

EXTREME SAP

EXSAP/MSX Type

EXTREME SAP

EXSAP/MSX TYPE



Facemill type



Modular head type



Endmill type

Various line up

Capable of a variety of applications such as facemilling , slotting and plunging

Arc-shaped cutting edge trajectory

Due to the arc-geometry on peripheral cutting edge, cusp height can be smaller even in case of large ap.

Achieves high efficient & high precision machining for side walls.



Strong clamping system

Due to unique clamping system that holds insert in place, it is possible to achieve high efficient machining in roughing application.

High precision G class periphery ground

capable of semi-finishing



Double sided 4 cutting edge insert

EXTREME SAP **EXSAP/MSX Type**

■ **EXSAP-11 type**



High speed machining
with multi flutes & small insert

Accuracy of tool diameter : 0-0.1mm
Achieves higher precision on semi-finishing process

Grade: **JC8050**
JC8118

PM breaker for general steel (up to 50HRC)

Grade: **JC7550**
JC7518
DS118
DS150

SL breaker for hard to cut material
such as Titanium alloy, Heat resistant alloy

■ **EXSAP-17 type**



Max.depth of cut (ap)=15mm
From roughing to semi-finishing

High rigidity insert
Achieves high precision machining even when using large ap

Grade: **JC8050**
JC8118

PM breaker for general steel (up to 50HRC)

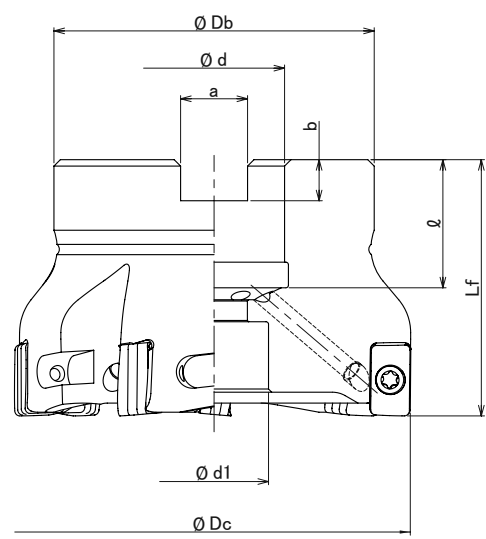
■ **Insert grades**

ISO	P					M					K				S					
	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30	S01	S10	S20	S30		
Range																	DS118			
				JC8118														DS150		
					JC8050															
				JC7518																JC7518
					JC7550															JC7550

EXTREME SAP **EXSAP/MSX Type**

- EXSAP-11 Type
- Facemill Type

Through coolant hole



Cat.No.	Stock	No. of inserts	Dimensions (mm)								Arbor set bolt	Weight (kg)	Inserts
			φDc	Lf	φDb	φd	φd1	a	b	ℓ			
EXSAP-6040R-11-16	●	6	40	40	35	16	14	8.4	5.6	18	M8	0.22	ZNGU1105**ZER-**
EXSAP-7050R-11-22	●	7	50		47	22	16.5	10.4	6.3	20	M10	0.38	
EXSAP-7052R-11-22	●		52	50	22	17	10.4	6.3	20	M10	0.39		
EXSAP-7063R-11-22	●		63							M10	0.53		
EXSAP-7063R-11-27	●	8	80	50	27	20	12.4	7	22	M12X1.75X30*	0.62		
EXSAP-8080R-11-27	●									56	M12X1.75X30*	0.99	

Screw	Torque(N.m)	Wrench
TSW-307H	2.1	A-10

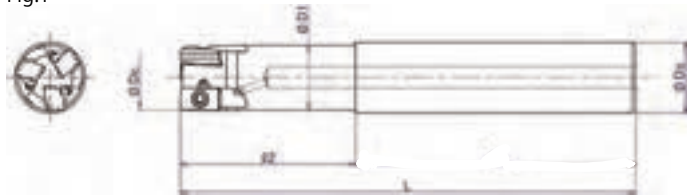
EXTREME SAP **EXSAP/MSX Type**

- EXSAP-11 Type
- Endmill Shank Type

Through coolant hole



Fig.1



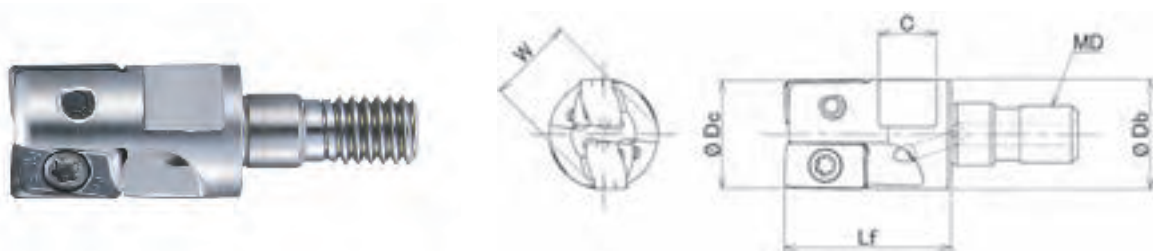
Cat.No.	Stock	No. of inserts	Dimensions (mm)					Inserts	Fig.
			φDc	ℓ2	L	φD1	φDs		
EXSAP-2016-11-50-S16+A	●	2	16	50	110	14.6	16	ZNGU1105**ZER-**	1
EXSAP-3020-11-50-S20+A	●	3	20	50	130	18.3	20		
EXSAP-3025-11-50-S25+A	●	2	25	50	130	23.4	25		
EXSAP-4030-11-50-S32+A	●	4	32	50	130	29	32		

Screw	Torque(N.m)	Wrench
TSW-307H	2.1	A-10

EXTREME SAP **EXSAP/MSX Type**

- EXSAP-11 Type
- Modular Head Type

Through coolant hole

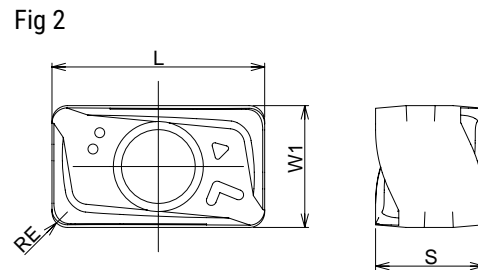
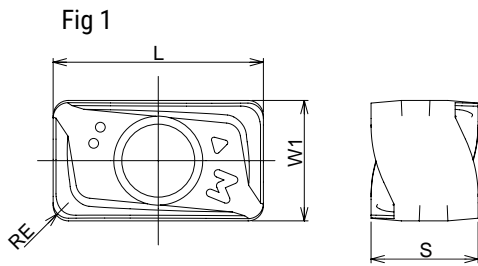


Cat.No.	Stock	No. of inserts	Dimensions (mm)						Inserts
			$\varnothing D_c$	L_f	$\varnothing D_b$	MD	C	W	
MSX-2016-11-M8	●	2	16	23	15	M8	8	12	ZNGU1105**ZER**
MSX-2017-11-M8	○		17						
MSX-2018-11-M8	○		18						
MSX-3020-11-M10	●	3	20	30	18	M10	9	14	
MSX-3021-11-M10	○		21						
MSX-3025-11-M12	●		25						
MSX-3026-11-M12	○	4	26	35	22	M12	11	19	
MSX-3028-11-M12	○		28						
MSX-4030-11-M16	○		30						
MSX-4032-11-M16	●	4	32	43	29	M16	12	22	
MSX-4033-11-M16	○		33						
MSX-4035-11-M16	○		35						
MSX-5040-11-M16	●	5	40						

Screw	Torque(N.m)	Wrench
TSW-307H	2.1	A-10

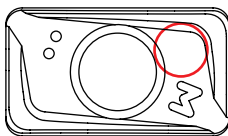
EXTREME SAP **EXSAP/MSX Type**

■ **Insert**

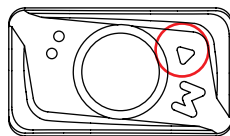


Cat.No	Tolerance	PVD Coating					Dimensions (mm)				Fig.	
		DS118	DS150	JC7518	JC7550	JC8050	JC8118	RE	L	W1		S
ZNGU110504ZER-PM	G					●	●	0.4	11	6.3	5.6	1
ZNGU110508ZER-PM						●	●	0.8				
ZNGU110516ZER-PM						●	●	1.6				
ZNGU110504ZER-SL		●	●	●	●			0.4				2
ZNGU110508ZER-SL		●	●	●	●			0.8				
ZNGU110516ZER-SL		●	●	●	●			1.6				

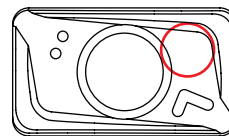
● **Grade markings**



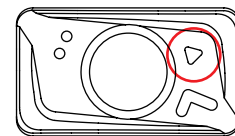
JC8118



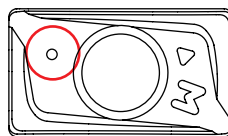
JC8050



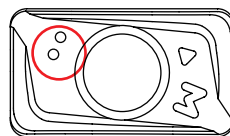
JC7518 / DS118



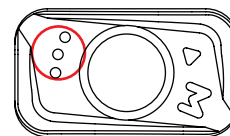
JC7550 / DS150



ZNGU110504ZER



ZNGU110508ZER



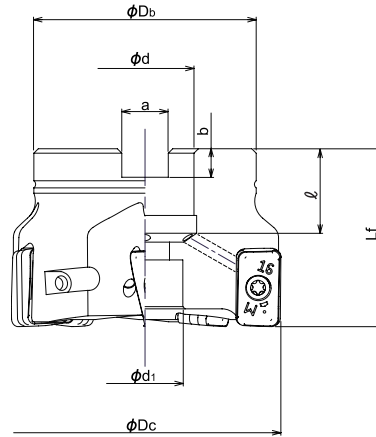
ZNGU110516ZER

EXTREME SAP **EXSAP/MSX Type**

- EXSAP-17 Type
- Facemill Type



Through coolant hole



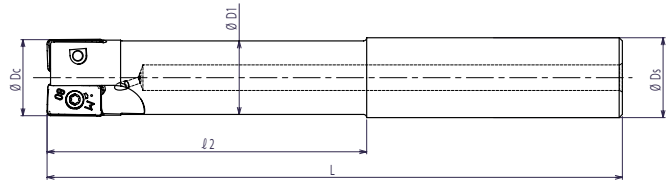
Cat.No.	Stock	No. of inserts	Dimensions (mm)								Arbor set bolt	Weight (kg)	Inserts					
			φDc	Lf	φDb	φd	φd1	a	b	ℓ								
EXSAP-4050R-22	●	4	50	40	47	22	17	10.4	6.3	20	M10	0.38	ZNGU1709**ZER-PM					
EXSAP-5050R-22	●	5	52									56		27	20	12.4	7	22
EXSAP-5052R-22	●		63	85	32	26	14.4	8	25	0.41								
EXSAP-5063R-22	●		80							50								
EXSAP-7080R-27	●	7	100	56	27	20	12.4	7	22		M12X1.75X30*	1.09						
EXSAP-7100R-32	●	8	125							85	32	26		14.4	8	25	M16X2X25*	1.93
EXSAP-8125R-40	●	8	63	100	40	32	16.4	9	32				M20X2.5X40*				3.66	

Screw	Torque(N.m)	Wrench
TSW-410H	3.5	A-15T

EXTREME SAP **EXSAP/MSX Type**

- EXSAP-17 Type
- Endmill Shank Type

Through coolant hole



Cat.No.	Stock	No. of inserts	Dimensions (mm)					Inserts
			φDc	ℓ2	L	φD1	φDs	
EXSAP-2025-60-S25	○	2	25	60	140	23	25	ZNGU1709**ZER-PM
EXSAP-2025-100-S25	○			100	180			
EXSAP-2032-70-S32	○		32	70	150	29	32	
EXSAP-2032-120-S32	○	120		200				
EXSAP-3032-70-S32	○	70		150				
EXSAP-3032-120-S32	○	120		200				

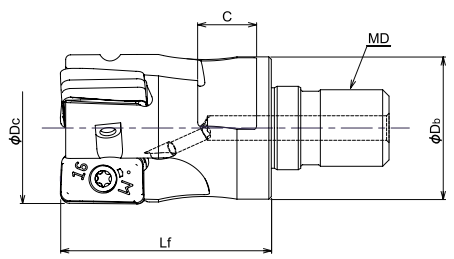
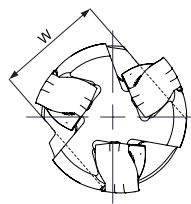
Screw	Torque(N.m)	Wrench
TSW-410H	3.5	A-15

EXTREME SAP **EXSAP/MSX Type**

- EXSAP-17 Type
- Modular Head Type



Through coolant hole

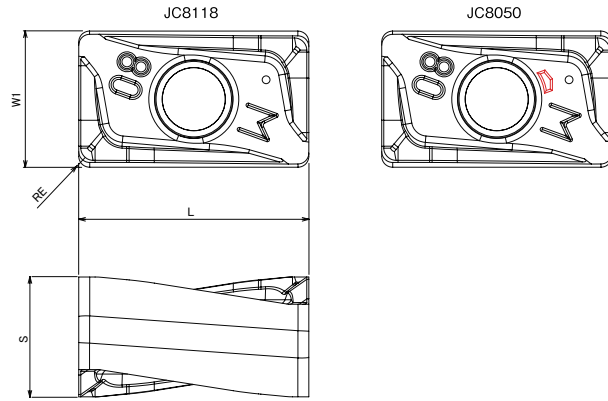


Cat.No.	Stock	No. of inserts	Dimensions (mm)						Inserts
			ϕD_c	Lf	ϕD_b	MD	C	W	
MSX-2025-M12	●	2	25	35	22	M12	11	19	ZNGU1709**ZER-PM
MSX-2026-M12	○		26						
MSX-2028-M12	○		28						
MSX-2030-M16	○		30						
MSX-2032-M16	●	3	32	43	29	M16	12	22	
MSX-3032-M16	●		33						
MSX-3033-M16	○		35						
MSX-3035-M16	○		35						
MSX-4040-M16	●	4	40						

Screw	Torque(N.m)	Wrench
TSW-410H	3.5	A-15

EXTREME SAP **EXSAP/MSX Type**

■ **Insert**



Cat.No.	Tolerance	PVD Coating		Dimensions (mm)			
		JC8050	JC8118	RE	L	W1	S
ZNGU170904ZER-PM	G	●	●	0.4	16.9	10	8.8
ZNGU170908ZER-PM		●	●	0.8			
ZNGU170916ZER-PM		●	●	1.6			
ZNGU170920ZER-PM		●	●	2			
ZNGU170930ZER-PM		●	●	3			8.6

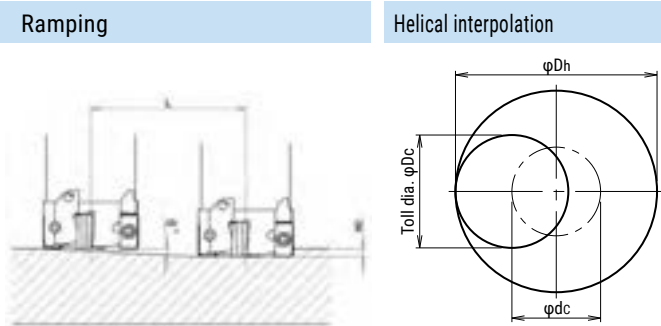
Cat.No.	Tolerance	PVD Coating	Dimensions (mm)			
		JC7550	RE	L	W1	S
ZNGU170908ZER-SM	G	●	0.8	16.9	10	8.8

EXTREME SAP

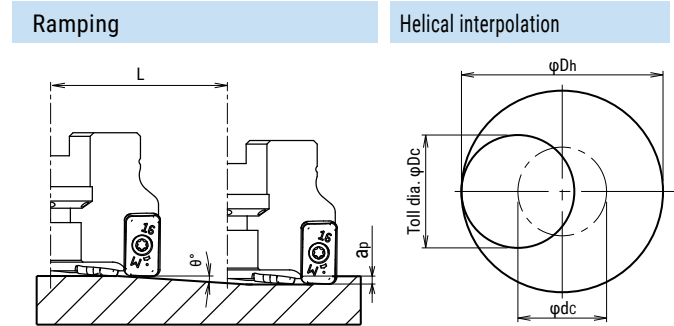
EXSAP/MSX Type

Recommended Data for Profile Milling

EXSAP-11 Type



EXSAP-17 Type



Cat. No.	Tool dia.	Effective Cutting dia.	Max. depth of cut : ap	Ramping		Helical interpolation	
				Max. ramping angle θ	Max. depth of cut : ap Total cutting length L(mm)	Min. Bore dia.	Max. Bore dia.
MSX-2016-11-M8	16	14.1	1.5	1.0°	86	18	29.6
MSX-3020-11-M10	20	18.1	1.5	0.7°	123	26	37.6
MSX-3025-11-M12	25	23.1	1.5	0.4°	215	36	47.6
MSX-4030-11-M16	30	28.1	1.5	0.3°	286	46	57.6
MSX-4032-11-M16	32	30.1	1.5	0.3°	286	50	61.6
MSX-5040-11-M16	40	38.1	1.5	0.2°	430	66	77.6
EXSAP-2016-11-**-S16	16	14.1	1.5	1.0°	86	18	29.6
EXSAP-3020-11-**-S20	20	18.1	1.5	0.7°	123	26	37.6
EXSAP-3025-11-**-S25	25	23.1	1.5	0.4°	215	36	47.6
EXSAP-4030-11-**-S32	30	28.1	1.5	0.3°	286	46	57.6
EXSAP-4032-11-**-S32	32	30.1	1.5	0.3°	286	50	61.6
EXSAP-5040-11-**-S32	40	38.1	1.5	0.2°	430	66	77.6
EXSAP-6040R-11-16	40	38.1	1.5	0.2°	430	66	77.6
EXSAP-7050R-11-22	50	48.1	1.5	0.15°	573	86	97.6
EXSAP-7052R-11-22	52	50.1	1.5	0.15°	573	90	101.6
EXSAP-7063R-11-22	63	61.1	1.5	Not recommended			
EXSAP-7063R-11-27	63	61.1	1.5	Not recommended			
EXSAP-8080R-11-27	80	78.1	1.5	Not recommended			

Cat. No.	Tool dia.	Effective Cutting dia.	Max. depth of cut : ap	Ramping		Helical interpolation	
				Max. ramping angle θ	Max. depth of cut : ap Total cutting length L(mm)	Min. Bore dia.	Max. Bore dia.
EXSAP/MSX-2025	25	21.5	1.5	0.7°	123	34	46
MSX-2026-M12	26	22.5	1.5	0.7°	123	36	48
MSX-2028-M12	28	25.5	1.5	0.6°	143	40	52
MSX-2030-M16	30	26.5	1.5	0.6°	143	44	56
EXSAP/MSX-*032	32	28.5	1.5	0.5°	172	48	60
MSX-3033-M16	33	29.5	1.5	0.5°	172	50	62
MSX-3035-M16	35	31.5	1.5	0.4°	215	54	66
MSX-4040-M16	40	36.5	1.5	0.4°	215	64	76
EXSAP-*050R-22	50	46.5	1.5	0.3°	286	84	96
EXSAP-5052R-22	52	48.5	1.5	0.3°	286	88	100
EXSAP-5063R-22	63	59.5	1.5	0.2°	430	110	122
EXSAP-7080R-27	80	76.5	1.5	0.15°	573	144	156
EXSAP-7100R-32	100	96.5	Not recommended				
EXSAP-8125R-40	125	121.5	Not recommended				

- In case of ramping and helical interpolation, apply 80% or less feed (Vf) from standard cutting condition table
- In case of helical interpolation, recommend wet cutting by coolant through the tool

- Calculation of tool pass dia.

$$\varphi_{Dc} = \varphi_{Dh} - \varphi_{Dc}$$

Tool pass dia. Bore dia. Tool Dia.

- Depth of cut per one circuit should not exceed max. depth of cut Ap

- Down cutting is recommended, tool pass rotation should be counterclockwise

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Facemill type / Side milling

Material	Grade	Tool dia.(mm)									
		40					50/52				
		6N					7N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~150	~8	~20	1,430	1,540	~200	~8	~24	1,150	1,610
		200	~6	~6	1,270	1,220	250	~6	~7.3	1,020	1,290
		250	~4	~2	1,110	930	300	~5	~2.4	890	1,000
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~150	~8	~20	1,430	1,540	~200	~8	~24	1,150	1,610
		200	~6	~6	1,270	1,220	250	~6	~7.3	1,020	1,290
		250	~4	~2	1,110	930	300	~5	~2.4	890	1,000
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~150	~8	~20	1,430	1,540	~200	~8	~24	1,150	1,610
		200	~6	~6	1,270	1,220	250	~6	~7.3	1,020	1,290
		250	~4	~2	1,110	930	300	~5	~2.4	890	1,000
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~150	~8	~20	1,030	870	~200	~8	~24	830	1,050
		200	~6	~6	950	680	250	~6	~7.3	760	850
		250	~4	~2	880	530	300	~5	~2.4	700	690
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~150	~8	~16	950	800	~200	~8	~20	760	960
		200	~6	~4.8	840	600	250	~6	~6	670	750
		250	~4	~1.6	720	430	300	~5	~2	570	560
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~150	~5	~4.8	800	580	~200	~6	~8	640	540
		200	~4	~1.6	720	430	250	~5	~2.4	570	400
		250	~3	~0.5	640	310	300	~4	~0.8	510	290
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~150	~8	~22	1,590	1,720	~200	~8	~28	1,270	1,780
		200	~6	~6.7	1,430	1,200	250	~6	~8.5	1,150	1,450
		250	~4	~2.2	1,270	910	300	~5	~2.8	1,020	1,140
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~150	~8	~22	1,430	1,370	~200	~8	~28	1,150	1,610
		200	~6	~6.7	1,270	1,070	250	~6	~8.5	1,020	1,290
		250	~4	~2.2	1,110	800	300	~5	~2.8	890	1,000
Austenitic stainless steel (SUS304, 316, 317)17Cr	JC8050 (JC7550)	~150	~8	~20	950	800	~200	~8	~24	760	960
		200	~6	~6	880	630	250	~6	~7.3	700	780
		250	~4	~2	800	480	300	~5	~2.4	640	630
Ferritic & martensitic stainless steel (SUS403, 420J2, 430)13Cr	JC8050 (JC7550)	~150	~8	~20	1,110	930	~200	~8	~24	890	1,120
		200	~6	~6	950	680	250	~6	~7.3	760	850
		250	~4	~2	800	480	300	~5	~2.4	640	630
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~150	~8	~14	560	440	~200	~8	~20	450	410
		200	~6	~4.2	480	350	250	~6	~6	380	320
		250	~4	~1.4	400	260	300	~5	~2	320	250
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~150	~8	~14	240	140	~200	~8	~20	190	130
		200	~6	~4.2	200	110	250	~6	~6	160	100
		250	~4	~1.4	160	80	300	~5	~2	130	70

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP
EXSAP/MSX Type
Recommended cutting conditions
EXSAP-11 Type
Facemill type / Side milling

Material	Grade	Tool dia.(mm)									
		63					80				
		7N					8N				
		f (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)	f (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~250	~9	~30	910	1,270	~300	~9	~36	720	1,150
		300	~7	~9	810	1,020	~350	~7	~11	640	920
		350	~5	~3	710	800	~400	~5	~3.6	560	720
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~250	~9	~30	910	1,270	~300	~9	~36	720	1,150
		300	~7	~9	810	1,020	~350	~7	~11	640	920
		350	~5	~3	710	800	~400	~5	~3.6	560	720
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~250	~9	~30	910	1,270	~300	~9	~36	720	1,150
		300	~7	~9	810	1,020	~350	~7	~11	640	920
		350	~5	~3	710	800	~400	~5	~3.6	560	720
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~250	~9	~30	660	830	~300	~9	~36	520	750
		300	~7	~9	610	680	~350	~7	~11	480	610
		350	~5	~3	560	550	~400	~5	~3.6	440	490
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~250	~9	~24	610	770	~300	~9	~28	480	690
		300	~7	~7.3	530	590	~350	~7	~8.5	420	540
		350	~5	~2.4	450	440	~400	~5	~2.8	360	400
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~250	~9	~9	510	430	~300	~9	~10	400	380
		300	~7	~2.7	450	320	~350	~7	~3	360	290
		350	~5	~0.9	400	220	~400	~5	~1	320	200
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~250	~9	~34	1,010	1,410	~300	~9	~40	800	1,280
		300	~7	~10	910	1,150	~350	~7	~12	720	1,040
		350	~5	~3.4	810	910	~400	~5	~4	640	820
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~250	~9	~34	910	1,270	~300	~9	~40	720	1,150
		300	~7	~10	810	1,020	~350	~7	~12	640	920
		350	~5	~3.4	710	800	~400	~5	~4	560	720
Austenitic stainless steel (SUS304, 316, 317)17Cr	JC8050 (JC7550)	~250	~9	~30	610	770	~300	~9	~36	480	690
		300	~7	~9	560	630	~350	~7	~11	440	560
		350	~5	~3	510	500	~400	~5	~3.6	400	450
Ferritic & martensitic stainless steel (SUS403, 420J2, 430)13Cr	JC8050 (JC7550)	~250	~9	~30	710	890	~300	~9	~36	560	810
		300	~7	~9	610	680	~350	~7	~11	480	610
		350	~5	~3	510	500	~400	~5	~3.6	400	450
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~250	~9	~26	350	320	~300	~9	~30	280	290
		300	~7	~8	300	250	~350	~7	~9	240	230
		350	~5	~2	250	190	~400	~5	~3	200	180
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~250	~9	~26	150	110	~300	~9	~30	120	100
		300	~7	~8	130	80	~350	~7	~9	100	70
		350	~5	~2.6	100	60	~400	~5	~3	80	50

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Endmill type / Side milling

Material	Grade	Tool dia.(mm)														
		16					20					25				
		2N					3N					3N				
		ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~30	~5	~4	3,580	1,000	~50	~5	~5	2,860	1,370	~70	~6	~7.2	2,290	1,100
		70	~3	~1.2	3,180	760	~120	~3	~1.5	2,550	1,070	120	~4	~2.2	2,040	860
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~30	~5	~4	3,580	1,000	~50	~5	~5	2,860	1,370	~70	~6	~7.2	2,290	1,100
		70	~3	~1.2	3,180	760	120	~3	~1.5	2,550	1,070	120	~4	~2.2	2,040	860
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~30	~5	~4	3,580	1,000	~50	~5	~5	2,860	1,370	~70	~6	~7.2	2,290	1,100
		70	~3	~1.2	3,180	760	~120	~3	~1.5	2,550	1,070	120	~4	~2.2	2,040	860
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~30	~5	~4	2,590	620	~50	~5	~5	2,070	870	~70	~6	~7.2	1,660	700
		70	~3	~1.2	2,390	480	120	~3	~1.5	1,910	690	120	~4	~2.2	1,530	550
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~30	~5	~3.4	2,390	570	~50	~5	~4	1,910	800	~70	~6	~6	1,530	640
		70	~3	~1	2,090	420	~120	~3	~1.2	1,670	600	120	~4	~1.8	1,340	480
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~30	~3	~1.6	1,990	320	~50	~3.5	~2	1,590	480	~70	~4	~3.2	1,270	380
		70	~2	~0.6	1,790	250	120	~2.5	~0.6	1,430	390	120	~3	~1	1,150	310
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~30	~5	~5	3,980	1,110	~50	~5	~6	3,180	1,530	~70	~6	~9.8	2,550	1,220
		70	~3	~1.5	3,580	860	~120	~3	~1.8	2,860	1,200	120	~4	~3	2,290	960
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~30	~5	~5	3,580	1,000	~50	~5	~6	2,860	1,370	~70	~6	~9.8	2,290	1,100
		70	~3	~1.5	3,180	760	120	~3	~1.8	2,550	1,070	120	~4	~3	2,040	860
Austenitic stainless steel (SUS304, 316, 317)17Cr	JC8050 (JC7550)	~30	~5	~4	2,390	570	~50	~5	~5	1,910	800	~70	~6	~7.2	1,530	640
		70	~3	~1.2	2,190	440	~120	~3	~1.5	1,750	630	120	~4	~2.2	1,400	500
Ferritic & martensitic stainless steel (SUS403, 420J2, 430)13Cr	JC8050 (JC7550)	~30	~5	~3.2	2,790	670	~50	~5	~5	2,230	940	~70	~6	~7.2	1,780	750
		70	~3	~1	2,390	480	120	~3	~1.5	1,910	690	120	~4	~2.2	1,530	550
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~30	~5	~3.2	1,390	330	~50	~5	~4	1,110	430	~70	~6	~6	890	350
		70	~3	~1	1,190	260	~120	~3	~1.2	950	340	120	~4	~1.8	760	270
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~30	~5	~3.2	600	110	~50	~5	~4	480	140	~70	~6	~6	380	110
		70	~3	~1	500	80	120	~3	~1.2	400	110	120	~4	~1.8	320	90

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Endmill type / Side milling

Material	Grade	Tool dia.(mm)									
		30/32					40				
		4N					5N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~70	~6	~9.8	1,790	1,150	~70	~7	~14	1,430	1,290
		120	~4	~3	1,590	890	170	~5	~4.2	1,270	1,020
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~70	~6	~9.8	1,790	1,150	~70	~7	~14	1,430	1,290
		120	~4	~3	1,590	890	170	~5	~4.2	1,270	1,020
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~70	~6	~9.8	1,790	1,150	~70	~7	~14	1,430	1,290
		120	~4	~3	1,590	890	170	~5	~4.2	1,270	1,020
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~70	~6	~9.8	1,290	720	~70	~7	~14	1,030	720
		120	~4	~3	1,190	570	170	~5	~4.2	950	570
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~70	~6	~8	1,190	670	~70	~7	~10	950	670
		120	~4	~2.4	1,040	500	170	~5	~3	840	500
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~70	~4	~3.6	990	400	~70	~4.5	~4	800	480
		120	~3	~1	900	320	170	~3.5	~1.2	720	360
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~70	~6	~12	1,990	1,270	~70	~7	~16	1,590	1,430
		120	~4	~3.6	1,790	1,000	170	~5	~4.8	1,430	1,000
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~70	~6	~12	1,790	1,150	~70	~7	~16	1,430	1,140
		120	~4	~3.6	1,590	890	170	~5	~4.8	1,270	890
Austenitic stainless steel (SUS304, 316, 317)17Cr	JC8050 (JC7550)	~70	~6	~9.8	1,190	670	~70	~7	~14	950	670
		120	~4	~3	1,090	520	170	~5	~4.2	880	530
Ferritic & martensitic stainless steel (SUS403, 420J2, 430)13Cr	JC8050 (JC7550)	~70	~6	~9.8	1,390	780	~70	~7	~14	1,110	780
		120	~4	~3	1,190	570	170	~5	~4.2	950	570
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~70	~6	~8	700	360	~70	~7	~10	560	360
		120	~4	~2.4	600	290	170	~5	~3	480	290
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~70	~6	~8	300	120	~70	~7	~10	240	120
		120	~4	~2.4	250	90	170	~5	~3	200	90

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Modular head type / Side milling

Material	Grade	Tool dia.(mm)														
		16/17/18					20/21					25/26/28				
		2N					3N					3N				
		ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~80	~5	~4	3,580	1,000	~100	~5	~5	2,860	1,370	~120	~6	~7.2	2,290	1,100
		120	~3	~1.2	3,180	760	150	~3	~1.5	2,550	1,070	190	~4	~2.2	2,040	860
		160	~2	~0.4	2,790	560	190	~2	~0.5	2,230	800	235	~3	~0.7	1,780	640
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~80	~5	~4	3,580	1,000	~100	~5	~5	2,860	1,370	~120	~6	~7.2	2,290	1,100
		120	~3	~1.2	3,180	760	150	~3	~1.5	2,550	1,070	190	~4	~2.2	2,040	860
		160	~2	~0.4	2,790	560	190	~2	~0.5	2,230	800	235	~3	~0.7	1,780	640
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~80	~5	~4	3,580	1,000	~100	~5	~5	2,860	1,370	~120	~6	~7.2	2,290	1,100
		120	~3	~1.2	3,180	760	150	~3	~1.5	2,550	1,070	190	~4	~2.2	2,040	860
		160	~2	~0.4	2,790	560	190	~2	~0.5	2,230	800	235	~3	~0.7	1,780	640
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~80	~5	~4	2,590	620	~100	~5	~5	2,070	870	~120	~6	~7.2	1,660	700
		120	~3	~1.2	2,390	480	150	~3	~1.5	1,910	690	190	~4	~2.2	1,530	550
		160	~2	~0.4	2,190	350	190	~2	~0.5	1,750	530	235	~3	~0.7	1,400	420
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~80	~5	~3.4	2,390	570	~100	~5	~4	1,910	800	~120	~6	~6	1,530	640
		120	~3	~1	2,090	420	150	~3	~1.2	1,670	600	190	~4	~1.8	1,340	480
		160	~2	~0.3	1,790	290	190	~2	~0.4	1,430	430	235	~3	~0.6	1,150	350
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~80	~3	~1.6	1,990	320	~100	~3.5	~2	1,590	480	~120	~4	~3.2	1,270	380
		120	~2	~0.6	1,790	250	150	~2.5	~0.6	1,430	390	190	~3	~1	1,150	310
		160	~1	~0.2	1,590	190	190	~1.5	~0.2	1,270	300	235	~2	~0.3	1,020	240
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~80	~5	~5	3,980	1,110	~100	~5	~6	3,180	1,530	~120	~6	~9.8	2,550	1,220
		120	~3	~1.5	3,580	860	150	~3	~1.8	2,860	1,200	190	~4	~3	2,290	960
		160	~2	~0.5	3,180	640	190	~2	~0.6	2,550	920	235	~3	~1	2,040	730
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~80	~5	~5	3,580	1,000	~100	~5	~6	2,860	1,370	~120	~6	~9.8	2,290	1,100
		120	~3	~1.5	3,180	760	150	~3	~1.8	2,550	1,070	190	~4	~3	2,040	860
		160	~2	~0.5	2,790	560	190	~2	~0.6	2,230	800	235	~3	~1	1,780	640
Austenitic stainless steel (SUS304, 316, 317)17Cr	JC8050 (JC7550)	~80	~5	~4	2,390	570	~100	~5	~5	1,910	800	~120	~6	~7.2	1,530	640
		120	~3	~1.2	2,190	440	150	~3	~1.5	1,750	630	190	~4	~2.2	1,400	500
		160	~2	~0.4	1,990	320	190	~2	~0.5	1,590	480	235	~3	~0.7	1,270	380
Ferritic & martensitic stainless steel (SUS403, 420J2, 430)13Cr	JC8050 (JC7550)	~80	~5	~3.2	2,790	670	~100	~5	~5	2,230	940	~120	~6	~7.2	1,780	750
		120	~3	~1	2,390	480	150	~3	~1.5	1,910	690	190	~4	~2.2	1,530	550
		160	~2	~0.4	1,990	320	190	~2	~0.5	1,590	480	235	~3	~0.7	1,270	380
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~80	~5	~3.2	1,390	330	~100	~5	~4	1,110	430	~120	~6	~6	890	350
		120	~3	~1	1,190	260	150	~3	~1.2	950	340	190	~4	~1.8	760	270
		160	~2	~0.3	990	200	190	~2	~0.4	800	260	235	~3	~0.6	640	210
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~80	~5	~3.2	600	110	~100	~5	~4	480	140	~120	~6	~6.0	380	110
		120	~3	~1	500	80	150	~3	~1.2	400	110	190	~4	~1.8	320	90
		160	~2	~0.3	400	60	190	~2	~0.4	320	80	235	~3	~0.6	250	60

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP

EXSAP/MSX Type

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Modular head type / Side milling

Material	Grade	Tool dia.(mm)									
		30/32/33/35					40				
		4N					5N				
		ℓ (mm)	ap (mm)	ap×ae (mm ²)	n (min ⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm ²)	n (min ⁻¹)	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~160	~6	~9.8	1,790	1,150	~160	~7	~14	1,430	1,290
		240	~4	~3	1,590	890	240	~5	~4.2	1,270	1,020
		290	~3	~1	1,390	670	290	~3	~1.4	1,110	780
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~160	~6	~9.8	1,790	1,150	~160	~7	~14	1,430	1,290
		240	~4	~3	1,590	890	240	~5	~4.2	1,270	1,020
		290	~3	~1	1,390	670	290	~3	~1.4	1,110	780
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~160	~6	~9.8	1,790	1,150	~160	~7	~14	1,430	1,290
		240	~4	~3	1,590	890	240	~5	~4.2	1,270	1,020
		290	~3	~1	1,390	670	290	~3	~1.4	1,110	780
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~160	~6	~9.8	1,290	720	~160	~7	~14	1,030	720
		240	~4	~3	1,190	570	240	~5	~4.2	950	570
		290	~3	~1	1,090	440	290	~3	~1.4	880	440
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~160	~6	~8	1,190	670	~160	~7	~10	950	670
		240	~4	~2.4	1,040	500	240	~5	~3	840	500
		290	~3	~0.8	900	360	290	~3	~1	720	360
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~160	~4	~3.6	990	400	~160	~4.5	~4	800	480
		240	~3	~1	900	320	240	~3.5	~1.2	720	360
		290	~2	~0.4	800	260	290	~2.5	~0.4	640	260
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~160	~6	~12	1,990	1,270	~160	~7	~16	1,590	1,430
		240	~4	~3.6	1,790	1,000	240	~5	~4.8	1,430	1,000
		290	~3	~1.2	1,590	760	290	~3	~1.6	1,270	760
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~160	~6	~12	1,790	1,150	~160	~7	~16	1,430	1,140
		240	~4	~3.6	1,590	890	240	~5	~4.8	1,270	890
		290	~3	~1.2	1,390	670	290	~3	~1.6	1,110	670
Austenitic stainless steel (SUS304, 316, 317)17Cr	JC8050 (JC7550)	~160	~6	~9.8	1,190	670	~160	~7	~14	950	670
		240	~4	~3	1,090	520	240	~5	~4.2	880	530
		290	~3	~1	990	400	290	~3	~1.4	800	400
Ferritic & martensitic stainless steel (SUS403, 420J2, 430)13Cr	JC8050 (JC7550)	~160	~6	~9.8	1,390	780	~160	~7	~14	1,110	780
		240	~4	~3	1,190	570	240	~5	~4.2	950	570
		290	~3	~1	990	400	290	~3	~1.4	800	400
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~160	~6	~8	700	360	~160	~7	~10	560	360
		240	~4	~2.4	600	290	240	~5	~3	480	290
		290	~3	~0.8	500	220	290	~3	~1	400	220
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~160	~6	~8	300	120	~160	~7	~10	240	120
		240	~4	~2.4	250	90	240	~5	~3	200	90
		290	~3	~0.8	200	60	290	~3	~1	160	60

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce ap or rpm and keep feed per tooth.
3. ap should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Facemill type / Face milling

Material	Grade	Tool dia.(mm)									
		40					50/52				
		刃数6N					刃数7N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1.2	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Cast steel (GM190, JCD5) below 285HB	JC8050 (JC8118)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1.2	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1.2	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~150	~2	~24	1,030	1,110	~200	~2	~30	830	1,050
		200	~1.2	~24	950	860	250	~1.2	~30	760	800
		250	~0.5	~24	880	630	300	~0.5	~30	700	590
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~150	~1.8	~24	950	910	~200	~1.8	~30	760	850
		200	~1	~24	840	660	250	~1	~30	670	610
		250	~0.5	~24	720	430	300	~0.5	~30	570	400
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~150	~1	~16	800	580	~200	~1	~20	640	540
		200	~0.5	~16	720	430	250	~0.5	~20	570	400
		250	~0.3	~16	640	310	300	~0.3	~20	510	290
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~150	~2	~24	1,590	1,910	~200	~2	~30	1,270	1,780
		200	~1.2	~24	1,430	1,460	250	~1.2	~30	1,150	1,370
		250	~0.5	~24	1,270	1,070	300	~0.5	~30	1,020	1,000
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~150	~2	~16	950	1,030	~200	~2	~20	760	960
		200	~1.2	~16	880	900	250	~1.2	~20	700	830
		250	~0.5	~16	800	670	300	~0.5	~20	640	630
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8050 (JC7550)	~150	~2	~24	1,110	1,200	~200	~2	~30	890	1,120
		200	~1.2	~24	950	970	250	~1.2	~30	760	900
		250	~0.5	~24	800	670	300	~0.5	~30	640	630
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~150	~1.8	~16	560	400	~200	~1.8	~20	450	380
		200	~1	~16	480	290	250	~1	~20	380	270
		250	~0.4	~16	400	190	300	~0.4	~20	320	180
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~150	~1.8	~16	240	160	~200	~1.8	~20	190	150
		200	~1	~16	200	110	250	~1	~20	160	100
		250	~0.4	~16	160	70	300	~0.4	~20	130	60

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP
EXSAP/MSX Type
Recommended cutting conditions
EXSAP-11 Type
Facemill type / Face milling

Material	Grade	Tool dia.(mm)									
		63					80				
		7N					8N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~250	~2	~38	660	830	~300	~2	~48	520	750
		300	~1.2	~38	610	640	~350	~1.2	~48	480	580
		350	~0.5	~38	560	470	~400	~0.5	~48	440	420
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~250	~1.8	~38	610	680	~300	~1.8	~48	480	610
		300	~1	~38	530	480	~350	~1	~48	420	440
		350	~0.5	~38	450	320	~400	~0.5	~48	360	290
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~250	~1	~25	510	430	~300	~1	~32	400	380
		300	~0.5	~25	450	320	~350	~0.5	~32	360	290
		350	~0.3	~25	400	220	~400	~0.3	~32	320	200
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~250	~2	~38	1,010	1,410	~300	~2	~48	800	1,280
		300	~1.2	~38	910	1,080	~350	~1.2	~48	720	980
		350	~0.5	~38	810	790	~400	~0.5	~48	640	720
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~250	~2	~25	610	770	~300	~2	~32	480	690
		300	~1.2	~25	560	670	~350	~1.2	~32	440	600
		350	~0.5	~25	510	500	~400	~0.5	~32	400	450
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8050 (JC7550)	~250	~2	~38	710	890	~300	~2	~48	560	810
		300	~1.2	~38	610	730	~350	~1.2	~48	480	650
		350	~0.5	~38	510	500	~400	~0.5	~48	400	450
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~250	~1.8	~25	350	290	~300	~1.8	~32	280	270
		300	~1	~25	300	210	~350	~1	~32	240	190
		350	~0.4	~25	250	140	~400	~0.4	~32	200	130
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~250	~1.8	~25	150	120	~300	~1.8	~32	120	110
		300	~1	~25	130	80	~350	~1	~32	100	70
		350	~0.4	~25	100	50	~400	~0.4	~32	80	40

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Endmill type / Face milling

Material	Grade	Tool dia.(mm)														
		16					20					25				
		2N					3N					3N				
		ℓ (mm)	a _p (mm)	a _e (mm)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _e (mm)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _e (mm)	n (min ⁻¹)	V _f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~30	~1	~10	2,590	670	~70	~1.2	~12	2,070	930	~70	~1.2	~15	1,660	750
		70	~0.5	~10	2,390	480	120	~0.6	~12	1,910	690	120	~0.6	~15	1,530	550
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~30	~0.8	~10	2,190	530	~70	~1	~12	1,750	740	~70	~1	~15	1,400	590
		70	~0.4	~10	1,990	360	120	~0.5	~12	1,590	520	120	~0.5	~15	1,270	420
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~30	~0.4	~6	1,790	360	~70	~0.5	~8	1,430	430	~70	~0.5	~10	1,150	350
		70	~0.3	~6	1,590	250	120	~0.4	~8	1,270	300	120	~0.4	~10	1,020	240
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~30	~1	~10	3,580	1,000	~70	~1.2	~12	2,860	1,370	~70	~1.2	~15	2,290	1,100
		70	~0.5	~10	3,180	700	120	~0.6	~12	2,550	990	120	~0.6	~15	2,040	800
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~30	~1	~10	2,790	780	~70	~1.2	~12	2,230	1,070	~70	~1.2	~15	1,780	850
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Austenitic stainless steel (SUS304, 316, 317)17Cr	JC8050 (JC7550)	~30	~1	~6	2,190	610	~70	~1.2	~8	1,750	840	~70	~1.2	~10	1,400	670
		70	~0.5	~6	1,990	440	120	~0.6	~8	1,590	620	120	~0.6	~10	1,270	500
Ferritic & martensitic stainless steel (SUS403, 420J2, 430)13Cr	JC8050 (JC7550)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~30	~0.8	~6	1,190	240	~70	~1	~8	950	290	~70	~1	~10	760	230
		70	~0.4	~6	990	160	120	~0.5	~8	800	190	120	~0.5	~10	640	150
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~30	~0.8	~6	600	110	~70	~1	~8	480	130	~70	~1	~10	380	110
		70	~0.4	~6	500	70	120	~0.5	~8	400	80	120	~0.5	~10	320	80

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Endmill type / Face milling

Material	Grade	Tool dia.(mm)									
		30/32					40				
		4N					5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min ⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min ⁻¹)	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~70	~1.5	~18	1,380	830	~70	~1.6	~24	1,030	820
		120	~0.8	~18	1,270	610	170	~1	~24	950	620
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~70	~1.2	~18	1,170	660	~70	~1.4	~24	950	710
		120	~0.6	~18	1,060	470	170	~0.8	~24	840	500
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~70	~0.6	~12	950	380	~70	~0.8	~16	800	440
		120	~0.4	~12	850	270	170	~0.4	~16	720	320
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~70	~1.5	~18	1,910	1,220	~70	~1.6	~24	1,590	1,430
		120	~0.8	~18	1,700	880	170	~1	~24	1,430	1,070
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~70	~1.5	~18	1,490	950	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~70	~1.5	~12	1,170	750	~70	~1.6	~16	950	860
		120	~0.8	~12	1,060	550	170	~1	~16	880	660
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8050 (JC7550)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,110	1,000
		120	~0.8	~18	1,380	720	170	~1	~24	950	710
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~70	~0.8	~12	640	260	~70	~1.4	~16	560	310
		120	~0.5	~12	530	170	170	~0.8	~16	480	220
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~70	~0.8	~12	320	130	~70	~1.4	~16	240	120
		120	~0.5	~12	270	90	170	~0.8	~16	200	80

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce ap or rpm and keep feed per tooth.
3. ap should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting , apply 50% or less feed (Vf) from standard cutting condition table.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Modular head type / Face milling

Material	Grade	Tool dia.(mm)														
		16/17/18					20/21					25/26/28				
		2N					3N					3N				
		ℓ (mm)	a _p (mm)	a _e (mm)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _e (mm)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _e (mm)	n (min ⁻¹)	V _f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~80	~1	~10	2,590	670	~100	~1.2	~12	2,070	930	~120	~1.2	~15	1,660	750
		120	~0.5	~10	2,390	480	150	~0.6	~12	1,910	690	190	~0.6	~15	1,530	550
		160	~0.2	~10	2,190	310	190	~0.3	~12	1,750	470	235	~0.3	~15	1,400	380
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~80	~0.8	~10	2,190	530	~100	~1	~12	1,750	740	~120	~1	~15	1,400	590
		120	~0.4	~10	1,990	360	150	~0.5	~12	1,590	520	190	~0.5	~15	1,270	420
		160	~0.2	~10	1,790	210	190	~0.3	~12	1,430	340	235	~0.3	~15	1,150	280
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~80	~0.4	~6	1,790	360	~100	~0.5	~8	1,430	430	~120	~0.5	~10	1,150	350
		120	~0.3	~6	1,590	250	150	~0.4	~8	1,270	300	190	~0.4	~10	1,020	240
		160	~0.2	~6	1,390	170	190	~0.2	~8	1,110	200	235	~0.2	~10	890	160
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~80	~1	~10	3,580	1,000	~100	~1.2	~12	2,860	1,370	~120	~1.2	~15	2,290	1,100
		120	~0.5	~10	3,180	700	150	~0.6	~12	2,550	990	190	~0.6	~15	2,040	800
		160	~0.2	~10	2,790	450	190	~0.3	~12	2,230	670	235	~0.3	~15	1,780	530
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~80	~1	~10	2,790	780	~100	~1.2	~12	2,230	1,070	~120	~1.2	~15	1,780	850
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,390	380	190	~0.3	~12	1,910	570	235	~0.3	~15	1,530	460
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~80	~1	~6	2,190	610	~100	~1.2	~8	1,750	840	~120	~1.2	~10	1,400	670
		120	~0.5	~6	1,990	440	150	~0.6	~8	1,590	620	190	~0.6	~10	1,270	500
		160	~0.2	~6	1,790	290	190	~0.3	~8	1,430	430	235	~0.3	~10	1,150	350
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8050 (JC7550)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~80	~0.8	~6	1,190	240	~100	~1	~8	950	290	~120	~1	~10	760	230
		120	~0.4	~6	990	160	150	~0.5	~8	800	190	190	~0.5	~10	640	150
		160	~0.2	~6	800	100	190	~0.3	~8	640	120	235	~0.3	~10	510	90
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~80	~0.8	~6	600	110	~100	~1	~8	480	130	~120	~1	~10	380	110
		120	~0.4	~6	500	70	150	~0.5	~8	400	80	190	~0.5	~10	320	80
		160	~0.2	~6	400	40	190	~0.3	~8	320	50	235	~0.3	~10	250	50

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP **EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-11 Type**

■ Modular head type / Face milling

Material	Grade	Tool dia.(mm)									
		30/32/33/35					40				
		4N					5N				
		f_z (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)	f_z (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050 (JC8118)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,170	470	290	~0.4	~24	1,110	670
Cast steel (GM190, ICD5) below 285HB	JC8050 (JC8118)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,170	470	290	~0.4	~24	1,110	670
Tool & die steel (SKD61, SKD11) below 255HB	JC8050 (JC8118)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,170	470	290	~0.4	~24	1,110	670
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118 (JC8050)	~160	~1.5	~18	1,380	830	~160	~1.6	~24	1,030	820
		240	~0.8	~18	1,270	610	240	~1	~24	950	620
		290	~0.3	~18	1,170	420	290	~0.4	~24	880	440
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118 (JC8050)	~160	~1.2	~18	1,170	660	~160	~1.4	~24	950	710
		240	~0.6	~18	1,060	470	240	~0.8	~24	840	500
		290	~0.3	~18	950	300	290	~0.4	~24	720	320
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~160	~0.6	~12	950	380	~160	~0.8	~16	800	440
		240	~0.4	~12	850	270	240	~0.4	~16	720	320
		290	~0.2	~12	740	180	290	~0.2	~16	640	220
Grey cast iron (FC250) 160-260HB	JC8118 (JC8050)	~160	~1.5	~18	1,910	1,220	~160	~1.6	~24	1,590	1,430
		240	~0.8	~18	1,700	880	240	~1	~24	1,430	1,070
		290	~0.3	~18	1,490	600	290	~0.4	~24	1,270	760
Nodular cast iron (FCD700) 170-300HB	JC8118 (JC8050)	~160	~1.5	~18	1,490	950	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,270	510	290	~0.4	~24	1,110	670
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~160	~1.5	~12	1,170	750	~160	~1.6	~16	950	860
		240	~0.8	~12	1,060	550	240	~1	~16	880	660
		290	~0.3	~12	950	380	290	~0.4	~16	800	480
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8050 (JC7550)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,110	1,000
		240	~0.8	~18	1,380	720	240	~1	~24	950	710
		290	~0.3	~18	1,170	470	290	~0.4	~24	800	480
Titanium alloy (Ti-6Al-4V) 35-43HRC	DS150 (JC7550) (DS118)	~160	~0.8	~12	640	260	~160	~1.4	~16	560	310
		240	~0.5	~12	530	170	240	~0.8	~16	480	220
		290	~0.2	~12	420	100	290	~0.3	~16	400	140
Heat resistant alloy (INCO718) 35-43HRC	DS118 (JC7518) (DS150)	~160	~0.8	~12	320	130	~160	~1.4	~16	240	120
		240	~0.5	~12	270	90	240	~0.8	~16	200	80
		290	~0.2	~12	210	50	290	~0.3	~16	160	50

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting , apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Facemill type / Side milling

Material	Grade	Tool dia.(mm)														
		50					50/52					63				
		4N					5N					5N				
		ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~100	~15	~40	1,270	1,520	~100	~15	~40	1,270	1,910	~100	~15	~45	1,010	1,770
		150	~12	~25	1,150	1,150	150	~12	~25	1,150	1,440	150	~12	~30	910	1,370
		200	~10	~15	1,020	820	200	~10	~15	1,020	1,020	200	~10	~20	810	1,010
Cast steel (GM190, ICD5) below 285HB	JC8050	~100	~15	~40	1,150	1,380	~100	~15	~40	1,150	1,730	~100	~15	~45	910	1,590
		150	~12	~25	1,020	1,020	150	~12	~25	1,020	1,280	150	~12	~30	810	1,220
		200	~10	~15	890	710	200	~10	~15	890	890	200	~10	~20	710	890
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~100	~15	~40	1,270	1,520	~100	~15	~40	1,270	1,910	~100	~15	~45	1,010	1,770
		150	~12	~25	1,150	1,150	150	~12	~25	1,150	1,440	150	~12	~30	910	1,370
		200	~10	~15	1,020	820	200	~10	~15	1,020	1,020	200	~10	~20	810	1,010
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~100	~15	~40	950	1,140	~100	~15	~40	950	1,430	~100	~15	~45	760	1,330
		150	~12	~25	860	860	150	~12	~25	860	1,080	150	~12	~30	680	1,020
		200	~10	~15	760	610	200	~10	~15	760	760	200	~10	~20	610	760
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~100	~15	~30	760	760	~100	~15	~30	760	950	~100	~15	~30	610	760
		150	~12	~20	670	540	150	~12	~20	670	670	150	~12	~25	530	530
		200	~10	~12	570	340	200	~10	~12	570	430	200	~10	~15	450	340
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~100	~15	~18	640	510	~100	~15	~18	640	640	~100	~15	~25	510	510
		150	~12	~12	570	340	150	~12	~12	570	430	150	~12	~15	450	340
		200	~10	~5	510	200	200	~10	~5	510	260	200	~10	~8	400	200
Grey cast iron (FC250) 160-260HB	JC8118	~100	~15	~40	1,590	1,910	~100	~15	~40	1,590	2,390	~100	~15	~45	1,260	2,210
		150	~12	~25	1,460	1,460	150	~12	~25	1,460	1,830	150	~12	~30	1,160	1,740
		200	~10	~15	1,340	1,070	200	~10	~15	1,340	1,340	200	~10	~20	1,060	1,330
Nodular cast iron (FCD700) 170-300HB	JC8118	~100	~15	~40	950	950	~100	~15	~40	950	1,190	~100	~15	~45	760	1,140
		150	~12	~25	830	660	150	~12	~25	830	830	150	~12	~30	660	830
		200	~10	~15	700	420	200	~10	~15	700	530	200	~10	~20	560	560
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~100	~15	~40	760	610	~100	~15	~40	760	760	~100	~15	~45	610	610
		150	~12	~25	700	420	150	~12	~25	700	530	150	~12	~30	560	420
		200	~10	~15	640	260	200	~10	~15	640	320	200	~10	~20	510	260
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~100	~15	~40	1,150	1,150	~100	~15	~40	1,150	1,440	~100	~15	~45	910	1,370
		150	~12	~25	1,020	820	150	~12	~25	1,020	1,020	150	~12	~30	810	1,010
		200	~10	~15	890	530	200	~10	~15	890	670	200	~10	~20	710	710

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP
EXSAP/MSX Type
Recommended cutting conditions
EXSAP-17 Type
Facemill type / Side milling

Material	Grade	Tool dia.(mm)														
		80					100					125				
		7N					7N					8N				
		ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)	ℓ (mm)	a _p (mm)	a _p ×a _e (mm ²)	n (min ⁻¹)	V _f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~100	~15	~45	800	1,960	~100	~15	~45	640	1,570	~100	~15	~45	510	1,430
		150	~12	~30	720	1,510	150	~12	~30	570	1,200	150	~12	~30	460	1,100
		200	~10	~20	640	1,120	200	~10	~20	510	890	200	~10	~20	410	820
Cast steel (GM190, ICD5) below 285HB	JC8050	~100	~15	~45	720	1,760	~100	~15	~45	570	1,400	~100	~15	~45	460	1,290
		150	~12	~30	640	1,340	150	~12	~30	510	1,070	150	~12	~30	410	980
		200	~10	~20	560	980	200	~10	~20	450	790	200	~10	~20	360	720
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~100	~15	~45	800	1,960	~100	~15	~45	640	1,570	~100	~15	~45	510	1,430
		150	~12	~30	720	1,510	150	~12	~30	570	1,200	150	~12	~30	460	1,100
		200	~10	~20	640	1,120	200	~10	~20	510	890	200	~10	~20	410	820
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~100	~15	~45	600	1,470	~100	~15	~45	480	1,180	~100	~15	~45	380	1,060
		150	~12	~30	540	1,130	150	~12	~30	430	900	150	~12	~30	340	820
		200	~10	~20	480	840	200	~10	~20	380	670	200	~10	~20	310	620
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~100	~15	~30	480	840	~100	~15	~30	380	670	~100	~15	~30	310	620
		150	~12	~25	420	590	150	~12	~25	330	460	150	~12	~25	270	430
		200	~10	~15	360	380	200	~10	~15	290	300	200	~10	~15	230	280
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~100	~15	~25	400	560	~100	~15	~25	320	450	~100	~15	~25	250	400
		150	~12	~15	360	380	150	~12	~15	290	300	150	~12	~15	230	280
		200	~10	~8	320	220	200	~10	~8	250	180	200	~10	~8	200	160
Grey cast iron (FC250) 160-260HB	JC8118	~100	~15	~45	990	2,430	~100	~15	~45	800	1,960	~100	~15	~45	640	1,790
		150	~12	~30	920	1,930	150	~12	~30	730	1,530	150	~12	~30	590	1,420
		200	~10	~20	840	1,470	200	~10	~20	670	1,170	200	~10	~20	530	1,060
Nodular cast iron (FCD700) 170-300HB	JC8118	~100	~15	~45	600	1,260	~100	~15	~45	480	1,010	~100	~15	~45	380	910
		150	~12	~30	520	910	150	~12	~30	410	720	150	~12	~30	330	660
		200	~10	~20	440	620	200	~10	~20	350	490	200	~10	~20	280	450
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~100	~15	~45	480	670	~100	~15	~45	380	530	~100	~15	~45	310	500
		150	~12	~30	440	460	150	~12	~30	350	370	150	~12	~30	280	340
		200	~10	~20	400	280	200	~10	~20	320	220	200	~10	~20	250	200
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~100	~15	~45	720	1,510	~100	~15	~45	570	1,200	~100	~15	~45	460	1,100
		150	~12	~30	640	1,120	150	~12	~30	510	890	150	~12	~30	410	820
		200	~10	~20	560	780	200	~10	~20	450	630	200	~10	~20	360	580

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Endmill type / Side milling

Material	Grade	Tool dia.(mm)									
		25					32				
		2N					2N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~60	~10	~15	2,550	1,530	~70	~12	~24	1,990	1,190
		90	~7	~10	2,290	1,150	100	~9	~18	1,790	900
Cast steel (GM190, ICD5) below 285HB	JC8050	~60	~10	~15	2,290	1,370	~70	~12	~24	1,790	1,070
		90	~7	~10	2,040	1,020	100	~9	~18	1,590	800
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~60	~10	~15	2,550	1,530	~70	~12	~24	1,990	1,190
		90	~7	~10	2,290	1,150	100	~9	~18	1,790	900
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~60	~10	~15	1,910	1,150	~70	~12	~24	1,490	890
		90	~7	~10	1,720	860	100	~9	~18	1,340	670
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~60	~10	~12	1,530	770	~70	~12	~18	1,190	600
		90	~7	~6	1,340	540	100	~9	~13	1,040	420
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~60	~10	~8	1,270	510	~70	~12	~12	990	400
		90	~7	~4	1,150	350	100	~9	~8	900	270
Grey cast iron (FC250) 160-260HB	JC8118	~60	~10	~15	3,180	1,910	~70	~12	~24	2,490	1,490
		90	~7	~10	2,930	1,470	100	~9	~18	2,290	1,150
Nodular cast iron (FCD700) 170-300HB	JC8118	~60	~10	~15	1,910	960	~70	~12	~24	1,490	750
		90	~7	~10	1,660	660	100	~9	~18	1,290	520
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~60	~10	~15	1,530	610	~70	~12	~24	1,190	480
		90	~7	~10	1,400	420	100	~9	~18	1,090	330
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~60	~10.0	~15	2,290	1,150	~70	~12	~24	1,790	900
		90	~7.0	~10	2,040	820	100	~9	~18	1,590	640

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Endmill type / Side milling

Material	Grade	Tool dia.(mm)				
		32				
		3N				
		ϕ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~70	~12	~24	1,990	1,790
		100	~9	~18	1,790	1,340
Cast steel (GM190, ICD5) below 285HB	JC8050	~70	~12	~24	1,790	1,610
		100	~9	~18	1,590	1,190
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~70	~12	~24	1,990	1,790
		100	~9	~18	1,790	1,340
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~70	~12	~24	1,490	1,340
		100	~9	~18	1,340	1,010
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~70	~12	~18	1,190	890
		100	~9	~13	1,040	620
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~70	~12	~12	990	590
		100	~9	~8	900	410
Grey cast iron (FC250) 160-260HB	JC8118	~70	~12	~24	2,490	2,240
		100	~9	~18	2,290	1,720
Nodular cast iron (FCD700) 170-300HB	JC8118	~70	~12	~24	1,490	1,120
		100	~9	~18	1,290	770
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~70	~12	~24	1,190	710
		100	~9	~18	1,090	490
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~70	~12	~24	1,790	1,340
		100	~9	~18	1,590	950

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Modular head type / Side milling

Material	Grade	Tool dia.(mm)									
		25/26/28					30/32				
		2N					2N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~90	~10	~15	2,450	1,470	~100	~12	~24	2,050	1,230
		140	~7	~10	2,200	1,100	150	~9	~18	1,850	930
		210	~4	~5	1,960	780	210	~6	~9	1,640	660
Cast steel (GM190, ICD5) below 285HB	JC8050	~90	~10	~15	2,200	1,320	~100	~12	~24	1,850	1,110
		140	~7	~10	1,960	980	150	~9	~18	1,640	820
		210	~4	~5	1,710	680	210	~6	~9	1,440	580
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~90	~10	~15	2,450	1,470	~100	~12	~24	2,050	1,230
		140	~7	~10	2,200	1,100	150	~9	~18	1,850	930
		210	~4	~5	1,960	780	210	~6	~9	1,640	660
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~90	~10	~15	1,840	1,100	~100	~12	~24	1,540	920
		140	~7	~10	1,650	830	150	~9	~18	1,390	700
		210	~4	~5	1,470	590	210	~6	~9	1,230	490
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~90	~10	~12	1,470	740	~100	~12	~18	1,230	620
		140	~7	~6	1,290	520	150	~9	~13	1,080	430
		210	~4	~2	1,100	330	210	~6	~7	920	280
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~90	~10	~8	1,220	490	~100	~12	~12	1,030	410
		140	~7	~4	1,100	330	150	~9	~8	920	280
		210	~4	~2	980	200	210	~6	~3	820	160
Grey cast iron (FC250) 160-260HB	JC8118	~90	~10	~15	3,060	1,840	~100	~12	~24	2,570	1,540
		140	~7	~10	2,820	1,410	150	~9	~18	2,360	1,180
		210	~4	~5	2,570	1,030	210	~6	~12	2,160	860
Nodular cast iron (FCD700) 170-300HB	JC8118	~90	~10	~15	1,840	920	~100	~12	~24	1,540	770
		140	~7	~10	1,590	640	150	~9	~18	1,330	530
		210	~4	~5	1,350	410	210	~6	~9	1,130	340
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~90	~10	~15	1,470	590	~100	~12	~24	1,230	490
		140	~7	~10	1,350	410	150	~9	~18	1,130	340
		210	~4	~5	1,220	240	210	~6	~9	1,030	210
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~90	~10	~15	2,200	1,100	~100	~12	~24	1,850	930
		140	~7	~10	1,960	780	150	~9	~18	1,640	660
		210	~4	~5	1,710	510	210	~6	~9	1,440	430

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Modular head type / Side milling

Material	Grade	Tool dia.(mm)									
		32/33/35					40				
		3N					4N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm ²)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~100	~12	~24	1,930	1,740	~100	~15	~30	1,590	1,910
		150	~9	~18	1,740	1,310	150	~10	~20	1,430	1,430
		210	~6	~9	1,540	920	210	~8	~12	1,270	1,020
Cast steel (GM190, ICD5) below 285HB	JC8050	~100	~12	~24	1,740	1,570	~100	~15	~30	1,430	1,720
		150	~9	~18	1,540	1,160	150	~10	~20	1,270	1,270
		210	~6	~9	1,350	810	210	~8	~12	1,110	890
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~100	~12	~24	1,930	1,740	~100	~15	~30	1,590	1,910
		150	~9	~18	1,740	1,310	150	~10	~20	1,430	1,430
		210	~6	~9	1,540	920	210	~8	~12	1,270	1,020
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~100	~12	~24	1,450	1,310	~100	~15	~30	1,190	1,430
		150	~9	~18	1,300	980	150	~10	~20	1,070	1,070
		210	~6	~9	1,160	700	210	~8	~12	950	760
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~100	~12	~18	1,160	870	~100	~15	~20	950	950
		150	~9	~13	1,010	610	150	~10	~15	840	670
		210	~6	~7	870	390	210	~8	~8	720	430
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~100	~12	~12	960	580	~100	~12	~12	800	640
		150	~9	~8	870	390	150	~10	~8	720	430
		210	~6	~3	770	230	210	~8	~3	640	260
Grey cast iron (FC250) 160-260HB	JC8118	~100	~12	~24	2,410	2,170	~100	~15	~30	1,990	2,390
		150	~9	~18	2,220	1,670	150	~10	~20	1,830	1,830
		210	~6	~12	2,030	1,220	210	~8	~16	1,670	1,340
Nodular cast iron (FCD700) 170-300HB	JC8118	~100	~12	~24	1,450	1,090	~100	~15	~30	1,190	1,190
		150	~9	~18	1,250	750	150	~10	~20	1,030	820
		210	~6	~9	1,060	480	210	~8	~12	880	530
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~100	~12	~24	1,160	700	~100	~15	~30	950	760
		150	~9	~18	1,060	480	150	~10	~20	880	530
		210	~6	~9	960	290	210	~8	~12	800	320
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~100	~12	~24	1,740	1,310	~100	~15	~30	1,430	1,430
		150	~9	~18	1,540	920	150	~10	~20	1,270	1,020
		210	~6	~9	1,350	610	210	~8	~12	1,110	670

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Facemill type / Face milling

Material	Grade	Tool dia.(mm)														
		50					50/52					63				
		4N					5N					5N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~150	~4	~50	950	1,140	~150	~4	~1Dc	950	1,430	~150	~4	~63	760	1,330
		200	~3	~40	830	830	200	~3	~40	830	1,040	200	~3	~55	660	990
		300	~2	~30	700	560	300	~2	~30	700	700	300	~2	~40	560	700
Cast steel (GM190, ICD5) below 285HB	JC8050	~150	~4	~50	950	1,140	~150	~4	~1Dc	950	1,430	~150	~4	~63	760	1,330
		200	~3	~40	830	830	200	~3	~40	830	1,040	200	~3	~55	660	990
		300	~2	~30	700	560	300	~2	~30	700	700	300	~2	~40	560	700
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~150	~4	~50	950	950	~150	~4	~1Dc	950	1,190	~150	~4	~63	760	1,140
		200	~3	~40	830	660	200	~3	~40	830	830	200	~3	~55	660	830
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~150	~4	~50	830	830	~150	~4	~1Dc	830	1,040	~150	~4	~63	660	990
		200	~3	~40	760	610	200	~3	~40	760	760	200	~3	~55	610	760
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~150	~3	~50	700	700	~150	~3	~1Dc	700	880	~150	~3	~63	560	700
		200	~2.5	~40	640	510	200	~2.5	~40	640	640	200	~2.5	~55	510	510
		300	~1.5	~30	570	340	300	~1.5	~30	570	430	300	~1.5	~40	450	340
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~150	~2.5	~40	570	460	~150	~2.5	~40	570	570	~150	~2.5	~55	450	450
		200	~2	~30	510	310	200	~2	~30	510	380	200	~2	~40	400	300
		300	~1.5	~20	450	180	300	~1.5	~20	450	230	300	~1.5	~32	350	180
Grey cast iron (FC250) 160-260HB	JC8118	~150	~6	~50	1,150	1,380	~150	~6	~1Dc	1,150	1,730	~150	~6	~63	910	1,590
		200	~4	~40	950	950	200	~4	~40	950	1,190	200	~4	~55	760	1,140
		300	~2	~30	830	660	300	~2	~30	830	830	300	~2	~40	660	830
Nodular cast iron (FCD700) 170-300HB	JC8118	~150	~4	~50	830	830	~150	~4	~1Dc	830	1,040	~150	~4	~63	660	990
		200	~3	~40	760	610	200	~3	~40	760	760	200	~3	~55	610	760
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~150	~4	~40	700	560	~150	~4	~40	700	700	~150	~4	~55	560	560
		200	~3	~30	640	380	200	~3	~30	640	480	200	~3	~40	510	380
		300	~2	~20	570	230	300	~2	~20	570	290	300	~2	~32	450	230
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~150	~4	~50	950	950	~150	~4	~1Dc	950	1,190	~150	~4	~63	760	1,140
		200	~3	~40	830	660	200	~3	~40	830	830	200	~3	~55	660	830
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP

EXSAP/MSX Type

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Facemill type / Face milling

Material	Grade	Tool dia.(mm)														
		80					100					125				
		7N					7N					8N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min ⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min ⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min ⁻¹)	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~150	~4	~80	600	1,470	~150	~4	~100	480	1,010	~150	~4	~125	380	910
		200	~3	~65	520	1,090	200	~3	~80	410	720	200	~3	~100	330	660
		300	~2	~50	440	770	300	~2	~60	350	490	300	~2	~75	280	450
Cast steel (GM190, ICD5) below 285HB	JC8050	~150	~4	~80	600	1,470	~150	~4	~100	480	1,010	~150	~4	~125	380	910
		200	~3	~65	520	1,090	200	~3	~80	410	720	200	~3	~100	330	660
		300	~2	~50	440	770	300	~2	~60	350	490	300	~2	~75	280	450
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~150	~4	~80	600	1,260	~150	~4	~100	480	840	~150	~4	~125	380	760
		200	~3	~65	520	910	200	~3	~80	410	570	200	~3	~100	330	530
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~150	~4	~80	520	1,090	~150	~4	~100	410	720	~150	~4	~125	330	660
		200	~3	~65	480	840	200	~3	~80	380	530	200	~3	~100	310	500
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~150	~3	~80	440	770	~150	~4	~100	350	490	~150	~4	~125	280	450
		200	~2.5	~65	400	560	200	~3	~80	320	340	200	~3	~100	250	300
		300	~1.5	~50	360	380	300	~2	~60	290	200	300	~2	~75	230	180
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~150	~2.5	~65	360	500	~150	~4	~80	290	300	~150	~4	~100	230	280
		200	~2.0	~50	320	340	200	~3	~60	250	180	200	~3	~75	200	160
		300	~1.5	~35	280	200	300	~2	~40	220	150	300	~2	~50	180	140
Grey cast iron (FC250) 160-260HB	JC8118	~150	~6	~80	720	1,760	~150	~4	~100	570	1,200	~150	~4	~125	460	1,100
		200	~4	~65	600	1,260	200	~3	~80	480	840	200	~3	~100	380	760
		300	~2	~50	520	910	300	~2	~60	410	570	300	~2	~75	330	530
Nodular cast iron (FCD700) 170-300HB	JC8118	~150	~4	~80	520	1,090	~150	~4	~100	410	720	~150	~4	~125	330	660
		200	~3	~65	480	840	200	~3	~80	380	530	200	~3	~100	310	500
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~150	~4	~65	440	620	~150	~4	~80	350	370	~150	~4	~100	280	340
		200	~3	~50	400	420	200	~3	~60	320	220	200	~3	~75	250	200
		300	~2	~35	360	250	300	~2	~40	290	200	300	~2	~50	230	180
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~150	~4	~80	600	1,260	~150	~4	~100	480	840	~150	~4	~125	380	760
		200	~3	~65	520	910	200	~3	~80	410	570	200	~3	~100	330	530
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce ap or rpm and keep feed per tooth.
3. ap should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting , apply 50% or less feed (Vf) from standard cutting condition table.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Endmill type / Face milling

Material	Grade	Tool dia.(mm)									
		25					32				
		2N					2N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~60	~3	~1Dc	1,910	1,150	~70	~3.5	~1Dc	1,490	890
		90	~2	~20	1,660	830	100	~2.5	~25	1,290	650
Cast steel (GM190, ICD5) below 285HB	JC8050	~60	~3	~1Dc	1,910	1,150	~70	~3.5	~1Dc	1,490	890
		90	~2	~20	1,660	830	100	~2.5	~25	1,290	650
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~60	~3	~1Dc	1,910	960	~70	~3.5	~1Dc	1,490	750
		90	~2	~20	1,660	660	100	~2.5	~25	1,290	520
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~60	~3	~1Dc	1,660	830	~70	~3.5	~1Dc	1,290	650
		90	~2	~20	1,530	610	100	~2.5	~25	1,190	480
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~60	~2	~1Dc	1,400	700	~70	~2.5	~1Dc	1,090	550
		90	~1	~20	1,270	510	100	~2	~25	990	400
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~60	~1	~20	1,150	460	~70	~2	~25	900	360
		90	~1	~15	1,020	310	100	~1.5	~20	800	240
Grey cast iron (FC250) 160-260HB	JC8118	~60	~5	~1Dc	2,550	1,530	~70	~5.5	~1Dc	1,990	1,190
		90	~3	~20	2,290	1,150	100	~3.5	~25	1,790	900
Nodular cast iron (FCD700) 170-300HB	JC8118	~60	~3	~1Dc	1,660	830	~70	~3.5	~1Dc	1,290	650
		90	~2	~20	1,530	610	100	~2.5	~25	1,190	480
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~60	~3	~20	1,400	560	~70	~3.5	~25	1,090	440
		90	~2	~15	1,270	380	100	~2.5	~20	990	300
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~60	~3	~1Dc	1,910	960	~70	~3.5	~1Dc	1,490	750
		90	~2	~20	1,660	660	100	~2.5	~25	1,290	520

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Endmill type / Face milling

Material	Grade	Tool dia.(mm)				
		32				
		3N				
		ϕ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~70	~3.5	~1Dc	1,490	1,340
		100	~2.5	~25	1,290	970
Cast steel (GM190, ICD5) below 285HB	JC8050	~70	~3.5	~1Dc	1,490	1,340
		100	~2.5	~25	1,290	970
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~70	~3.5	~1Dc	1,490	1,120
		100	~2.5	~25	1,290	770
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~70	~3.5	~1Dc	1,290	970
		100	~2.5	~25	1,190	710
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~70	~2.5	~1Dc	1,090	820
		100	~2	~25	990	590
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~70	~2	~25	900	540
		100	~1.5	~20	800	360
Grey cast iron (FC250) 160-260HB	JC8118	~70	~5.5	~1Dc	1,990	1,790
		100	~3.5	~25	1,790	1,340
Nodular cast iron (FCD700) 170-300HB	JC8118	~70	~3.5	~1Dc	1,290	970
		100	~2.5	~25	1,190	710
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~70	~3.5	~25	1,090	650
		100	~2.5	~20	990	450
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~70	~3.5	~1Dc	1,490	1,120
		100	~2.5	~25	1,290	770

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP**EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Modular head type / Face milling

Material	Grade	Tool dia.(mm)									
		25/26/28					30/32				
		2N					2N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min ⁻¹)	V_f (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~90	~3	~1Dc	1,840	1,100	~100	~3.5	~1Dc	1,540	920
		140	~2	~20	1,590	800	150	~2.5	~25	1,330	670
		210	~1	~15	1,350	540	210	~1.5	~20	1,130	450
Cast steel (GM190, ICD5) below 285HB	JC8050	~90	~3	~1Dc	1,840	1,100	~100	~3.5	~1Dc	1,540	920
		140	~2	~20	1,590	800	150	~2.5	~25	1,330	670
		210	~1	~15	1,350	540	210	~1.5	~20	1,130	450
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~90	~3	~1Dc	1,840	920	~100	~3.5	~1Dc	1,540	770
		140	~2	~20	1,590	640	150	~2.5	~25	1,330	530
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~90	~3	~1Dc	1,590	800	~100	~3.5	~1Dc	1,330	670
		140	~2	~20	1,470	590	150	~2.5	~25	1,230	490
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~90	~2	~1Dc	1,350	680	~100	~2.5	~1Dc	1,130	570
		140	~1.5	~20	1,220	490	150	~2	~25	1,030	410
		210	~1	~15	1,100	330	210	~1.5	~20	920	280
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~90	~1.5	~20	1,100	440	~100	~2	~25	920	370
		140	~1	~15	980	290	150	~1.5	~20	820	250
		210	~0.5	~10	860	170	210	~1	~15	720	140
Grey cast iron (FC250) 160-260HB	JC8118	~90	~5	~1Dc	2,450	1,470	~100	~5.5	~1Dc	2,050	1,230
		140	~3	~20	2,200	1,100	150	~3.5	~25	1,850	930
		210	~1	~15	1,960	780	210	~1.5	~20	1,640	660
Nodular cast iron (FCD700) 170-300HB	JC8118	~90	~3	~1Dc	1,590	800	~100	~3.5	~1Dc	1,330	670
		140	~2	~20	1,470	590	150	~2.5	~25	1,230	490
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~90	~3	~20	1,350	540	~100	~3.5	~25	1,130	450
		140	~2	~15	1,220	370	150	~2.5	~20	1,030	310
		210	~1	~10	1,100	220	210	~1.5	~15	920	180
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~90	~3	~1Dc	1,840	920	~100	~3.5	~1Dc	1,540	770
		140	~2	~20	1,590	640	150	~2.5	~25	1,330	530
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a_p or rpm and keep feed per tooth.
3. a_p should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting, apply 50% or less feed (V_f) from standard cutting condition table.

EXTREME SAP **EXSAP/MSX Type**

■ Recommended cutting conditions

■ **EXSAP-17 Type**

■ Modular head type / Face milling

Material	Grade	Tool dia.(mm)									
		32/33/35					40				
		3N					4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min ⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min ⁻¹)	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8050	~100	~3.5	~1Dc	1,450	1,310	~100	~3.5	~40	1,190	1,430
		150	~2.5	~25	1,250	940	150	~2.5	~32	1,030	1,030
		210	~1.5	~20	1,060	640	210	~1.5	~24	880	700
Cast steel (GM190, ICD5) below 285HB	JC8050	~100	~3.5	~1Dc	1,450	1,310	~100	~3.5	~40	1,190	1,430
		150	~2.5	~25	1,250	940	150	~2.5	~32	1,030	1,030
		210	~1.5	~20	1,060	640	210	~1.5	~24	880	700
Tool & die steel (SKD61, SKD11) below 255HB	JC8050	~100	~3.5	~1Dc	1,450	1,090	~100	~3.5	~40	1,190	1,190
		150	~2.5	~25	1,250	750	150	~2.5	~32	1,030	820
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530
Mold steel (HPM7, PX5, P20) 30-36 HRC	JC8118	~100	~3.5	~1Dc	1,250	940	~100	~3.5	~40	1,030	1,030
		150	~2.5	~25	1,160	700	150	~2.5	~32	950	760
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530
Mold steel (NAK80, HPM1, P21) 38-43HRC	JC8118	~100	~2.5	~1Dc	1,060	800	~100	~2.5	~40	880	880
		150	~2	~25	960	580	150	~2	~32	800	640
		210	~1.5	~20	870	390	210	~1.5	~24	720	430
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	JC8118	~100	~2	~25	870	520	~100	~2	~32	720	580
		150	~1.5	~20	770	350	150	~1.5	~24	640	380
		210	~1	~15	680	200	210	~1	~18	560	220
Grey cast iron (FC250) 160-260HB	JC8118	~100	~5.5	~1Dc	1,930	1,740	~100	~5.5	~40	1,590	1,910
		150	~3.5	~25	1,740	1,310	150	~3.5	~32	1,430	1,430
		210	~1.5	~20	1,540	920	210	~1.5	~24	1,270	1,020
Nodular cast iron (FCD700) 170-300HB	JC8118	~100	~3.5	~1Dc	1,250	940	~100	~3.5	~40	1,030	1,030
		150	~2.5	~25	1,160	700	150	~2.5	~32	950	760
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530
Austenitic stainless steel (SUS304, 316, 317) 17Cr	JC8050	~100	~3.5	~25	1,060	640	~100	~3.5	~32	880	700
		150	~2.5	~20	960	430	150	~2.5	~24	800	480
		210	~1.5	~15	870	260	210	~1.5	~18	720	290
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	JC8118	~100	~3.5	~1Dc	1,450	1,090	~100	~3.5	~40	1,190	1,190
		150	~2.5	~25	1,250	750	150	~2.5	~32	1,030	820
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce ap or rpm and keep feed per tooth.
3. ap should be reduced when using on low rigidity machine.
4. Use air blow.
5. In case of slotting , apply 50% or less feed (Vf) from standard cutting condition table.