										●	6.35	—	3.18	3	0.8	Fig-1,3		
MPHW060320ZEL		●				●	●	●		6.35	—	3.18	3	2	Fig-1,3			
MPNW060308ZEL		N		●	●	●				6.35	—	3.18	3	0.8	Fig-1,3			
MPNW060320ZEL				●	●	●					6.35	—	3.18	3	2	Fig-1,3		

■ : General cutting, First recommended

□ : General cutting, Second recommended

[Note] Please note that the JS Coating does not cause a reaction in conductive touch sensors.

Parts

Numeric figure in a circle $\circ$.

Parts		Clamp screw		Screw driver	Screw anti-seizure agent
Shape					
Cutter body		Fastening torque (N·m)			
Modular	ASPVM20 $\circ$ $\circ$ R- $\circ$	250-141	1.1	104-T8	P-37
Shank	ASPVS20 $\circ$ $\circ$ R- $\circ$				
Bore	ASPVB20 $\circ$ $\circ$ R- $\circ$				
	ASPVB20 $\circ$ $\circ$ RM- $\circ$				

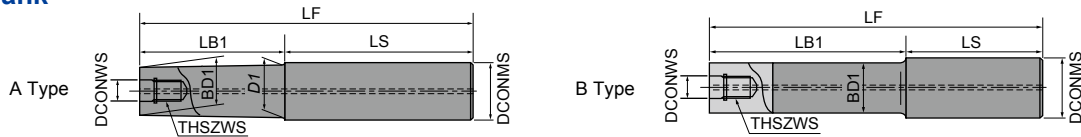
[Note] When supplying air and cutting agent to each flute, please use the arbor screws listed above.

The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage. One spare clamp screw is provided for cutter bodies with 3 or less flutes, and two for 4 or more flutes.

Line Up

The Shanks for Modular Mill

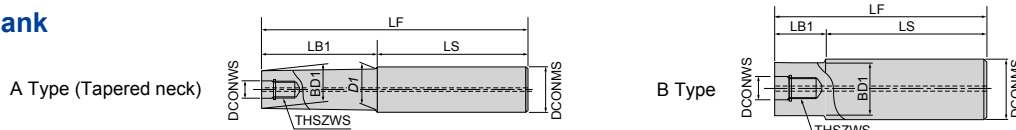
Carbide Shank



	Item code	Stock	Size (mm)							Type	Cutter body	Note	
			DCONWS	THSZWS	LF	LB1	LS	BD1	DCONMS				D1
※2	ASC16-8.5-95-30Z	●	8.5	M8	95	30	65	14.5	16	15.5	A	φ16 φ18	With Air hole
	ASC16-8.5-120-55Z	●			120	55	65						
	ASC16-8.5-140-75Z	●			140	75	65						
	ASC16-8.5-160-95Z	●			160	95	65						
	ASC16-8.5-160-30Z	●			160	30	130						
※2	ASC20-10.5-120-50Z	●	10.5	M10	120	50	70	18.5	20	19.5	A	φ20 φ22	
	ASC20-10.5-170-90Z	●			170	90	80						
	ASC20-10.5-220-120Z	●			220	120	100						
	ASC20-10.5-270-150Z	●			270	150	120						
	※2	ASC20-10.5-220-50Z			●	10.5	M10						
※2	ASC20-10.5-270-50Z	●	270	220									
※2	ASC25-12.5-145-65	●	12.5	M12	145	65	80	23	25	—	B	φ25 φ28	
	ASC25-12.5-215-115	●			215	115	100						
	ASC25-12.5-265-145	●			265	145	120						
	ASC25-12.5-315-195	●			315	195	120						
	※2	ASC25-12.5-265-65			●	12.5	M12						
※2	ASC25-12.5-315-65	●	315	250									
※2	ASC32-17-160-80	●	17	M16	160	80	80	28	32	—	B	φ30 φ32 φ35 〈φ40〉	
	ASC32-17-210-110	●			210	110	100						
	ASC32-17-260-140	●			260	140	120						
	ASC32-17-310-190	●			310	190	120						
	ASC32-17-360-240	●			360	240	120						
※2	ASC32-17-260-80	●	17	M16	260	80	180	28	32	—	B	φ30 φ32 〈φ40〉	
※2	ASC32-17-310-80	●			310		230						
※2	ASC32-17-360-80	●			360		280						

[Note] ① When※2 and※1 (P4) are used together as a set, there is no interference.
 ② Commercial milling chucks or shrink-fit holders can be used.
 ③ For the φ40 size, it is recommended that the protrusion length be 200mm or less.

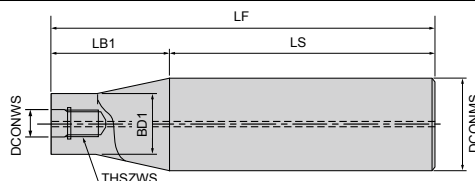
Steel Shank



Item code	Stock	Size (mm)								Type	Cutter body	Note
		DCONWS	THSZWS	LF	LB1	LS	BD1	DCONMS	D1			
AS16-8.5-95-15	●	8.5	M8	95	15	80	14.5	16	15.5	A	φ16 φ18	With Air hole
AS20-10.5-100-20	●	10.5	M10	100	20	80	18	20	—	B	φ20 φ22	
AS25-12.5-115-35	●	12.5	M12	115	35	80	23	25	—	B	φ25 φ28	
AS32-17-110-30	●	17	M16	110	30	80	28	32	—	B	φ30 φ32 φ35 φ40	

[Note] Commercial milling chucks can be used.

Steel Shank



※ For neck section or total length, additional machining to user specifications is possible.

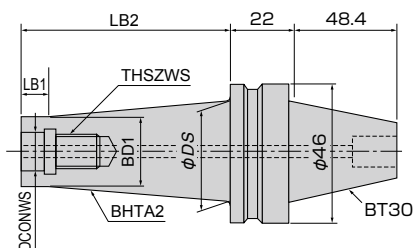
Item code	Stock	Size(mm)							Cutter body	Note
		DCONWS	THSZWS	LF	LB1	LS	BD1	DCONMS		
AS42-17-360-90	●	17	M16	360	90	270	28	42	φ30 φ32 φ35 φ40	With Air hole

[Note] Commercial milling chucks can be used.

● : Stocked Items.

Modular Mill Arbor

BT30

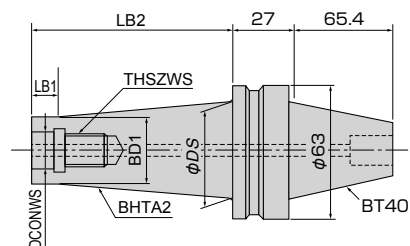


※For neck section, additional machining to user specifications is possible.

Item code	Stock	Size (mm)							Note
		DCONWS	THSZWS	BD1	φDS	LB2	LB1	BHTA2	
BT30-8.5-25-15		8.5	8	15	30	25	5	20.6°	With Air hole
BT30-8.5-50-15						50	10	10.6°	
BT30-8.5-75-15						75	10	6.6°	
BT30-10.5-20-18		10.5	10	18	35	20	5	29.5°	
BT30-10.5-45-18						45	10	13.7°	
BT30-10.5-70-18						70	10	8.1°	
BT30-12.5-15-21		12.5	12	21	40	15	5	32.3°	
BT30-12.5-40-21						40	10	17.6°	
BT30-12.5-65-21						65	10	9.8°	
BT30-12.5-85-21						85	10	7.2°	
BT30-17-10-28		17	16	28	40	10	5	31°	
BT30-17-35-28						35	10	13.5°	
BT30-17-60-28						60	10	6.8°	

[Note] When using the BT30 arbor for modular mills, determine the processing conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the processing conditions, adjust conditions by 1. reducing cutting depth (ap) or 2. reducing per-flute feed rate (fz).

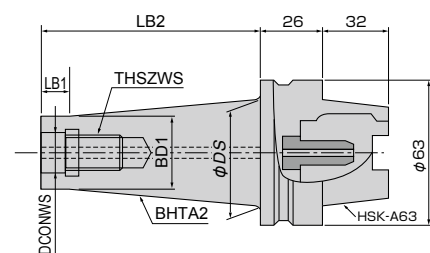
BT40



※For neck section, additional machining to user specifications is possible.

Item code	Stock	Size (mm)							Note
		DCONWS	THSZWS	BD1	φDS	LB2	LB1	BHTA2	
BT40-8.5-25-15		8.5	8	15	30	25	5	20.6°	With Air hole
BT40-8.5-50-15						50	10	10.6°	
BT40-8.5-75-15						75	10	6.6°	
BT40-8.5-125-15						125	10	3.7°	
BT40-10.5-20-18		10.5	10	18	35	20	5	29.5°	
BT40-10.5-45-18						45	10	13.7°	
BT40-10.5-70-18						70	10	8.1°	
BT40-10.5-120-18						120	10	4.4°	
BT40-12.5-15-21		12.5	12	21	40	15	5	32.3°	
BT40-12.5-40-21						40	10	17.6°	
BT40-12.5-65-21						65	10	9.8°	
BT40-12.5-115-21						115	10	5.2°	
BT40-17-10-28		17	16	28	48	10	5	45°	
BT40-17-35-28						35	10	21.8°	
BT40-17-60-28						60	10	11.3°	
BT40-17-110-28						110	10	5.7°	

HSK-A63



[Note] Coolant Pipe is attached.

Item code	Stock	Size (mm)							Note
		DCONWS	THSZWS	BD1	φDS	LB2	LB1	BHTA2	
HSK-A63-10.5-30-18	●	10.5	10	18	20.8	30	-	3°	With Air hole
HSK-A63-10.5-70-18	●				25	70	10	3°	
HSK-A63-10.5-70-18S	●				48	70	10	12°	
HSK-A63-10.5-120-18	●				30.2	120	10	3°	
HSK-A63-12.5-35-21	●	12.5	12	21	24.3	35	-	3°	
HSK-A63-12.5-65-21	●				27.5	65	10	3°	
HSK-A63-12.5-65-21S	●				48	65	10	12°	
HSK-A63-12.5-115-21	●				32.7	115	10	3°	
HSK-A63-17-40-28	●	17	16	28	31.8	40	-	3°	
HSK-A63-17-60-28	●				33.9	60	10	3°	
HSK-A63-17-60-28S	●				48	60	10	9.5°	
HSK-A63-17-110-28	●				39.2	110	10	3°	

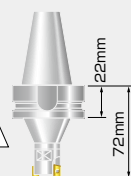
Arbor (BT, HSK) Features

Point

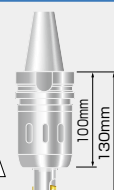
Reduce the chattering vibration by BT, HSK arbor due to the reduction in the "actual" overhang.

Example : Overhang and Application Area

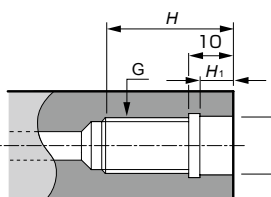
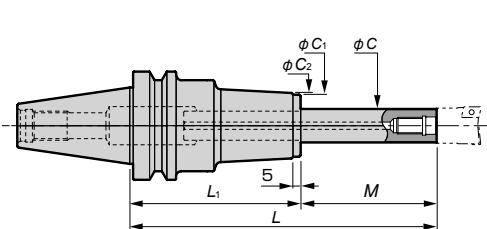
Cutter :
ASPVM2020R-3
Arbor :
BT30-10.5-20-18



Cutter :
ASPVS2020R-3
Arbor :
Commercial milling chuck
(BT30 type)



Red screw arbor



Dimensions for the Modular Mill mounting

■ Caution

- Some of the indexable end mills cannot be attached to the RED screw arbor. Please check your indexable end mills for conformance to the dimensions, or please contact MOLDINO Tool Engineering, Ltd.
- Because cutting resistance is greater than the tool holder connection force associated with the machine spindle, please reduce the recommended cutting conditions by 50% for the RED screw arbors marked with ※. Otherwise, the tool holder shank may experience fretting corrosion or fall out of the machine spindle.

Item code	Stock	Size(mm)										Weight (kg)	Rigidity value (μm) δ↓	Item code	Stock	Size(mm)										Weight (kg)	Rigidity value (μm) δ↓										
		G	φD	H	H ₁	φC	L	M	L ₁	φC ₁	φC ₂					G	φD	H	H ₁	φC	L	M	L ₁	φC ₁	φC ₂												
BT40-RSG8-105-M25	BT40	M8	8.5	18	6.5	15	105		80			1.4	0.6	BT50-RSG10-200-M25	M10	10.5	22	6.5	19	200	25	175			5.6	0.5											
135							25	110			1.8	0.7	BT50-RSG10-165-M50	165							115			4.4	0.8												
165								140			2.1	0.8	BT50-RSG10-195-M50	195						50	145			4.7	0.9												
130								80			1.4	1.5	BT50-RSG10-225-M50	225							175			5.7	1.0												
160							50	110			1.8	1.7	BT50-RSG10-190-M75	190							115			4.5	1.6												
190								140			2.1	1.8	BT50-RSG10-220-M75	220						75	145			4.8	1.7												
155								80			1.5	3.1	BT50-RSG10-250-M75	250							175			5.8	1.8												
185							75	110	30	32	1.9	3.4	BT50-RSG10-215-M100	215							115		36	38	4.5	2.2											
215								140			2.2	3.5	BT50-RSG10-245-M100	245						100	145				4.8	2.9											
170								80			1.5	4.5	BT50-RSG10-275-M100	275							175				5.8	2.9											
200							90	110			1.9	4.8	BT50-RSG10-235-M120	235							115				4.6	3.9											
230								140			2.2	4.9	BT50-RSG10-265-M120	265						120	145				4.9	4.2											
185								80			1.6	6.2	BT50-RSG10-295-M120	295							175				5.9	4.2											
215							105	110			2.0	6.7	BT50-RSG10-255-M140	255							115				4.7	5.5											
245								140			2.3	6.8	BT50-RSG10-285-M140	285						140	145				5.0	5.8											
125								100			1.8	0.4	BT50-RSG10-315-M140	315							175				6.0	5.8											
155							25	130			2.2	0.5	BT50-RSG12-140-M25	140							115				4.6	0.2											
185								160			2.4	0.7	BT50-RSG12-170-M25	170						25	145				5.0	0.3											
150								100			1.9	0.8	BT50-RSG12-200-M25	200							175				5.8	0.4											
180							50	130			2.3	1.0	BT50-RSG12-165-M50	165							115				4.7	0.5											
210								160			2.5	1.2	BT50-RSG12-195-M50	195						50	145				5.1	0.6											
175								100			2.0	1.6	BT50-RSG12-225-M50	225							175				5.9	0.6											
205							75	130	36	38	2.4	1.8	BT50-RSG12-190-M75	190							115				4.9	0.8											
235								160			2.6	2.0	BT50-RSG12-220-M75	220						75	145				5.3	1.0											
200		100			2.0	2.7	BT50-RSG12-250-M75	250		175				6.1	1.0																						
230	100	130			2.4	3.0	BT50-RSG12-215-M100	215		115				5.0	1.3																						
260		160			2.6	3.3	BT50-RSG12-245-M100	245	100	145		43	45	5.4	1.5																						
220		100			2.1	4.0	BT50-RSG12-275-M100	275		175				6.2	1.6																						
250	120	130			2.5	4.3	BT50-RSG12-240-M125	240		115				5.2	2.1																						
280		160			2.7	4.6	BT50-RSG12-270-M125	270	125	145				5.6	2.3																						
125		100			2.0	0.3	BT50-RSG12-300-M125	300		175				6.4	2.4																						
155	25	130			2.4	0.4	BT50-RSG12-265-M150	265		115				5.3	3.0																						
185		160			2.7	0.5	BT50-RSG12-295-M150	295	150	145				5.7	3.3																						
150		100			2.1	0.5	BT50-RSG12-325-M150	325		175				6.5	3.4																						
180	50	130			2.5	0.7	BT50-RSG12-290-M175	290		115				5.5	4.2																						
210		160			2.8	0.9	BT50-RSG12-320-M175	320	175	145				5.9	4.6																						
175		100			2.3	0.9	BT50-RSG12-350-M175	350		175				6.7	4.6																						
205	75	130	43	45	2.7	1.1	BT50-RSG16-140-M25	140		115				4.8	0.2																						
235		160			3.0	1.3	BT50-RSG16-170-M25	170	25	145				5.4	0.2																						
200		100			2.4	1.4	BT50-RSG16-200-M25	200		175				6.6	0.2																						
230	100	130			2.8	1.6	BT50-RSG16-165-M50	165		115				5.0	0.3																						
260		160			3.1	1.9	BT50-RSG16-195-M50	195	50	145				5.6	0.4																						
225		100			2.6	2.1	BT50-RSG16-225-M50	225		175				6.8	0.4																						
255	125	130			3.0	2.4	BT50-RSG16-190-M75	190		115				5.3	0.5																						
285		160			3.3	2.8	BT50-RSG16-220-M75	220	75	145				5.9	0.6																						
125	25				2.6	0.2	BT50-RSG16-250-M75	250		175				7.0	0.6																						
150	50				2.8	0.3	BT50-RSG16-215-M100	215		115				5.5	0.7																						
175	75	100	52	54	3.0	0.5	BT50-RSG16-245-M100	245	100	145				6.1	0.9																						
200	100				3.2	0.8	BT50-RSG16-275-M100	275		175				7.2	0.9																						
225	125				3.4	1.2	BT50-RSG16-240-M125	240		115				5.7	1.1																						
BT50-RSG8-120-M25	BT50	M8	8.5	18	6.5	15	120		95			4.0	0.6	BT50-RSG16-270-M125	M16	17	25	6	29	270	125	145	52	54	6.3	1.3											
150							25	125			4.3	0.7	BT50-RSG16-300-M125	300							175			7.4	1.3												
180								155			4.8	0.7	BT50-RSG16-265-M150	265							115			5.9	1.6												
145								95			4.0	1.5	BT50-RSG16-295-M150	295						150	145			6.5	1.8												
175							50	125			4.3	1.7	BT50-RSG16-325-M150	325							175			7.7	1.8												
205								155			4.8	1.7	BT50-RSG16-290-M175	290							115			6.1	2.2												
170								95			4.1	3.1	BT50-RSG16-320-M175	320						175	145			6.7	2.4												
200							75	125	30	32	4.4	3.4	BT50-RSG16-350-M175	350							175			7.9	2.5												
230								155			4.9	3.4	BT50-RSG16-315-M200	315							115			6.3	3.0												
185								95			4.9	4.4	BT50-RSG16-345-M200	345						200	145			6.9	3.2												
215							90	125			4.4	4.8	BT50-RSG16-375-M200	375							175			8.1	3.3												
245								155			4.9	4.8	BT50-RSG16-340-M225	340							115			6.5	3.9												
200								95			4.2	6.2	BT50-RSG16-370-M225	370						225	145			7.1	4.1												
230							105	125			4.5	6.6	BT50-RSG16-400-M225	400							175			8.3	4.2												
260								155			5.0	6.6	A63-RSG8-105-M25								105		80	30	32	1.3	0.6										
BT50-RSG10-140-M25							M10	10.5	22	6.5	19	140		25						115			4.3	0.4	A63-RSG8-135-M25	M8	8.5	18	6.5	15	135	25	110			1.4	0.7
170													145								4.6	0.5	A63-RSG8-165-M25	165							140			1.9	0.7		

No mark : Manufactured upon request only. Delivery time is about ten days after an order received.

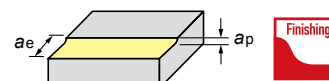
Item code	Stock	Size(mm)										Weight (kg)	Rigidity value (μm) δ ↓
		G	ϕD	H	H ₁	ϕC	L	M	L ₁	ϕC_1	ϕC_2		
A63-RSG8-130-M50							130	80				1.3	1.5
A63-RSG8-160-M50							160	50	110			1.4	1.7
A63-RSG8-190-M50							190		140			1.9	1.7
A63-RSG8-155-M75							155	80				1.4	3.1
A63-RSG8-185-M75							185	75	110			1.5	3.4
A63-RSG8-215-M75							215		140	30	32	2.0	3.4
A63-RSG8-170-M90							170	80				2.0	4.4
A63-RSG8-200-M90							200	90	110			1.5	4.8
A63-RSG8-230-M90							230		140			2.0	4.9
A63-RSG8-185-M105							185	80				1.5	6.2
A63-RSG8-215-M105							215	105	110			1.6	6.6
A63-RSG8-245-M105							245		140			2.1	6.7
A63-RSG10-125-M25							125		100			1.6	0.4
A63-RSG10-155-M25							155	25	130			1.9	0.5
A63-RSG10-185-M25							185		160			2.3	0.6
A63-RSG10-150-M50							150		100			1.7	0.8
A63-RSG10-180-M50							180	50	130			2.0	1.0
A63-RSG10-210-M50							210		160			2.4	1.2
A63-RSG10-175-M75							175		100			1.8	1.6
A63-RSG10-205-M75							205	75	130			2.1	1.8
A63-RSG10-235-M75							235		160			2.5	2.0
A63-RSG10-200-M100							200		100	36	38	1.8	2.7
A63-RSG10-230-M100							230	100	130			2.1	2.9
A63-RSG10-260-M100							260		160			2.5	3.2
A63-RSG10-220-M120							220		100			1.9	4.0
A63-RSG10-250-M120							250	120	130			2.2	4.2
A63-RSG10-280-M120							280		160			2.6	4.5
A63-RSG10-240-M140							240		100			2.0	5.6
A63-RSG10-270-M140							270	140	130			2.3	5.9
A63-RSG10-300-M140							300		160			2.7	6.2
A63-RSG12-125-M25							125		100			1.9	0.3
A63-RSG12-155-M25							155	25	130			2.3	0.4
A63-RSG12-185-M25							185		160			2.7	0.5
A63-RSG12-150-M50							150		100			2.0	0.5
A63-RSG12-180-M50							180	50	130			2.4	0.6
A63-RSG12-210-M50							210		160			2.8	0.8
A63-RSG12-175-M75							175		100			2.2	0.9
A63-RSG12-205-M75							205	75	130			2.6	1.0
A63-RSG12-235-M75							235		160			3.0	1.3
A63-RSG12-200-M100							200		100	43	45	2.3	1.4
A63-RSG12-230-M100							230	100	130			2.7	1.6
A63-RSG12-260-M100							260		160			3.1	1.9
A63-RSG12-225-M125							225		100			2.5	2.1
A63-RSG12-255-M125							255	125	130			2.9	2.4
A63-RSG12-285-M125							285		160			3.3	2.7
A63-RSG12-250-M150							250		100			2.6	3.1
A63-RSG12-280-M150							280	150	130			3.0	3.4
A63-RSG12-310-M150							310		160			3.4	3.8
A63-RSG16-140-M25							140	25				2.8	0.2
A63-RSG16-165-M50							165	50				3.2	0.4
A63-RSG16-190-M75							190	75				3.6	0.6
A63-RSG16-215-M100							215	100	115	52	54	2.8	0.9
A63-RSG16-240-M125 ※							240	125				2.8	1.3
A63-RSG16-265-M150 ※							265	150				3.2	1.9
A63-RSG16-290-M175 ※							290	175				3.6	2.5
A100-RSG8-120-M25							120	95				2.6	0.6
A100-RSG8-150-M25							150	25	125			2.9	0.8
A100-RSG8-180-M25							180		155			3.4	0.8
A100-RSG8-145-M50							145	95				2.6	1.5
A100-RSG8-175-M50							175	50	125			2.9	1.7
A100-RSG8-205-M50							205		155			3.4	1.7
A100-RSG8-170-M75							170	95	30	32		2.7	3.1
A100-RSG8-200-M75							200	75	125			3.0	3.4
A100-RSG8-230-M75							230		155			3.5	3.4
A100-RSG8-185-M90							185	95				2.7	4.5
A100-RSG8-215-M90							215	90	125			3.0	4.9
A100-RSG8-245-M90							245		155			3.5	4.8
A100-RSG8-200-M105							200	105	95			2.8	6.3
A100-RSG8-230-M105							230		155			3.5	6.6
A100-RSG10-140-M25							140		115			3.1	0.4
A100-RSG10-170-M25							170	25	145			3.5	0.5
A100-RSG10-200-M25							200		175			4.4	0.5
A100-RSG10-165-M50							165		115			3.2	0.8
A100-RSG10-195-M50							195	50	145			3.6	1.0
A100-RSG10-225-M50							225		175			4.5	1.0
A100-RSG10-190-M75							190		115			3.3	1.6
A100-RSG10-220-M75							220	75	145			3.7	1.8
A100-RSG10-250-M75							250		175			4.6	1.8
A100-RSG10-215-M100							215		115	36	38	3.3	2.7
A100-RSG10-245-M100							245	100	145			3.7	2.9
A100-RSG10-275-M100							275		175			4.6	2.9
A100-RSG10-235-M120							235		115			3.4	4.0
A100-RSG10-265-M120							265	120	145			3.8	4.2
A100-RSG10-295-M120							295		175			4.7	4.2
A100-RSG10-255-M140							255		115			3.5	5.6
A100-RSG10-285-M140							285	140	145			3.9	5.8
A100-RSG10-315-M140							315		175			4.8	5.8
A100-RSG12-140-M25							140		115			3.4	0.3
A100-RSG12-170-M25							170	25	145			3.7	0.4
A100-RSG12-200-M25							200		175			4.7	0.4
A100-RSG12-165-M50							165		115			3.5	0.5
A100-RSG12-195-M50							195	50	145			3.8	0.6
A100-RSG12-225-M50							225		175			4.8	0.6
A100-RSG12-190-M75							190		115			3.7	0.8
A100-RSG12-220-M75							220	75	145			4.0	1.0
A100-RSG12-250-M75							250		175			5.0	1.0
A100-RSG12-215-M100							215		115			3.8	1.4
A100-RSG12-245-M100							245	100	145	43	45	4.1	1.6
A100-RSG12-275-M100							275		175			5.1	1.6
A100-RSG12-240-M125							240		115			4.0	2.1
A100-RSG12-270-M125							270	125	145			4.3	2.4
A100-RSG12-300-M125							300		175			5.3	2.4
A100-RSG12-265-M150							265		115			4.1	3.0
A100-RSG12-295-M150							295	150	145			4.4	3.4
A100-RSG12-325-M150							325		175			5.4	3.4
A100-RSG12-290-M175							290		115			4.3	4.3
A100-RSG12-320-M175							320	175	145			4.6	4.6
A100-RSG12-350-M175							350		175			5.6	4.6
A100-RSG16-140-M25							140		115			4.0	0.2
A100-RSG16-170-M25							170	25	145			4.5	0.2
A100-RSG16-200-M25							200		175			5.7	0.2
A100-RSG16-165-M50							165		115			4.2	0.3
A100-RSG16-195-M50							195	50	145			4.7	0.4
A100-RSG16-225-M50							225		175			5.9	0.4
A100-RSG16-190-M75							190		115			4.5	0.5
A100-RSG16-220-M75							220	75	145			5.0	0.6
A100-RSG16-250-M75							250		175			6.1	0.6
A100-RSG16-215-M100							215		115			4.7	0.8
A100-RSG16-245-M100							245	100	145			5.2	0.9
A100-RSG16-275-M100							275		175			6.3	0.9
A100-RSG16-240-M125							240		115			4.9	1.1
A100-RSG16-270-M125							270	125	145	52	54	5.4	1.3
A100-RSG16-300-M125							300		175			6.5	1.3
A100-RSG16-265-M150							265		115			5.1	1.6
A100-RSG16-295-M150							295	150	145			5.6	1.8
A100-RSG16-325-M150							325		175			6.7	1.8
A100-RSG16-290-M175							290		115			5.3	2.2
A100-RSG16-320-M175							320	175					

Standard cutting conditions for bottom finishing

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DC	φ16 (2 Flutes)					φ20 (3 Flutes)					φ25 (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Mild steels (200HB or less)	※ MZ1000 ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	2,990	5,980	3,990	2,990	2,590	2,390	4,780	3,190	2,390	2,080	1,920	3,830	2,550	1,920	1,660
		<i>vc</i> (m/min)	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130
		<i>vf</i> (mm/min)	600	1,800	1,200	720	520	720	2,160	1,440	870	630	770	2,300	1,530	930	670
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Carbon steels Alloy steels (30HRC or less)	MZ1000 ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	2,990	4,980	3,590	2,590	2,000	2,390	3,990	2,870	2,080	1,600	1,920	3,190	2,300	1,660	1,280
		<i>vc</i> (m/min)	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100
		<i>vf</i> (mm/min)	600	1,500	1,080	630	400	720	1,800	1,300	750	480	770	1,920	1,380	800	520
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Carbon steels Alloy steels (30~45HRC)	ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	2,590	3,990	3,190	2,590	1,800	2,080	3,190	2,550	2,080	1,440	1,660	2,550	2,040	1,660	1,150
		<i>vc</i> (m/min)	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90
		<i>vf</i> (mm/min)	520	960	770	520	360	630	1,150	920	630	440	670	1,230	980	670	460
		<i>fz</i> (mm/t)	0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.1	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Stainless steels SUS	JP4120 JM4160 ATH08M	<i>n</i> (min ⁻¹)	2,990	4,980	3,590	2,590	2,000	2,390	3,990	2,870	2,080	1,600	1,920	3,190	2,300	1,660	1,280
		<i>vc</i> (m/min)	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100
		<i>vf</i> (mm/min)	600	1,500	1,080	630	400	720	1,800	1,300	750	480	770	1,920	1,380	800	520
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Cast irons FC FCD	ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	2,990	4,980	3,990	2,990	2,590	2,390	3,990	3,190	2,390	2,080	1,920	3,190	2,550	1,920	1,660
		<i>vc</i> (m/min)	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130
		<i>vf</i> (mm/min)	600	2,000	1,600	900	520	720	2,400	1,920	1,080	630	770	2,560	2,040	1,160	670
		<i>fz</i> (mm/t)	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Aluminum alloys	SD5010	<i>n</i> (min ⁻¹)	11,950	23,890	15,930	11,950	11,950	9,560	19,110	12,740	9,560	9,560	7,650	15,290	10,200	7,650	7,650
		<i>vc</i> (m/min)	600	1,200	800	600	600	600	1,200	800	600	600	600	1,200	800	600	600
		<i>vf</i> (mm/min)	2,390	7,170	4,780	2,870	2,390	2,870	8,600	5,740	3,450	2,870	3,060	9,180	6,120	3,680	3,060
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Titanium alloys Ti-6Al-4V (wet condition)	ATH08M JP4120	<i>n</i> (min ⁻¹)	600	1,200	1,000	600	600	480	960	800	480	480	390	770	640	390	390
		<i>vc</i> (m/min)	30	60	50	30	30	30	60	50	30	30	30	60	50	30	30
		<i>vf</i> (mm/min)	120	360	300	120	120	150	440	360	150	150	160	470	390	160	160
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.1	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Hardened steels 45~55HRC	JP4105 ATH08M JP4120	<i>n</i> (min ⁻¹)	1,600	2,390	2,000	1,600	1,600	1,280	1,920	1,600	1,280	1,280	1,020	1,530	1,280	1,020	1,020
		<i>vc</i> (m/min)	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80
		<i>vf</i> (mm/min)	320	480	400	320	320	390	580	480	390	390	410	620	520	410	410
		<i>fz</i> (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Hardened steels 55~62HRC	JP4105 ATH08M JP4120	<i>n</i> (min ⁻¹)	1,000	2,000	1,400	1,000	1,000	800	1,600	1,120	800	800	640	1,280	900	640	640
		<i>vc</i> (m/min)	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50
		<i>vf</i> (mm/min)	100	280	200	100	100	120	340	240	120	120	130	360	260	130	130
		<i>fz</i> (mm/t)	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05
		<i>ap</i> (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		<i>ae</i> (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5

- [Note]** ①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
 ②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
 ③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensure the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
 ④Please note that the JS Coating does not cause a reaction in conductive touch sensors.
 ⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
 ⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
 ⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
 ⑧Due to fire risks do not use neat cutting oil as a coolant.
 ⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*ap*) or 2.reducing per-flute feed rate (*fz*).



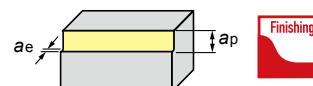
$\phi 32$ (5 Flutes)					$\phi 40$ (6 Flutes)					$\phi 50$ (7 Flutes)					$\phi 63$ (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	
1,500	2,990	2,000	1,500	1,300	1,200	2,390	1,600	1,200	1,040	960	1,600	1,280	960	830	760	1,270	1,020	760	660	Mild steels (200HB or less)
150	300	200	150	130	150	300	200	150	130	150	250	200	150	130	150	250	200	150	130	
750	2,250	1,500	900	650	720	2,160	1,160	720	630	680	1,680	1,350	810	590	610	1,530	1,230	730	530	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.12	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Carbon steels Alloy steels (30HRC or less)
1,500	2,490	1,800	1,300	1,000	1,200	2,000	1,440	1,040	800	960	1,470	1,150	830	640	760	1,170	910	660	510	
150	250	180	130	100	150	250	180	130	100	150	230	180	130	100	150	230	180	130	100	
750	1,870	1,350	780	500	720	1,800	1,040	630	480	680	1,550	1,210	700	450	610	1,410	1,100	640	410	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.12	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Carbon steels Alloy steels (30~45HRC)
1,300	2,000	1,600	1,300	900	1,040	1,600	1,280	1,040	720	830	1,150	960	830	580	660	910	760	660	460	
130	200	160	130	90	130	200	160	130	90	130	180	150	130	90	130	180	150	130	90	
650	1,200	960	650	450	630	1,160	930	630	440	590	970	810	700	410	530	880	730	530	370	
0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Stainless steels SUS
1,500	2,490	1,800	1,300	1,000	1,200	2,000	1,440	1,040	800	960	1,470	1,150	830	640	760	1,170	910	660	510	
150	250	180	130	100	150	250	180	130	100	150	230	180	130	100	150	230	180	130	100	
750	1,870	1,350	780	500	720	1,800	1,040	630	480	680	1,550	1,210	700	450	610	1,410	1,100	640	410	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.12	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Cast irons FC FCD
1,500	2,490	2,000	1,500	1,300	1,200	2,000	1,600	1,200	1,040	960	1,600	1,280	960	830	760	1,270	1,020	760	660	
150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	
750	2,490	2,000	1,130	650	720	2,400	1,920	1,080	630	680	2,240	1,800	1,010	590	610	2,040	1,640	920	530	
0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Aluminum alloys
5,980	11,950	7,970	5,980	5,980	4,780	9,560	6,370	4,780	4,780	3,830	9,560	6,370	3,830	3,830	3,040	7,590	5,060	3,040	3,040	
600	1,200	800	600	600	600	1,200	800	600	600	600	1,500	1,000	600	600	600	1,500	1,000	600	600	
2,990	8,970	5,980	3,590	2,990	2,870	8,610	5,740	3,450	2,870	2,690	10,040	6,690	3,220	3,220	2,440	9,110	6,080	2,920	2,920	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.12	0.1	0.15	0.15	0.12	0.12	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Titanium alloys Ti-6Al-4V (wet condition)
300	600	500	300	300	240	480	400	240	240	200	390	320	200	200	160	310	260	160	160	
30	60	50	30	30	30	60	50	30	30	30	60	50	30	30	30	60	50	30	30	
150	450	380	150	150	150	440	360	150	150	140	410	340	170	140	130	380	320	160	130	
0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Hardened steels 45~55HRC
800	1,200	1,000	800	800	640	960	800	640	640	390	640	510	390	390	310	510	410	310	310	
80	120	100	80	80	80	120	100	80	80	60	100	80	60	60	60	100	80	60	60	
400	600	500	400	400	390	580	480	390	390	280	450	360	280	280	250	410	330	250	250	
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	Hardened steels 55~62HRC
500	1,000	700	500	500	400	800	560	400	400	320	510	390	320	320	260	410	310	260	260	
50	100	70	50	50	50	100	70	50	50	50	80	60	50	50	50	80	60	50	50	
130	350	250	130	130	120	340	240	120	120	120	250	200	120	120	110	230	180	110	110	
0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	

Standard cutting conditions for side finishing

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DC	φ16 (2 Flutes)					φ20 (3 Flutes)					φ25 (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Mild steels (200HB or less)	※ MZ1000 ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	7,970	15,930	11,950	7,970	7,970	6,370	12,740	9,560	6,370	6,370	5,100	10,200	7,650	5,100	5,100
		<i>vc</i> (m/min)	400	800	600	400	400	400	800	600	400	400	400	800	600	400	400
		<i>vf</i> (mm/min)	1,600	4,780	3,590	1,920	1,600	1,920	5,740	4,310	2,300	1,920	2,040	6,120	4,590	2,450	2,040
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Carbon steels Alloy steels (30HRC or less)	MZ1000 ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		<i>vc</i> (m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		<i>vf</i> (mm/min)	1,200	3,590	2,400	1,920	1,200	1,440	4,310	2,870	2,300	1,440	1,540	4,590	3,060	2,450	1,540
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Carbon steels Alloy steels (30~45HRC)	ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	3,990	9,960	6,970	5,980	5,980	3,190	7,970	5,580	4,780	4,780	2,550	6,370	4,460	3,830	3,830
		<i>vc</i> (m/min)	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300
		<i>vf</i> (mm/min)	800	2,400	1,680	1,200	960	960	2,870	2,010	1,440	1,150	1,020	3,060	2,150	1,540	1,230
		<i>fz</i> (mm/t)	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08
		<i>ap</i> (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Stainless steels SUS	JP4120 JM4160 ATH08M	<i>n</i> (min ⁻¹)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		<i>vc</i> (m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		<i>vf</i> (mm/min)	1,200	3,590	2,400	1,920	1,200	1,440	4,310	2,870	2,300	1,440	1,540	4,590	3,060	2,450	1,540
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cast irons FC FCD	ATH08M JP4120 JS4060	<i>n</i> (min ⁻¹)	5,980	11,950	9,960	7,970	7,970	4,780	9,560	7,970	6,370	6,370	3,830	7,650	6,370	5,100	5,100
		<i>vc</i> (m/min)	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400
		<i>vf</i> (mm/min)	1,200	3,590	2,990	1,920	1,600	1,440	4,310	3,590	2,300	1,920	1,540	4,590	3,830	2,450	2,040
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Aluminum alloys	SD5010	<i>n</i> (min ⁻¹)	11,950	23,890	15,930	11,950	11,950	9,560	19,110	12,740	9,560	9,560	7,650	15,290	10,200	7,650	7,650
		<i>vc</i> (m/min)	600	1,200	800	600	600	600	1,200	800	600	600	600	1,200	800	600	600
		<i>vf</i> (mm/min)	2,390	7,170	4,780	2,870	2,390	2,870	8,600	5,740	3,450	2,870	3,060	9,180	6,120	3,680	3,060
		<i>fz</i> (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		<i>ap</i> (mm)	2	2	2	1.5	1	2	2	2	1.5	1	2	2	2	1.5	1
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Titanium alloys Ti-6Al-4V (wet condition)	ATH08M JP4120	<i>n</i> (min ⁻¹)	1,200	1,800	1,600	1,200	1,200	960	1,440	1,280	960	960	770	1,150	1,020	770	770
		<i>vc</i> (m/min)	60	90	80	60	60	60	90	80	60	60	60	90	80	60	60
		<i>vf</i> (mm/min)	240	440	390	240	200	290	520	470	290	240	310	560	490	310	250
		<i>fz</i> (mm/t)	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08
		<i>ap</i> (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hardened steels 45~55HRC	JP4105 ATH08M JP4120	<i>n</i> (min ⁻¹)	2,990	4,980	3,590	2,990	2,990	2,390	3,990	2,870	2,390	2,390	1,920	3,190	2,300	1,920	1,920
		<i>vc</i> (m/min)	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150
		<i>vf</i> (mm/min)	600	1,000	720	480	480	720	1,200	870	580	580	770	1,280	920	620	620
		<i>fz</i> (mm/t)	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08
		<i>ap</i> (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hardened steels 55~62HRC	JP4105 ATH08M JP4120	<i>n</i> (min ⁻¹)	2,590	3,990	3,190	2,590	2,590	2,080	3,190	2,550	2,080	2,080	1,660	2,550	2,040	1,660	1,660
		<i>vc</i> (m/min)	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130
		<i>vf</i> (mm/min)	520	800	640	420	260	630	960	770	500	320	670	1,020	820	540	340
		<i>fz</i> (mm/t)	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05
		<i>ap</i> (mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		<i>ae</i> (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

- [Note]** ①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
 ②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
 ③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensure the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
 ④Please note that the JS Coating does not cause a reaction in conductive touch sensors.
 ⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
 ⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
 ⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
 ⑧Due to fire risks do not use neat cutting oil as a coolant.
 ⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*ap*) or 2.reducing per-flute feed rate (*fz*).



$\phi 32$ (5 Flutes)					$\phi 40$ (6 Flutes)					$\phi 50$ (7 Flutes)					$\phi 63$ (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	
3,990	7,970	5,980	3,990	3,990	3,190	6,370	4,780	3,190	3,190	2,550	5,100	3,830	2,550	2,550	2,030	4,050	3,040	2,030	2,030	Mild steels (200HB or less)
400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	
2,000	5,980	4,490	2,400	2,000	1,920	5,740	4,310	2,300	1,920	1,790	5,360	4,030	2,150	1,790	1,630	4,860	3,650	1,950	1,630	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	Carbon steels Alloy steels (30HRC or less)
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
1,500	4,490	3,000	2,400	1,500	1,440	4,310	2,880	2,300	1,440	1,350	4,030	2,680	2,150	1,350	1,220	3,650	2,440	1,950	1,220	Carbon steels Alloy steels (30~45HRC)
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,000	4,980	3,490	2,990	2,990	1,600	3,990	2,790	2,390	2,390	1,280	3,190	2,230	1,920	1,920	1,020	2,530	1,770	1,520	1,520	Stainless steels SUS
200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	
1,000	2,990	2,100	1,500	1,200	960	2,880	2,010	1,440	1,150	900	2,680	1,880	1,350	1,080	820	2,430	1,700	1,220	980	
0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	Cast irons FC FCD
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	3,190	2,550	2,550	1,520	3,040	2,530	2,030	2,030	
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
1,500	4,490	3,000	2,400	1,500	1,440	4,310	2,880	2,300	1,440	1,350	4,030	2,680	2,150	1,350	1,220	3,650	2,440	1,950	1,220	Aluminum alloys
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,990	5,980	4,980	3,990	3,990	2,390	4,780	3,990	3,190	3,190	1,920	3,830	3,190	2,550	2,550	1,520	3,040	2,530	2,030	2,030	Titanium alloys Ti-6Al-4V (wet condition)
300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	
1,500	4,490	3,740	2,400	2,000	1,440	4,310	3,600	2,300	1,920	1,350	4,030	3,350	2,150	1,790	1,220	3,650	3,040	1,950	1,630	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	Hardened steels 45~55HRC
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
5,980	11,950	7,970	5,980	5,980	4,780	9,560	6,370	4,780	4,780	3,830	9,560	6,370	3,830	3,830	3,040	7,590	5,060	3,040	3,040	
600	1,200	800	600	600	600	1,200	800	600	600	600	1,500	1,000	600	600	600	1,500	1,000	600	600	
2,990	8,970	5,980	3,590	2,990	2,870	8,610	5,740	3,450	2,870	2,690	10,040	6,690	3,220	2,690	2,440	9,110	6,080	2,920	2,440	Hardened steels 55~62HRC
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	2	1.5	1	2	2	2	1.5	1	2	2	2	2	1.5	2	2	2	2	1.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
600	900	800	600	600	480	720	640	480	480	390	580	510	390	390	310	460	410	310	310	Hardened steels 55~62HRC
60	90	80	60	60	60	90	80	60	60	60	90	80	60	60	60	90	80	60	60	
300	540	480	300	240	290	520	470	290	240	280	490	430	280	220	250	450	400	250	200	
0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	Hardened steels 55~62HRC
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,500	2,490	1,800	1,500	1,500	1,200	2,000	1,440	1,200	1,200	960	1,600	1,150	960	960	760	1,270	910	760	760	
150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	
750	1,250	900	600	600	720	1,200	870	580	580	680	1,120	810	540	540	610	1,020	730	490	490	Hardened steels 55~62HRC
0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1.2	1	2	2	1.5	1.2	1	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,300	2,000	1,600	1,300	1,300	1,040	1,600	1,280	1,040	1,040	830	1,280	1,020	830	830	660	1,020	810	660	660	Hardened steels 55~62HRC
130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	
650	1,000	800	520	330	630	960	770	500	320	590	900	720	470	300	530	820	650	370	270	
0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.07	0.05	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1.5	1	0.7	1.5	1.5	1.5	1.2	1	Hardened steels 55~62HRC
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	

Standard cutting conditions for vertical side finishing

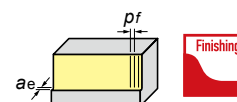
Work material	Recommended grade	Tool dia. DC	$\phi 16$ (2 Flutes)					$\phi 20$ (3 Flutes)					$\phi 25$ (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steels Alloy steels (30HRC or less)	※ ATH08M MZ1000 JP4120 JS4060	n (min ⁻¹)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		v_c (m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		v_f (mm/min)	1,560	4,780	2,400	2,080	1,200	1,870	5,740	2,870	2,490	1,440	2,300	6,120	3,680	3,060	1,840
		f_z (mm/t)	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.15	0.2	0.18	0.15	0.12
		pr (mm)	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cast irons FC FCD	ATH08M JP4120 JS4060	n (min ⁻¹)	5,980	11,950	9,960	7,970	7,970	4,780	9,560	7,970	6,370	6,370	3,830	7,650	6,370	5,100	5,100
		v_c (m/min)	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400
		v_f (mm/min)	1,800	4,780	3,990	3,190	2,400	2,160	5,740	4,790	3,830	2,870	3,070	7,650	5,100	4,080	3,060
		f_z (mm/t)	0.15	0.2	0.2	0.2	0.15	0.15	0.2	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15
		pr (mm)	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

Standard cutting conditions for vertical roughing

[Note] Use nose corner radius $R0.8$ insert.

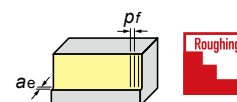
Work material	Recommended grade	Tool dia. DC	$\phi 16$ (2 Flutes)					$\phi 20$ (3 Flutes)					$\phi 25$ (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steels Alloy steels (30HRC or less)	※ JS4060 JP4120	n (min ⁻¹)	2,990	3,990	2,990	2,990	2,390	2,390	3,190	2,390	2,390	1,920	1,920	2,550	1,920	1,920	1,530
		v_c (m/min)	150	200	150	150	120	150	200	150	150	120	150	200	150	150	120
		v_f (mm/min)	900	1,200	720	600	340	1,080	1,440	870	720	410	1,160	1,530	930	770	430
		f_z (mm/t)	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07
		pr (mm)	3.6	3.6	3.6	3.6	3	4	4	4	4	4	4.5	4.5	4.5	4.5	4.5
		ae (mm)	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2
Cast irons FC FCD	ATH08M JP4120 JS4060	n (min ⁻¹)	2,990	4,980	3,990	3,990	2,990	2,390	3,990	3,190	3,190	2,390	1,920	3,190	2,550	2,550	1,920
		v_c (m/min)	150	250	200	200	150	150	250	200	200	150	150	250	200	200	150
		v_f (mm/min)	1,200	2,000	1,200	1,040	600	1,440	2,400	1,440	1,250	720	1,540	2,560	1,530	1,330	770
		f_z (mm/t)	0.2	0.2	0.15	0.13	0.1	0.2	0.2	0.15	0.13	0.1	0.2	0.2	0.15	0.13	0.1
		pr (mm)	3.6	3.6	3.6	3.6	3.6	4	4	4	4	4	4.5	4.5	4.5	4.5	4.5
		ae (mm)	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3

- [Note]** ① These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
 ② To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
 ③ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensure the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
 ④ Please note that the JS Coating does not cause a reaction in conductive touch sensors.
 ⑤ Ensure to index the insert at the correct time to ensure safety of the tool-body.
 ⑥ Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
 ⑦ MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
 ⑧ Due to fire risks do not use neat cutting oil as a coolant.
 ⑨ When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1. reducing cutting depth (ap) or 2. reducing per-flute feed rate (fz).



※Red indicates primary recommended grade.

φ32 (5 Flutes)					φ40 (6 Flutes)					φ50 (7 Flutes)					φ63 (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	Carbon steels Alloy steels (30HRC or less)
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
2,250	5,980	3,600	3,000	1,800	2,160	5,740	3,450	2,880	1,730	2,020	5,370	3,220	2,680	1,750	1,830	4,870	2,930	2,440	1,590	
0.15	0.2	0.18	0.15	0.12	0.15	0.2	0.18	0.15	0.12	0.15	0.2	0.18	0.15	0.13	0.15	0.2	0.18	0.15	0.13	
0.8	0.8	0.8	0.8	0.8	0.88	0.88	0.88	0.88	0.88	1	1	1	1	1	1.12	1.12	1.12	1.12	1.12	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
2,990	5,980	4,980	3,990	3,990	2,390	4,780	3,990	3,190	3,190	1,920	3,830	3,190	2,550	2,550	1,520	3,040	2,530	2,030	2,030	Cast irons FC FCD
300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	
2,990	7,480	4,980	3,990	3,000	2,870	7,170	4,790	3,830	2,880	2,690	6,710	4,920	3,570	3,220	2,440	6,080	4,460	3,250	2,930	
0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.22	0.2	0.18	0.2	0.25	0.22	0.2	0.18	
0.8	0.8	0.8	0.8	0.8	0.88	0.88	0.88	0.88	0.88	1	1	1	1	1	1.12	1.12	1.12	1.12	1.12	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	



※Red indicates primary recommended grade.

φ32 (5 Flutes)					φ40 (6 Flutes)					φ50 (7 Flutes)					φ63 (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	
1,500	2,000	1,500	1,500	1,200	1,200	1,600	1,200	1,200	960	960	1,280	960	960	770	760	1,020	760	760	610	Carbon steels Alloy steels (30HRC or less)
150	200	150	150	120	150	200	150	150	120	150	200	150	150	120	150	200	150	150	120	
1,130	1,500	900	750	420	1,080	1,440	870	720	410	1,010	1,350	810	680	380	920	1,230	730	610	350	
0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	
5	5	5	5	5	5.7	5.7	5.7	5.7	5.7	6.3	6.3	6.3	6.3	6.3	7.1	7.1	7.1	7.1	7.1	
< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	
1,500	2,490	2,000	2,000	1,500	1,200	2,000	1,600	1,600	1,200	960	1,600	1,280	1,280	960	760	1,270	1,020	1,020	760	Cast irons FC FCD
150	250	200	200	150	150	250	200	200	150	150	250	200	200	150	150	250	200	200	150	
1,500	3,120	2,000	2,000	1,130	1,440	3,000	1,920	1,920	1,080	1,350	2,800	1,800	1,800	1,010	1,220	2,540	1,640	1,640	920	
0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	
5	5	5	5	5	5.7	5.7	5.7	5.7	5.7	6.3	6.3	6.3	6.3	6.3	7.1	7.1	7.1	7.1	7.1	
< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	

Standard cutting conditions for contour roughing

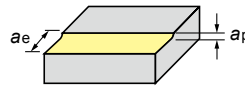
[Note] Use nose corner radius R2 insert.

Work material	Recommended grade	Tool dia. DC	$\phi 16$ (2 Flutes)					$\phi 20$ (3 Flutes)					$\phi 25$ (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steels Alloy steels (30HRC or less)	※ JP4120 JS4060	n (min ⁻¹)	2,590	3,990	2,590	2,590	1,800	2,080	3,190	2,080	2,080	1,440	1,660	2,550	1,660	1,660	1,150
		v_c (m/min)	130	200	130	130	90	130	200	130	130	90	130	200	130	130	90
		v_f (mm/min)	2,590	3,990	2,590	2,590	1,800	3,120	4,790	3,120	3,120	2,160	3,320	5,100	3,320	3,320	2,300
		f_z (mm/t)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		a_p (mm)	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25
		a_e (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
		a_r (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
Carbon steels Alloy steels (30~45HRC)	JP4120 JS4060	n (min ⁻¹)	1,800	3,590	2,590	2,590	1,800	1,440	2,870	2,080	2,080	1,440	1,150	2,300	1,660	1,660	1,150
		v_c (m/min)	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90
		v_f (mm/min)	1,440	2,880	2,080	2,080	1,440	1,730	3,450	2,500	2,500	1,730	1,840	3,680	2,660	2,660	1,840
		f_z (mm/t)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		a_p (mm)	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25
		a_e (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
		a_r (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
Stainless steels SUS	JM4160	n (min ⁻¹)	2,590	3,990	2,590	2,590	1,800	2,080	3,190	2,080	2,080	1,440	1,660	2,550	1,660	1,660	1,150
		v_c (m/min)	130	200	130	130	90	130	200	130	130	90	130	200	130	130	90
		v_f (mm/min)	2,590	3,990	2,590	2,590	1,800	3,120	4,790	3,120	3,120	2,160	3,320	5,100	3,320	3,320	2,300
		f_z (mm/t)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		a_p (mm)	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25
		a_e (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
		a_r (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
Cast irons FC FCD	JP4120 JS4060	n (min ⁻¹)	2,990	3,990	2,590	2,590	1,800	2,390	3,190	2,080	2,080	1,440	1,920	2,550	1,660	1,660	1,150
		v_c (m/min)	150	200	130	130	90	150	200	130	130	90	150	200	130	130	90
		v_f (mm/min)	4,190	5,590	3,630	3,630	2,520	5,020	6,700	4,370	4,370	3,030	5,380	7,140	4,650	4,650	3,220
		f_z (mm/t)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
		a_p (mm)	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3
		a_e (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
		a_r (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20

Standard cutting conditions for CBN bottom finishing

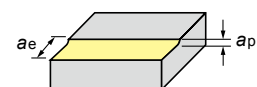
Work material	Recommended grade	Tool dia. DC	$\phi 16$ (2 Flutes)		$\phi 20$ (3 Flutes)		$\phi 25$ (4 Flutes)	
		Overhang	<3DC		<3DC		<3DC	
			High-speed cutting	Modular carbide shank 3DC-5DC	High-speed cutting	Modular carbide shank 3DC-5DC	High-speed cutting	Modular carbide shank 3DC-5DC
Carbon steels Alloy steels (30HRC or less)	BH250	n (min ⁻¹)	11,950	9,960	9,560	7,970	7,650	6,370
		v_c (m/min)	600	500	600	500	600	500
		v_f (mm/min)	2,390	1,600	2,870	1,920	3,060	2,040
		f_z (mm/t)	0.1	0.08	0.1	0.08	0.1	0.08
		a_p (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
		a_e (mm)	8~16	8~16	10~20	10~20	12.5~25	12.5~25
		a_r (mm)	8~16	8~16	10~20	10~20	12.5~25	12.5~25
Cast irons FC FCD	BH250	n (min ⁻¹)	15,930	11,950	12,740	9,560	11,470	8,920
		v_c (m/min)	800	600	800	600	900	700
		v_f (mm/min)	3,830	2,870	4,590	3,450	5,510	4,290
		f_z (mm/t)	0.12	0.12	0.12	0.12	0.12	0.12
		a_p (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
		a_e (mm)	8~16	8~16	10~20	10~20	12.5~25	12.5~25
		a_r (mm)	8~16	8~16	10~20	10~20	12.5~25	12.5~25

- [Note] ①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
 ②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
 ③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensure the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
 ④Please note that the JS Coating does not cause a reaction in conductive touch sensors.
 ⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
 ⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
 ⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
 ⑧Due to fire risks do not use neat cutting oil as a coolant.
 ⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (a_p) or 2.reducing per-flute feed rate (f_z).



※Red indicates primary recommended grade.

φ32 (5 Flutes)					φ40 (6 Flutes)					φ50 (7 Flutes)					φ63 (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
1,300	2,000	1,300	1,300	900	1,040	1,600	1,040	1,040	720	830	1,280	830	830	580	660	1,020	660	660	460	Carbon steels Alloy steels (30HRC or less)
130	200	130	130	90	130	200	130	130	90	130	200	130	130	90	130	200	130	130	90	
3,250	5,000	3,250	3,250	2,250	3,120	4,800	3,120	3,120	2,160	2,910	4,480	2,910	2,910	2,030	2,640	4,080	2,640	2,640	1,840	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	Carbon steels Alloy steels (30~45HRC)
900	1,800	1,300	1,300	900	720	1,440	1,040	1,040	720	830	1,280	830	830	580	460	910	660	660	460	
90	180	130	130	90	90	180	130	130	90	130	200	130	130	90	90	180	130	130	90	
1,800	3,600	2,600	2,600	1,800	1,730	3,460	2,500	2,500	1,730	2,330	3,590	2,330	2,330	1,630	1,480	2,920	2,120	2,120	1,480	
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	Stainless steels SUS
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	
1,300	2,000	1,300	1,300	900	1,040	1,600	1,040	1,040	720	960	1,470	1,150	830	640	660	1,020	660	660	460	
130	200	130	130	90	130	200	130	130	90	150	230	180	130	100	130	200	130	130	90	
3,250	5,000	3,250	3,250	2,250	3,120	4,800	3,120	3,120	2,160	3,360	5,150	4,030	2,910	2,240	2,640	4,080	2,640	2,640	1,840	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Cast irons FC FCD
0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	
1,500	2,000	1,300	1,300	900	1,200	1,600	1,040	1,040	720	960	1,280	830	830	580	760	1,020	660	660	460	
150	200	130	130	90	150	200	130	130	90	150	200	130	130	90	150	200	130	130	90	
5,250	7,000	4,550	4,550	3,150	5,040	6,720	4,370	4,370	3,030	4,710	6,280	4,070	4,070	2,850	4,260	5,720	3,700	3,700	2,580	
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	



φ32 (5 Flutes)		φ40 (6 Flutes)		φ50 (7 Flutes)		φ63 (8 Flutes)		Work material
<3DC	Modular carbide shank	<3DC	Modular carbide shank	<3DC	3DC-5DC	<3DC	3DC-5DC	
High-speed cutting	3DC-5DC	High-speed cutting	3DC-5DC	High-speed cutting		High-speed cutting		
5,980	4,980	4,780	3,990	3,830	3,190	3,040	2,530	Carbon steels Alloy steels (30HRC or less)
600	500	600	500	600	500	600	500	
2,990	2,000	2,870	1,920	2,690	2,240	2,440	2,030	
0.1	0.08	0.1	0.08	0.1	0.1	0.1	0.1	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
16~32	16~32	20~40	20~40	25~50	25~50	31~63	31~63	Cast irons FC FCD
8,960	6,970	7,170	5,580	5,740	4,460	4,550	3,540	
900	700	900	700	900	700	900	700	
5,380	4,190	5,170	4,020	4,830	3,750	4,370	3,400	
0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
16~32	16~32	20~40	20~40	25~50	25~50	31~63	31~63	

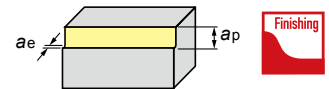
Standard cutting conditions for CBN side finishing

Work material	Recommended grade	Tool dia. DC	$\phi 16$ (2 Flutes)				$\phi 20$ (3 Flutes)				$\phi 25$ (4 Flutes)			
		Overhang	<3DC				<3DC				<3DC			
			High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steels Alloy steels (30HRC or less)	BH250	n (min ⁻¹)	15,930	15,930	11,950	11,950	12,740	12,740	9,560	9,560	10,200	10,200	7,650	7,650
		v_c (m/min)	800	800	600	600	800	800	600	600	800	800	600	600
		v_f (mm/min)	2,240	2,240	1,680	1,200	3,830	3,830	2,010	2,010	4,080	4,080	2,150	2,150
		f_z (mm/t)	0.07	0.07	0.07	0.05	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07
		a_p (mm)	2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cast irons FC FCD	BH250	n (min ⁻¹)	19,910	15,930	15,930	15,930	15,930	12,740	12,740	12,740	12,740	10,200	10,200	10,200
		v_c (m/min)	1,000	800	800	800	1,000	800	800	800	1,000	800	800	800
		v_f (mm/min)	4,780	3,830	3,190	3,190	5,740	4,590	3,830	3,830	6,120	4,900	4,080	4,080
		f_z (mm/t)	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1
		a_p (mm)	2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

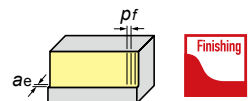
Standard cutting conditions for CBN vertical side finishing

Work material	Recommended grade	Tool dia. DC	$\phi 16$ (2 Flutes)				$\phi 20$ (3 Flutes)				$\phi 25$ (4 Flutes)			
		Overhang	<3DC				<3DC				<3DC			
			High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steels Alloy steels (30HRC or less)	BH250	n (min ⁻¹)	15,930	15,930	11,950	11,950	12,740	12,740	9,560	9,560	10,200	10,200	7,650	7,650
		v_c (m/min)	800	800	600	600	800	800	600	600	800	800	600	600
		v_f (mm/min)	2,240	2,240	1,680	1,200	3,830	3,830	2,010	2,010	4,080	4,080	2,150	2,150
		f_z (mm/t)	0.07	0.07	0.07	0.05	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07
		p_f (mm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.6	< 0.6	< 0.6	< 0.6	< 0.7	< 0.7	< 0.7	< 0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cast irons FC FCD	BH250	n (min ⁻¹)	19,910	15,930	15,930	15,930	15,930	12,740	12,740	12,740	12,740	10,200	10,200	10,200
		v_c (m/min)	1,000	800	800	800	1,000	800	800	800	1,000	800	800	800
		v_f (mm/min)	4,780	3,830	3,190	3,190	5,740	4,590	3,830	3,830	6,120	4,900	4,080	4,080
		f_z (mm/t)	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1
		p_f (mm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.6	< 0.6	< 0.6	< 0.6	< 0.7	< 0.7	< 0.7	< 0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

- [Note]** ①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
 ②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
 ③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensure the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
 ④Please note that the JS Coating does not cause a reaction in conductive touch sensors.
 ⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
 ⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
 ⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
 ⑧Due to fire risks do not use neat cutting oil as a coolant.
 ⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (a_p) or 2.reducing per-flute feed rate (f_z).

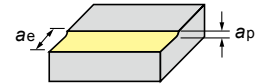


$\phi 32$ (5 Flutes)				$\phi 40$ (6 Flutes)				$\phi 50$ (7 Flutes)				$\phi 63$ (8 Flutes)				Work material
<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	3DC-5DC	5DC-7DC	>7DC	<3DC	3DC-5DC	5DC-7DC	>7DC	
High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	
7,970	7,970	5,980	5,980	6,370	6,370	4,780	4,780	5,100	5,100	3,830	3,830	4,050	4,050	3,040	3,040	Carbon steels Alloy steels (30HRC or less)
800	800	600	600	800	800	600	600	800	800	600	600	800	800	600	600	
3,990	3,990	2,100	2,100	3,830	3,830	2,010	2,010	3,570	3,570	1,880	1,880	3,240	3,240	1,710	1,710	
0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	
2	1.5	1	0.7	2	1.5	1	0.7	2	2	1.5	1	2	2	1.5	1	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	Cast irons FC FCD
11,950	9,960	8,960	7,970	9,560	7,970	7,170	6,370	7,650	6,370	5,740	5,100	6,070	5,060	4,550	4,050	
1,200	1,000	900	800	1,200	1,000	900	800	1,200	1,000	900	800	1,200	1,000	900	800	
7,170	5,980	4,480	3,990	6,890	5,740	4,310	3,830	6,430	5,360	4,020	3,570	5,830	4,860	3,640	3,240	
0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	
2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	



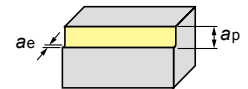
$\phi 32$ (5 Flutes)				$\phi 40$ (6 Flutes)				$\phi 50$ (7 Flutes)				$\phi 63$ (8 Flutes)				Work material
<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	3DC-5DC	5DC-7DC	>7DC	<3DC	3DC-5DC	5DC-7DC	>7DC	
High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	
7,970	7,970	5,980	5,980	6,370	6,370	4,780	4,780	5,100	5,100	3,830	3,830	4,050	4,050	3,040	3,040	Carbon steels Alloy steels (30HRC or less)
800	800	600	600	800	800	600	600	800	800	600	600	800	800	600	600	
3,990	3,990	2,100	2,100	3,830	3,830	2,010	2,010	3,570	3,570	2,690	2,690	3,240	3,240	2,440	2,440	
0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
< 0.8	< 0.8	< 0.8	< 0.8	< 0.88	< 0.88	< 0.88	< 0.88	< 1	< 1	< 1	< 1	< 1.12	< 1.12	< 1.12	< 1.12	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	Cast irons FC FCD
11,950	9,960	8,960	7,970	9,560	7,970	7,170	6,370	7,650	6,370	5,740	5,100	6,070	5,060	4,550	4,050	
1,200	1,000	900	800	1,200	1,000	900	800	1,200	1,000	900	800	1,200	1,000	900	800	
7,170	5,980	4,480	3,990	6,890	5,740	4,310	3,830	6,430	5,360	4,020	3,570	5,830	4,860	3,640	3,240	
0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	
< 0.8	< 0.8	< 0.8	< 0.8	< 0.88	< 0.88	< 0.88	< 0.88	< 1	< 1	< 1	< 1	< 1.12	< 1.12	< 1.12	< 1.12	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	

Cutting conditions for cutting aluminum alloy and copper using SD5010



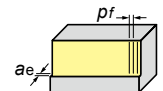
Cutting conditions for bottom finishing : $a_e = 0.5DC \sim 0.7DC$

Work material	Cutting conditions	φ16 2ft.	φ18 2ft.	φ20 3ft.	φ22 3ft.	φ25 4ft.	φ28 4ft.	φ30 4ft.	φ32 5ft.	φ35 5ft.	φ40 6ft.	φ50 7ft.	φ63 8ft.
Expanded aluminum alloy material A5052, A7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min ⁻¹)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed V_c (m/min)	800	900	1,000	1,100	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Feed rate f_z (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.08	0.08	0.08	0.06	0.06
	Feed speed V_f (mm/min)	3,180	3,180	4,770	4,770	6,120	5,460	5,090	4,780	4,360	4,580	3,210	2,910
	Cutting depth a_p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cast aluminum alloy material AC4A, ADC12, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min ⁻¹)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed V_c (m/min)	640	720	800	880	960	960	960	960	960	960	960	960
	Feed rate f_z (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.08	0.08	0.08	0.06	0.06
	Feed speed V_f (mm/min)	2,540	2,540	3,810	3,810	4,900	4,360	4,080	3,820	3,490	3,670	2,570	2,330
	Cutting depth a_p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pure copper C1100, C1020, etc. (Wet: Water-soluble agent)	Revolution n (min ⁻¹)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed V_c (m/min)	300	300	300	300	300	300	300	300	300	300	300	300
	Feed rate f_z (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.08	0.08	0.08	0.06	0.06
	Feed speed V_f (mm/min)	1,190	1,060	1,430	1,300	1,530	1,360	1,270	1,190	1,090	1,150	800	730
	Cutting depth a_p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2



Cutting conditions for side finishing : $a_e \leq 0.2\text{mm}$

Work material	Cutting conditions	φ16 2ft.	φ18 2ft.	φ20 3ft.	φ22 3ft.	φ25 4ft.	φ28 4ft.	φ30 4ft.	φ32 5ft.	φ35 5ft.	φ40 6ft.	φ50 7ft.	φ63 8ft.
Expanded aluminum alloy material A5052, A7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min ⁻¹)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed V_c (m/min)	800	900	1,000	1,100	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Feed rate f_z (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.18	0.2	0.2
	Feed speed V_f (mm/min)	4,770	4,770	7,160	7,160	9,180	8,180	7,640	8,960	8,180	10,300	10,700	9,700
	Cutting depth a_p (mm)	2	2	2	2	2	2	2	2	2	2	2	2
Cast aluminum alloy material AC4A, ADC12, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min ⁻¹)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed V_c (m/min)	640	720	800	880	960	960	960	960	960	960	960	960
	Feed rate f_z (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.18	0.2	0.2
	Feed speed V_f (mm/min)	3,810	3,810	5,720	5,720	7,320	6,540	6,100	7,160	6,550	8,250	8,550	7,760
	Cutting depth a_p (mm)	2	2	2	2	2	2	2	2	2	2	2	2
Pure copper C1100, C1020, etc. (Wet: Water-soluble agent)	Revolution n (min ⁻¹)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed V_c (m/min)	300	300	300	300	300	300	300	300	300	300	300	300
	Feed rate f_z (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.25	0.25
	Feed speed V_f (mm/min)	1,790	1,590	2,150	1,950	2,290	2,050	1,910	2,240	2,730	2,870	3,340	3,040
	Cutting depth a_p (mm)	2	2	2	2	2	2	2	2	2	2	2	2



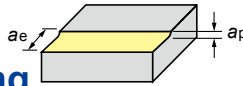
Cutting conditions for vertical roughing

Work material	Cutting conditions	φ16 2ft.	φ18 2ft.	φ20 3ft.	φ22 3ft.	φ25 4ft.	φ28 4ft.	φ30 4ft.	φ32 5ft.	φ35 5ft.	φ40 6ft.	φ50 7ft.	φ63 8ft.
Expanded aluminum alloy material A5052, A7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min ⁻¹)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed V_c (m/min)	800	900	1,000	1,100	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Feed rate f_z (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Feed speed V_f (mm/min)	4,770	4,770	7,160	7,160	9,180	8,180	7,640	8,960	8,180	8,600	8,020	7,270
	Pick feed p_f (mm)	3.5	4	4	4	4.5	4.5	5	5	5.5	6	6.5	7
	Cutting width a_e (mm)	4	4	4	4	4	4	4	4	4	4	4	4
Cast aluminum alloy material AC4A, ADC12, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min ⁻¹)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed V_c (m/min)	640	720	800	880	960	960	960	960	960	960	960	960
	Feed rate f_z (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Feed speed V_f (mm/min)	3,810	3,810	5,720	5,720	7,320	6,540	6,100	7,160	6,550	6,880	6,420	5,820
	Pick feed p_f (mm)	3.5	4	4	4	4.5	4.5	5	5	5.5	6	6.5	7
	Cutting width a_e (mm)	4	4	4	4	4	4	4	4	4	4	4	4
Pure copper C1100, C1020, etc. (Wet: Water-soluble agent)	Revolution n (min ⁻¹)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed V_c (m/min)	300	300	300	300	300	300	300	300	300	300	300	300
	Feed rate f_z (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Feed speed V_f (mm/min)	1,790	1,590	2,150	1,950	2,290	2,050	1,910	2,240	2,050	2,150	2,000	1,820
	Pick feed p_f (mm)	3.5	4	4	4	4.5	4.5	5	5	5.5	6	6.5	7
	Cutting width a_e (mm)	4	4	4	4	4	4	4	4	4	4	4	4

- [Note]**
- ① These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
 - ② When L/D = 4 or higher, reduce the rotation speed and feed rate by 60% (set them to 0.4 times the values shown above).
 - ③ Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safe environment.
 - ④ When using a machine that cannot provide the rotation speed shown above, set the highest rotation speed possible and calculate the feed rate using the f_z value.
 - ⑤ Be sure to use this tool at rotation speeds within the acceptable range for the milling chuck being used. If the acceptable rotation speed range is below the rotation speed shown above, set the highest acceptable rotation speed and calculate the feed rate using the f_z value.

Field data

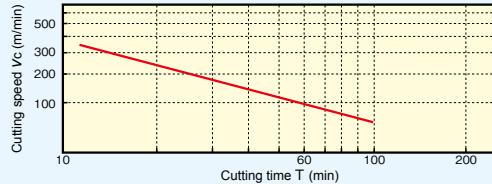
Cutting performance : Vc-T diagrams for various finishing



● Vc-T diagrams for bottom finishing

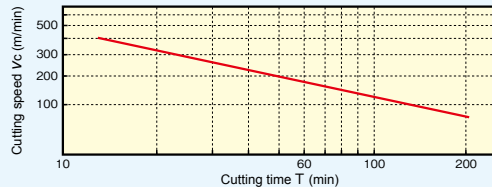
【 Carbon Steels 】

Work Material : S50C(220HB)
Tools : ASPVM2020R-3
Arbor : BT30-10.5-20-18
Insert : MPHW060308ZEL-1.5(MZ1000)
Overhang : 50mm
Machine used : Vertical type (BT30)
Feed rate per flute : 0.15mm/t
Depth of cut : $ap \times ae = 0.2 \times 10\text{mm}$
Air



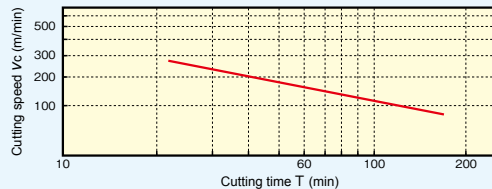
【 Material for plastic mold 】

Work Material : P20(32HRC)
Tools : ASPVM2020R-3
Arbor : BT30-10.5-20-18
Insert : MPHW060308ZEL-1.5(MZ1000)
Overhang : 50mm
Machine used : Vertical type (BT30)
Feed rate per flute : 0.15mm/t
Depth of cut : $ap \times ae = 0.2 \times 10\text{mm}$
Air



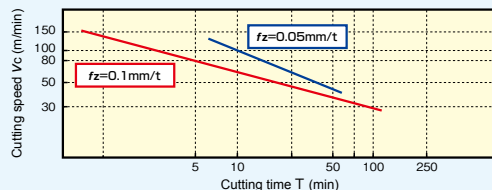
【 Material for plastic mold 】

Work Material : P21(40HRC)
Tools : ASPVM2020R-3
Arbor : BT30-10.5-20-18
Insert : MPHW060308ZEL-1.5(ATH08M)
Overhang : 50mm
Machine used : Vertical type (BT30)
Feed rate per flute : 0.15mm/t
Depth of cut : $ap \times ae = 0.2 \times 10\text{mm}$
Air



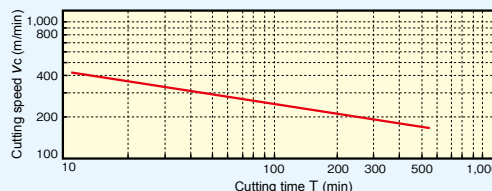
【 Cold-worked die steels 】

Work Material : SKD11(61HRC)
Tools : ASPVM2020R-3
Arbor : BT30-10.5-20-18
Insert : MPHW060308ZEL-1.5(ATH08M)
Overhang : 50mm
Machine used : Vertical type (BT30)
Feed rate per flute : 0.05, 0.1mm/t
Depth of cut : $ap \times ae = 0.2 \times 10\text{mm}$
Air



【 Cast Iron 】

Work Material : FC250
Tools : ASPVB2050R-7
Arbor : BT50-22.225-50-50
Insert : MPHW060308ZEL-1.5(ATH08M)
Overhang : 100mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.15mm/t
Depth of cut : $ap \times ae = 0.2 \times 40\text{mm}$
Air

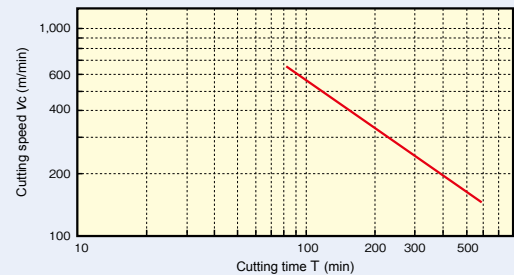


※ Tool life shown is for flank wear width of 0.2mm.

● Vc-T diagrams for side finishing

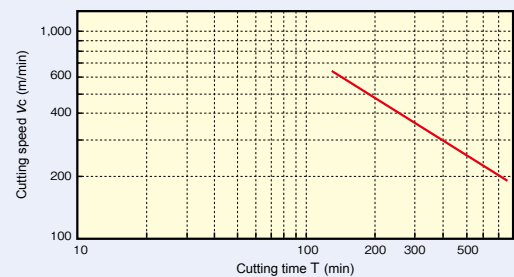
【 Carbon Steels 】

Work Material : S50C(220HB)
Tools : ASPVM2032R-5
Arbor : ASC32-17-260-140
Insert : MPHW060308ZEL(ATH08M)
Overhang : 200mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.1mm/t
Depth of cut : $ap \times ae = 1 \times 0.1\text{mm}$
Air



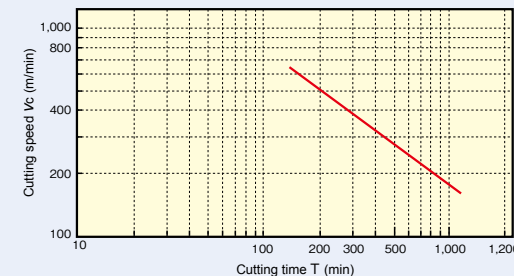
【 Material for plastic mold 】

Work Material : P20(32HRC)
Tools : ASPVM2032R-5
Arbor : ASC32-17-260-140
Insert : MPHW060308ZEL(ATH08M)
Overhang : 200mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.1mm/t
Depth of cut : $ap \times ae = 1 \times 0.1\text{mm}$
Air



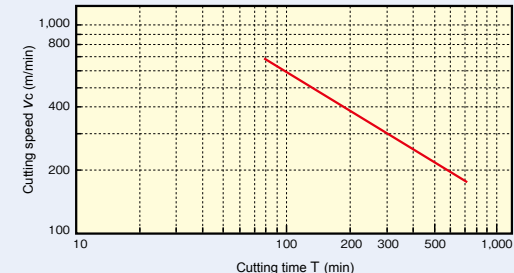
【 Material for plastic mold 】

Work Material : P21(40HRC)
Tools : ASPVM2032R-5
Arbor : ASC32-17-260-140
Insert : MPHW060308ZEL(ATH08M)
Overhang : 200mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.1mm/t
Depth of cut : $ap \times ae = 1 \times 0.1\text{mm}$
Air



【 Hot-worked die steels 】

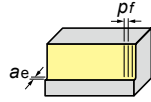
Work Material : SKD61(48HRC)
Tools : ASPVM2032R-5
Arbor : ASC32-17-260-140
Insert : MPHW060308ZEL(ATH08M)
Overhang : 200mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.1mm/t
Depth of cut : $ap \times ae = 1 \times 0.1\text{mm}$
Air



※ Tool life shown is for flank wear width of 0.15mm.

Field data

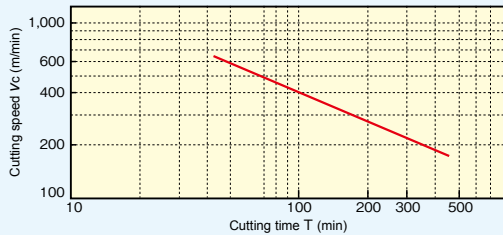
Cutting performance : Vc-T diagrams for various finishing



● Vc-T diagrams for vertical machining side finishing

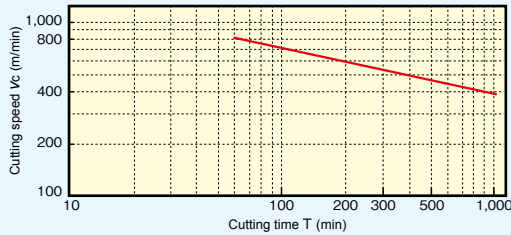
[Carbon Steels]

Work Material : S50C(220HB)
Tools : ASPVB2050R-7
Arbor : BT50-22.225-200-50
Insert : MPHWO60308ZEL(ATH08M)
Overhang : 250mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.15mm/t
Depth of cut : $p_f \times a_e = 1 \times 0.2 \times 0.5$ mm Reciprocating machining
Air



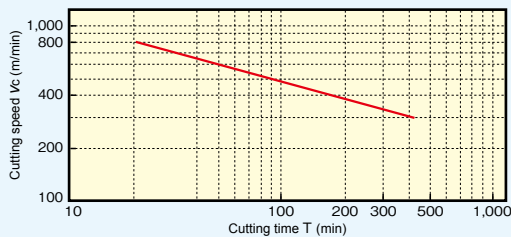
[Cast Irons]

Work Material : FC250
Tools : ASPVB2050R-7
Arbor : BT50-22.225-200-50
Insert : MPHWO60308ZEL(ATH08M)
Overhang : 250mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.15mm/t
Depth of cut : $p_f \times a_e = 1 \times 0.2$ mm Reciprocating machining
Air



[Cast Irons]

Work Material : FC250
Tools : ASPVB2050R-7
Arbor : BT50-22.225-200-50
Insert : MPHWO60308ZEL(ATH08M)
Overhang : 250mm
Machine used : Vertical type (BT50)
Feed rate per flute : 0.15mm/t
Depth of cut : $p_f \times a_e = 1 \times 0.5$ mm Reciprocating machining
Air



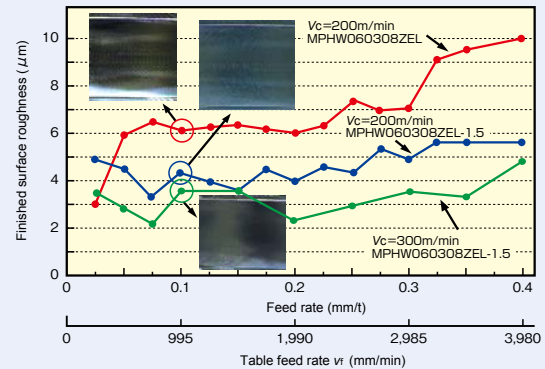
※ Tool life shown is for flank wear width of 0.15mm.

Cutting performance : Finished surface roughness

● Relation between feed rate and surface roughness

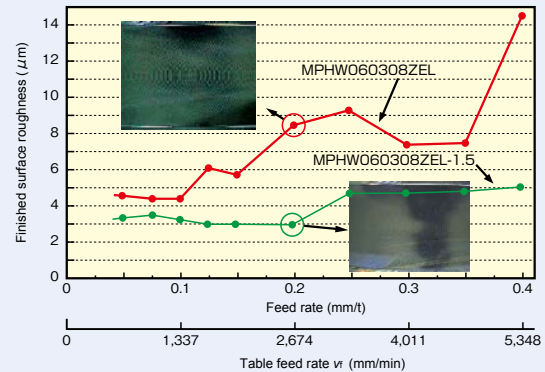
〈When mill diameter is $\phi 32$ 〉

Work Material : S50C(220HB)
Tools : ASPVM2032R-5
Shank : AS32-17-110-30
Insert : MPHWO60308ZEL-1.5(MZ1000)
MPHW060308ZEL(MZ1000)
Overhang : 70mm
Machine used : Vertical type(BT50)
Cutting speed : $v_c = 200.300$ m/min
Depth of cut : $a_p \times a_e = 0.2 \times 32$ (Full) mm
Air



〈When mill diameter is $\phi 50$ 〉

Work Material : S50C(220HB)
Tools : ASPVB2050R-7
Arbor : BT50-22.225-50-50
Insert : MPHWO60308ZEL-1.5(MZ1000)
MPHW060308ZEL(MZ1000)
Overhang : 100mm
Machine used : Vertical type(BT50)
Rotation speed : $n = 1,910$ min⁻¹
Cutting speed : $v_c = 300$ m/min
Depth of cut : $a_p \times a_e = 0.2 \times 50$ (Full) mm
Air

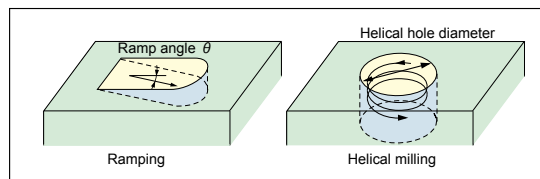


Cutting by direct milling is also possible.

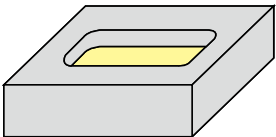
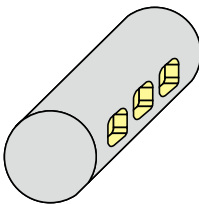
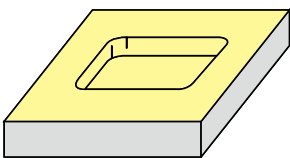
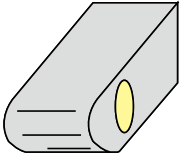
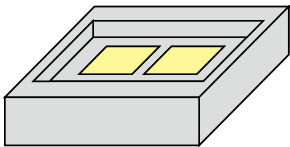
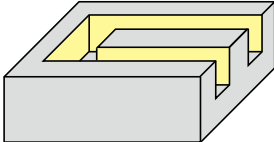
Since the cutting flute do not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown right, cutting by direct milling without a pilot hole is possible for ramping and helical milling.

(mm)

Inserts	MPN (H) W0603 ZEL											
Tool dia. DC	φ16	φ18	φ20	φ22	φ25	φ28	φ30	φ32	φ35	φ40	φ50	φ63
Maximum ramp angle θ	2.5°	2.5°	2.5°	2.5°	2.1°	1.8°	1.7°	1.6°	1.4°	1.2°	1°	0.5°
Hole Dia.	22~30	26~34	30~38	34~42	40~48	46~54	50~58	54~62	60~68	70~78	90~98	116~124



[Note] ① The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 0.5° or less is recommended.
② For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Tools : ASPVS2020R-3	Cutting Conditions	Result
	Work Material : S55C (220HB) Tools : ASPVS2020R-3 Arbor : Commercial milling chuck Insert : MPHWO60302ZEL-0.5 (MZ1000) Overhang : OH=50mm Machine used : Vertical type (BT50) Rotation speed : $n=3,180\text{min}^{-1}$ Cutting speed : $v_c=200\text{m/min}$ Feed rate : $v_f=670\text{mm/min}$ Feed rate per flute : 0.07mm/t Depth of cut : $a_p \times a_e = 0.1 \times 10\text{mm}$	Compared to past indexable tools, feed rate is $1.5 \times$ as fast and cutting accuracy is more stable, so tool life is more than doubled.
Tools : ASPVM2016R-2	Cutting Conditions	Result
	Work Material : SCM (30HRC) Tools : ASPVM2016R-2 Arbor : ASC16-8.5-95-30 Insert : MPHWO60302ZEL (MZ1000) Overhang : OH=55mm Machine used : Compound machining machine (BT40) Rotation speed : $n=4,050\text{min}^{-1}$ Cutting speed : $v_c=203\text{m/min}$ Feed rate : $v_f=800\text{mm/min}$ Feed rate per flute : 0.1mm/t Depth of cut : $a_p \times a_e = 0.5 \times 0.4\text{mm}$	In the past, HSS end mills were used, but by using ASPVM and a carbide shank, in addition to improved inclination accuracy, it was also possible to stably use an indexable tool.
Tools : ASPVS2016R-2	Cutting Conditions	Result
	Work Material : SUS420 Tools : ASPVS2016R-2 Arbor : Commercial milling chuck Insert : MPHWO60304ZEL-0.5 (Equivalent to JP4120) Overhang : OH=40mm Machine used : Vertical type (BT40) Rotation speed : $n=4,000\text{min}^{-1}$ Cutting speed : $v_c=200\text{m/min}$ Feed rate : $v_f=1,000\text{mm/min}$ Feed rate per flute : 0.125mm/t Depth of cut : $a_p \times a_e = 0.1 \times 8\text{mm}$	In the past, when using a normal angle type indexable tool, progressing with cutting tended to result in chattering marks, but with ASPV a stable cutting surface with no chattering marks was achieved. Use of the inserts for approximately 1 hour of cutting showed good constant wear.
Tools : ASPVM2032R-5	Cutting Conditions	Result
	Work Material : FCD550 Tools : ASPVM2032R-5 Arbor : ASC32-17-210-110 Insert : MPHWO60308ZEL (ATH08M) Overhang : OH=160mm Machine used : Vertical type (BT50) Rotation speed : $n=1,800\text{min}^{-1}$ Cutting speed : $v_c=180\text{m/min}$ Feed rate : $v_f=2,500\text{mm/min}$ Feed rate per flute : 0.28mm/t Depth of cut : $a_p \times a_e = 1 \times 0.2\text{mm}$	In the past, HSS end mills with long flute lengths were used, but cutting accuracy was unstable. Using ASPVM and carbide shanks provided stable cutting accuracy.
Tools : ASPVB2050R-7	Cutting Conditions	Result
	Work Material : FC250 Tools : ASPVB2050R-7 Arbor : BT50-22.225-200-50 Insert : MPHWO60308ZEL-1.5 (ATH08M) Overhang : OH=250mm Machine used : Vertical type (BT50) Rotation speed : $n=1,270\text{min}^{-1}$ Cutting speed : $v_c=200\text{m/min}$ Feed rate : $v_f=1,510\text{mm/min}$ Feed rate per flute : 0.17mm/t Depth of cut : $a_p \times a_e = 0.1 \times 30\text{mm}$	Compared to past indexable tools, feed marks on the cutting surface were stable and good.
Tools : ASPVM2032R-5	Cutting Conditions	Result
	Work Material : SKD61 (HB $\leq$ 229) Tools : ASPVM2032R-5 Arbor : Commercial Modular arbor Insert : MPHWO60308ZEL (Equivalent to JP4120) Overhang : OH=220mm Machine used : Vertical type (BT50) Rotation speed : $n=5,000\text{min}^{-1}$ Cutting speed : $v_c=500\text{m/min}$ Feed rate : $v_f=4000\text{mm/min}$ Feed rate per flute : 0.16mm/t Depth of cut : $a_p \times a_e = 1.0 \times 0.2\text{mm}$	In the past, solid end mills were used, but cutting accuracy was unstable. Using ASPVM provided stable cutting accuracy and provided machining efficiency.



The diagrams and table data are examples of test results, and are not guaranteed values.
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Attentions on Safety

1. Attentions regarding handling

- (1) When removing the tool from the case (package), be careful not to drop it on your foot or drop it onto the tips of your bare fingers.
- (2) When actually setting the inserts, be careful not to touch the cutting flute directly with your bare hands.

2. Attentions regarding mounting

- (1) When preparing for use, be sure that the inserts are firmly mounted in place and that they are firmly mounted on the arbor, etc.
- (2) If abnormal chattering occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Attentions during use

- (1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
- (2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
- (3) The inserts are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be installed and safety equipment such as safety glasses should be worn to create a safe environment for work.
 - Do not use where there is a risk of fire or explosion.
 - Do not use non-water-soluble cutting oils. Such oils may result in fire.
- (4) Do not use the tool for any purpose other than that for which it is intended, and do not modify it.

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