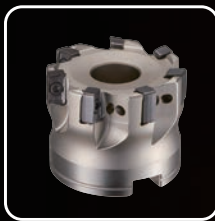


**EXTREME SAP**

**EXSAP/MSX Type**

# EXTREME SAP

## EXSAP/MSX TYPE



Facemill type



Modular head type



Endmill type

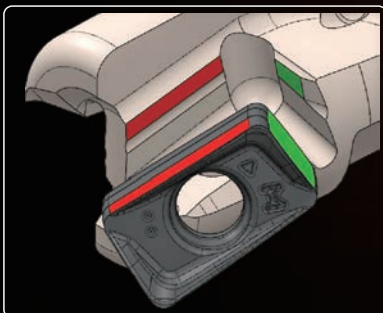
Various line up

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

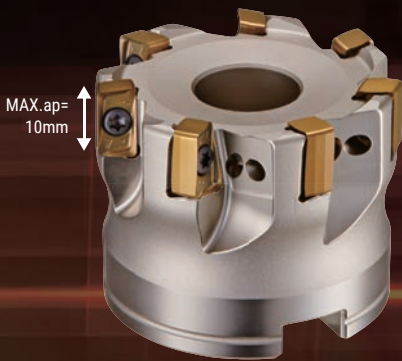
capable of semi-finishing



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**

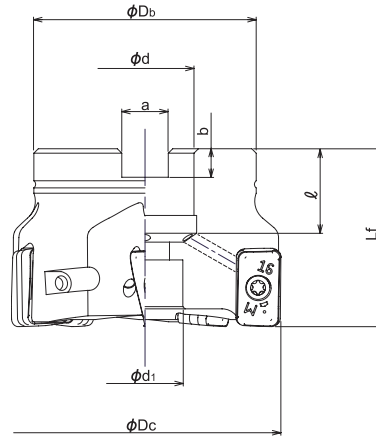
PM breaker for general steel (up to 50HRC)

■ **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																				
				JC8118														DS118		
					JC8050														DS150	
				JC7518																JC7518
					JC7550															JC7550

**EXTREME SAP** **EXSAP/MSX Type**

- EXSAP-17 Type
- Facemill Type



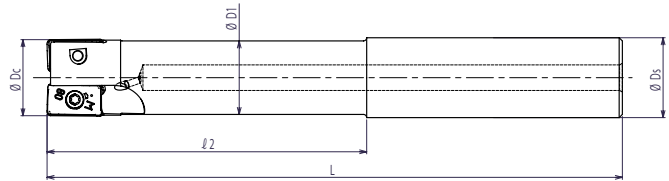
Cat.No.	Stock	No. of inserts	Dimensions (mm)								Arbor set bolt	Weight (kg)	Inserts
			$\phi D_c$	$L_f$	$\phi D_b$	$\phi d$	$\phi d_1$	a	b	$\ell$			
EXSAP-4050R-22	●	4	50	40	47	22	17	10.4	6.3	20	M10	0.38	ZNGU1709**ZER-PM
EXSAP-5050R-22	●	5	52									0.38	
EXSAP-5052R-22	●		63	0.41									
EXSAP-5063R-22	●		50	0.58									
EXSAP-7080R-27	●	7	80	50	56	27	20	12.4	7	22	M12X1.75X30*	1.09	
EXSAP-7100R-32	●	100	85	32	26	14.4	8	25	M16X2X25*	1.93			
EXSAP-8125R-40	●	8	125	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				

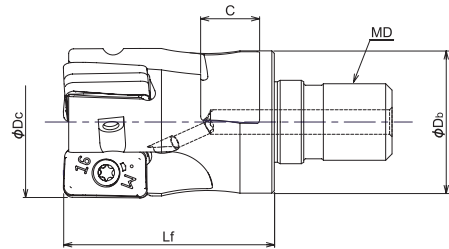
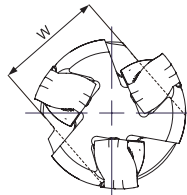
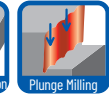
Screw	Torque(N.m)	Wrench
TSW-410H	3.5	A-15

**EXTREME SAP** **EXSAP/MSX Type**

- EXSAP-17 Type
- Modular Head Type



Through coolant hole

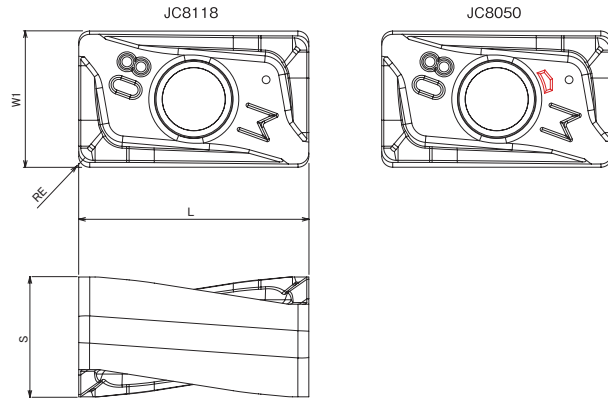


Cat.No.	Stock	No. of inserts	Dimensions (mm)						Inserts
			φDc	Lf	φDb	MD	C	W	
MSX-2025-M12	●	2	25	35	22	M12	11	19	ZNGU1709**ZER-PM
MSX-2026-M12	○		26						
MSX-2028-M12	○		28						
MSX-2030-M16	○		30						
MSX-2032-M16	●	3	32	43	29	M16	12	22	
MSX-3032-M16	●		33						
MSX-3033-M16	○		35						
MSX-3035-M16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

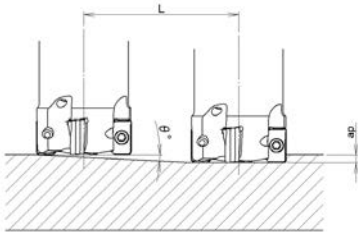
# EXTREME SAP

# EXSAP/MSX Type

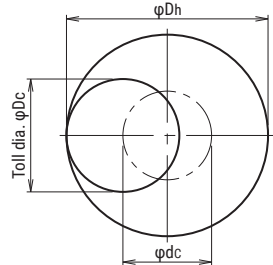
## Recommended Data for Profile Milling

### EXSAP-11 Type

#### Ramping

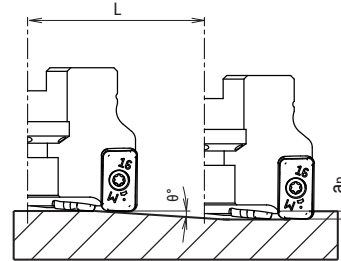


#### Helical interpolation

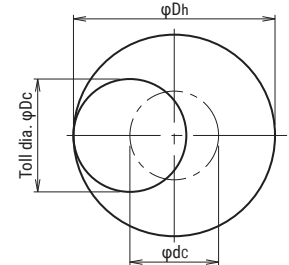


### EXSAP-17 Type

#### Ramping



#### Helical interpolation



Cat. No.	Tool dia.	Effective Cutting dia.	Max. depth of cut : ap	Ramping		Helical interpolation	
				Max. ramping angle $\theta$	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 $\theta$	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.

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

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-17 Type**

## ■ Facemill type / Side milling

Material	Grade	Tool dia.(mm)														
		50					50/52					63				
		4N					5N					5N				
		ℓ (mm)	a <sub>p</sub> (mm)	a <sub>p</sub> ×a <sub>e</sub> (mm <sup>2</sup> )	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	ℓ (mm)	a <sub>p</sub> (mm)	a <sub>p</sub> ×a <sub>e</sub> (mm <sup>2</sup> )	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	ℓ (mm)	a <sub>p</sub> (mm)	a <sub>p</sub> ×a <sub>e</sub> (mm <sup>2</sup> )	n (min <sup>-1</sup> )	V <sub>f</sub> (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<sub>p</sub> or rpm and keep feed per tooth.
3. a<sub>p</sub> 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 <sub>p</sub> (mm)	a <sub>p</sub> ×a <sub>e</sub> (mm <sup>2</sup> )	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	ℓ (mm)	a <sub>p</sub> (mm)	a <sub>p</sub> ×a <sub>e</sub> (mm <sup>2</sup> )	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	ℓ (mm)	a <sub>p</sub> (mm)	a <sub>p</sub> ×a <sub>e</sub> (mm <sup>2</sup> )	n (min <sup>-1</sup> )	V <sub>f</sub> (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<sub>p</sub> or rpm and keep feed per tooth.
3. a<sub>p</sub> 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				
		$\ell$ (mm)	$a_p$ (mm)	$a_p \times a_e$ (mm <sup>2</sup> )	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$\ell$ (mm)	$a_p$ (mm)	$a_p \times a_e$ (mm <sup>2</sup> )	$n$ (min <sup>-1</sup> )	$V_f$ (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				
		$\phi$ (mm)	$a_p$ (mm)	$a_p \times a_e$ (mm <sup>2</sup> )	$n$ (min <sup>-1</sup> )	$V_f$ (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				
		$\ell$ (mm)	$a_p$ (mm)	$a_p \times a_e$ (mm <sup>2</sup> )	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$\ell$ (mm)	$a_p$ (mm)	$a_p \times a_e$ (mm <sup>2</sup> )	$n$ (min <sup>-1</sup> )	$V_f$ (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 <sup>2</sup> )	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$l$ (mm)	$a_p$ (mm)	$a_p \times a_e$ (mm <sup>2</sup> )	$n$ (min <sup>-1</sup> )	$V_f$ (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				
		$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (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 <sup>-1</sup> )	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	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				
		$\phi$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$\phi$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (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				
		$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (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				
		$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (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				
		$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (mm/min)	$\ell$ (mm)	$a_p$ (mm)	$a_e$ (mm)	$n$ (min <sup>-1</sup> )	$V_f$ (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  $a_p$  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.