

SKS Extreme

EXSKSTYPE

SKS EXTREME

Next generation high feed cutter



G-Body

*Possible to high feed machining $fz=2\text{mm/t}$
at max. depth of cut $ap=3\text{mm}$*

■ FEATURES

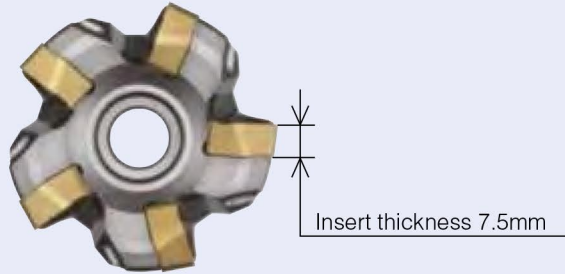
- Achieve high metal removal rate by double side 6 cutting edges insert



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EXSKS_{TYPE}

- Insert thickness 7.5mm gives 1.5 times stronger than conventional tools.



- Inclined dovetail seat prevents movement of insert.

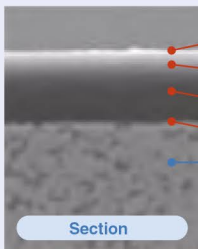


Inclined dovetail seat

- Stable high feed machining is possible even in case of $L/D_c > 6$.

- High efficient pocket milling by excellent ramping and helical interpolation.

- PVD coated grade <JC7560> against thermal shock



- | |
|---|
| Ti based nitride layer with excellent welding resistance and low friction |
| Al-Cr based nitride layer with oxidation and thermal resistance |
| Ti-Al based nitride layer with wear and thermal resistance |
| Adhesion layer |
| Substrate with thermal crack resistance and thermal shock resistance |

In case of rough milling, JC7560 improve heat fracture resistance and impact strength.

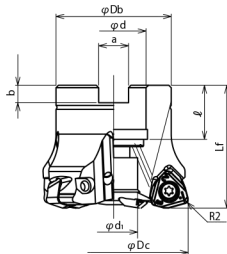
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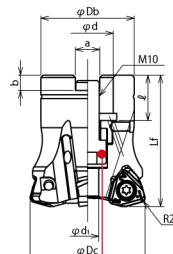
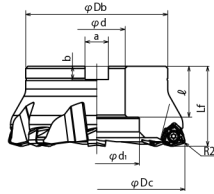


● Fig.1: Through coolant hole

● Fig. 3: Through coolant hole



● Fig. 2: Without coolant hole



Set bolt built into the cutter body

■ BODY

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Set Bolt	Weight (kg)	Fig.	
				φDc	Lf	φDb	φd	φd1	a	b	ℓ				
Metric Bore	EXSKS-4050R-22	●	4	50	55	40	22	9.6	10.4	6.3	19	M10x1.5x25*	Head cap screw (JIS Standard)	0.3	3
	EXSKS-4052R-22	●	4	52	50	40	22	17	10.4	6.3	20	M10		0.4	1
	EXSKS-5063R-22	●	5	63	50	48	22	17	10.4	6.3	20	M10		0.5	1
	EXSKS-5063R-27	●	5	63	50	48	27	20	12.4	7	22	M12x1.75x30*	Head cap screw (JIS Standard)	0.5	1
	EXSKS-5066R-27	●	5	66	50	48	27	20	12.4	7	22	M12x1.75x30*		0.5	1
	EXSKS-6080R-27	●	6	80	55	65	27	37	12.4	7	22	M12		0.9	2
	EXSKS-7100R-32	●	7	100	55	85	32	45	14.4	8	32	M16	Clamp bolt	1.7	2
	EXSKS-8125R-40	●	8	125	55	100	40	60	16.4	9	35	M20		2.7	2
	EXSKS-9160R-40	●	9	160	55	100	40	85	16.4	9	35	M20		3.9	2

Note) 1. All cutters are supplied without inserts.

2. Please refer page C016-C018 for recommended cutting conditions.

3. * mark shows: these cutter bodies are equipped with the set bolt because of the specified bolt size.

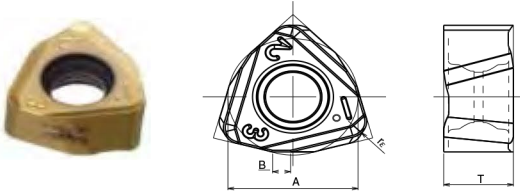
Except for these cutter bodies, please use the set bolt equipped with arbor.

Clamp Screw	Recommended Torque (N·m)
CSW-513H	5.5

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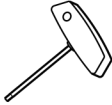
■ INSERTS



Cat. No.	Tolerance	PVD coated		Dimensions (mm)			
		JC7560	JC8118	A	T	B	r _ε
WNMU090720ZER-PM	M	●	●	14	7.66	1.94	2

10 inserts per case

■ PARTS

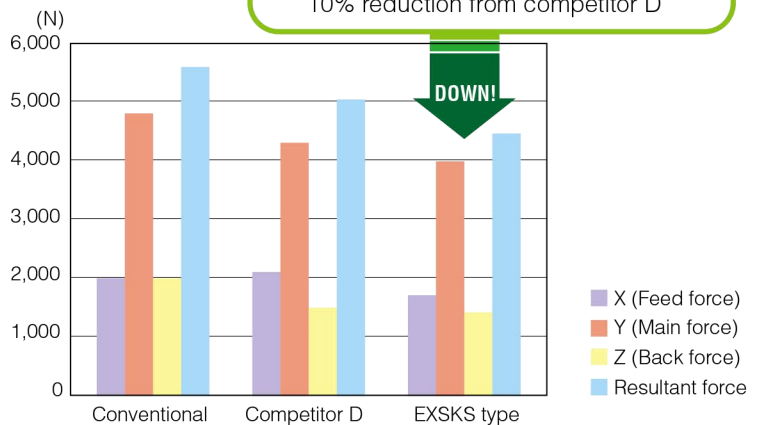
Clamp screw	Wrench
	
CSW-513H	A-20

■ CUTTING PERFORMANCE

Cutting Force Comparison

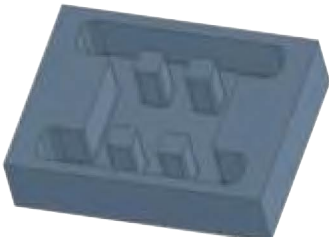
Cutting condition

Mat'l: S50C (C50)
 Tool dia.: φ63mm
 V_c=150m/min, f_z=1.5mm/t
 a_p=1.5mm, a_e=40mm

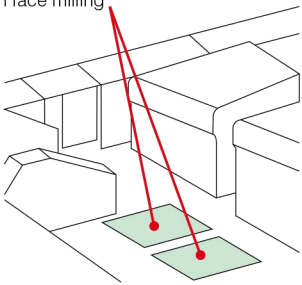


■ CASE STUDIES

1. High feed machining on mold steel

Surface roughing		Work	Part name	Cavity mold	
			Material	Mold steel (heat-treated)	
Hardness	30-34HRC				
Result	EXSKS achieved high metal removal rate ($Q=756\text{cm}^3/\text{min}$) by 2.4 times compared with conventional tool and showed normal wear after machining 80min.	Tool	Tool No.	EXSKS-7100R	
			Insert No.	WNMU090720ZER-PM (JC7560)	
		Cutting conditions	Cutting speed	n	325min^{-1}
				V_c	102m/min
			Feed speed	V_f	$3,980\text{mm/min}$
		f_z		1.75mm/t	
		a_p (mm)	2.5mm		
		a_e (mm)	76mm		
Coolant	Dry				
Machine	Vertical MC (24kW)				

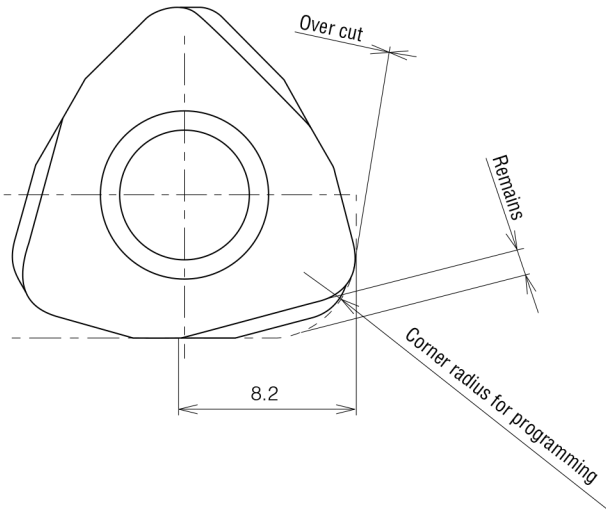
2. High feed machining on die structure part

Rough face milling		Work	Part name	Die structure part	
			Material	FC350 (GG35)	
Hardness	-				
Result	No chatter, very smooth cutting. Achieved high metal removal rate by 1.9 times and longer tool life by 1.5 times compared with competitor D. Able to machining for 5 hours.	Tool	Tool No.	EXSKS-6080R	
			Insert No.	WNMU090720ZER-PM (JC7560)	
		Cutting conditions	Cutting speed	n	500min^{-1}
				V_c	125m/min
			Feed speed	V_f	$5,000\text{mm/min}$
		f_z		1.66mm/t	
		a_p (mm)	3mm		
		a_e (mm)	47mm		
Coolant	Dry				
Machine	Double column MC				

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■ Definition of corner for programming

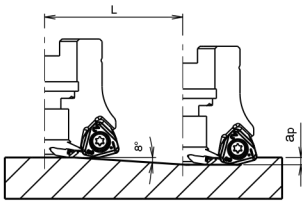


Corner radius for programming	Over cut	Remains
R3.0	0	1.41
R3.5	0	1.30
R4.0	0.025	1.19

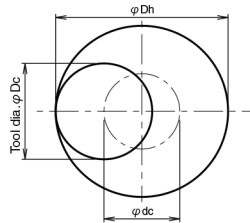
(mm)

■ Instructions for profile milling

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

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

Tool pass dia. Bore dia. Tool dia.

- Depth of cut per one circle should not exceed max. depth of cut ap.
- Down cutting is recommended. Tool pass rotation should be counter-clockwise.

- In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting condition table.
- In case of drilling, apply 50% or less Z axis feed speed from standard cutting condition table.
- Long continuous chips may come out in case of drilling, confirm the safe cutting conditions.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut a_p (mm)	Ramping		Helical interpolation		Max. drilling depth (mm)
				Max. ramping angle θ°	Total cutting length L(m) at max. a_p	Min. bore dia. D_h min (mm)	Max. bore dia. D_h max (mm)	
EXSKS-*050	50	33.7	3	2°24'	71.6	68	96	2
EXSKS-*052	52	35.7	3	2°24'	71.6	72	100	2
EXSKS-*063	63	46.7	3	3°	57.3	94	122	2
EXSKS-*066	66	49.7	3	2°42'	63.7	100	128	2
EXSKS-*080	80	63.6	3	2°18'	74.7	128	156	2
EXSKS-*100	100	83.6	3	1°42'	101.1	168	196	2
EXSKS-*125	125	108.5	3	1°18'	132.2	218	246	2
EXSKS-*160	160	143.5	3	1°	171.9	288	316	2

RECOMMENDED CUTTING CONDITIONS

Work materials	Grades	Tool dia. (mm)														
		50 / 52					63 / 66					80				
		No. of teeth 4N					No. of teeth 5N					No. of teeth 6N				
		l (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	l (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	l (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel (C50,C55) Below 250HB	JC7560 (JC8118)	~150	2	950	7,600	12.4	~150	2	750	7,500	15.4	~150	2	600	7,200	18.7
		200	1.5	800	6,400	7.8	200	1.8	680	6,800	12.5	200	1.8	540	6,480	15.2
		250	1	650	3,900	3.2	250	1.5	600	6,000	9.2	250	1.8	480	5,760	13.5
		300	0.6	650	2,600	1.3	300	1	550	5,500	5.6	300	1.5	440	5,280	10.3
		350	—	—	—	—	350	0.6	550	4,125	2.5	350	1	440	5,280	6.9
400	—	—	—	—	400	0.4	550	2,750	1.1	400	0.6	440	3,960	3.1		
Die steel (1.2344,1.2379) Below 255HB	JC7560 (JC8118)	~150	2	950	7,600	12.4	~150	2	750	7,500	15.4	~150	2	600	7,200	18.7
		200	1.5	800	6,400	7.8	200	1.8	680	6,800	12.5	200	1.8	540	6,480	15.2
		250	1	650	3,900	3.2	250	1.5	600	6,000	9.2	250	1.8	480	5,760	13.5
		300	0.6	650	2,600	1.3	300	1	550	5,500	5.6	300	1.5	440	5,280	10.3
		350	—	—	—	—	350	0.6	550	4,125	2.5	350	1	440	5,280	6.9
400	—	—	—	—	400	0.4	550	2,750	1.1	400	0.6	440	3,960	3.1		
Mold steel (1.2311,P20) 30-36HRC	JC7560 (JC8118)	~150	2	830	6,640	12.3	~150	2	650	6,500	15.2	~150	2	520	6,240	18.5
		200	1.5	700	5,600	7.8	200	1.8	580	5,800	12.2	200	1.8	470	5,640	15.1
		250	1	570	3,420	3.2	250	1.5	520	5,200	9.1	250	1.8	420	5,040	13.5
		300	0.6	570	2,280	1.3	300	1	460	4,600	5.4	300	1.5	360	4,320	9.6
		350	—	—	—	—	350	0.6	460	3,450	2.4	350	1	360	4,320	6.4
400	—	—	—	—	400	0.4	460	2,300	1.1	400	0.6	360	3,240	2.9		
Mold steel (1.2311,P21) 38-43HRC	JC8118	~150	1.5	700	2,800	6.8	~150	1.5	550	2,750	8.4	~150	1.5	430	2,580	10.1
		200	1	600	2,400	3.9	200	1.2	500	2,500	6.1	200	1.2	390	2,340	7.3
		250	0.7	490	1,960	2.2	250	1	440	2,200	4.5	250	1.2	340	2,040	6.4
		300	0.4	490	980	0.6	300	0.7	380	1,900	2.7	300	1	300	1,800	4.7
		350	—	—	—	—	350	0.5	380	1,900	1.9	350	0.7	300	1,800	3.3
400	—	—	—	—	400	—	—	—	—	400	0.4	300	1,800	1.9		
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	510	2,040	6.6	~150	1.5	400	2,000	8.2	~150	1.5	320	1,920	10.0
		200	1	460	1,840	4.0	200	1.2	360	1,800	5.9	200	1.2	290	1,740	7.2
		250	0.7	420	1,680	2.5	250	1	320	1,600	4.4	250	1.2	260	1,560	6.5
		300	0.4	420	840	0.7	300	0.7	280	1,400	2.7	300	1	220	1,320	4.6
		350	—	—	—	—	350	0.5	280	1,400	1.9	350	0.7	220	1,320	3.2
400	—	—	—	—	400	—	—	—	—	400	0.4	220	1,320	1.8		
Grey cast iron (GG25, GG30) Below 300HB	JC8118 (JC7560)	~150	2.5	950	7,600	12.4	~150	2.5	750	7,500	15.4	~150	2.5	600	7,200	18.7
		200	2	800	6,400	8.3	200	2	680	6,800	11.1	200	2	540	6,480	13.5
		250	1.5	650	3,900	3.8	250	1.5	600	6,000	7.4	250	2	480	5,760	12.0
		300	1	650	2,600	1.7	300	1	550	5,500	4.5	300	1.5	440	5,280	8.2
		350	—	—	—	—	350	0.6	550	4,125	2.0	350	1	440	5,280	5.5
400	—	—	—	—	400	0.4	550	2,750	0.9	400	0.6	440	3,960	2.5		
Nodular cast iron (GGG50, GGG70) Below 300HB	JC8118	~150	2.5	950	7,600	12.4	~150	2.5	750	7,500	15.4	~150	2.5	600	7,200	18.7
		200	2	800	6,400	8.3	200	2	680	6,800	11.1	200	2	540	6,480	13.5
		250	1.5	650	3,900	3.8	250	1.5	600	6,000	7.4	250	2	480	5,760	12.0
		300	1	650	2,600	1.7	300	1	550	5,500	4.5	300	1.5	440	5,280	8.2
		350	—	—	—	—	350	0.6	550	4,125	2.0	350	1	440	5,280	5.5
400	—	—	—	—	400	0.4	550	2,750	0.9	400	0.6	440	3,960	2.5		
Stainless steel Below 250HB	JC7560	~150	2	950	5,700	14.8	~150	2	750	5,625	18.4	~150	2	600	5,400	22.5
		200	1.5	800	4,800	9.4	200	1.8	680	5,100	15.0	200	1.8	540	4,860	18.2
		250	1	650	2,600	3.4	250	1.5	600	4,500	11.1	250	1.8	480	4,320	16.2
		300	0.6	650	2,600	2.0	300	1	550	3,300	5.4	300	1.5	440	3,960	12.4
		350	—	—	—	—	350	0.6	550	2,750	2.7	350	1	440	3,168	6.6
400	—	—	—	—	400	0.4	550	2,750	1.8	400	0.6	440	2,640	3.3		

l : Overhung length, a_p : Depth of cut, n : Spindle speed, V_f : Feed speed, P_c : Net power consumption

NOTE

- 1) The figure to be adjusted according to the machine rigidity or work rigidity.
- 2) In case of chatter occurring, recommend to reduce the depth of cut a_p or Spindle speed and keep feed per tooth.
- 3) If machine does not have enough power, recommend to reduce the depth of cut a_p or Spindle speed and Feed speed.
- 4) Use air blow.

SKS Extreme

EXSKSTYPE

RECOMMENDED CUTTING CONDITIONS

Work materials	Grades	Tool dia. (mm)														
		100					125					160				
		No. of teeth 7N					No. of teeth 8N					No. of teeth 9N				
		l (mm)	a_p (mm)	n (min ⁻¹)	V_f (mm/min)	P_c (kW)	l (mm)	a_p (mm)	n (min ⁻¹)	V_f (mm/min)	P_c (kW)	l (mm)	a_p (mm)	n (min ⁻¹)	V_f (mm/min)	P_c (kW)
Carbon steel (C50,C55) Below 250HB	JC7560 (JC8118)	~150	2	480	6,720	21.8	~150	2	380	6,080	24.7	~150	2	300	5,400	28.1
		200	2	430	6,020	19.6	200	2	340	5,440	22.1	200	2	270	4,860	25.3
		250	2	380	5,320	17.3	250	2	300	4,800	19.5	250	2	240	4,320	22.5
		300	1.5	350	4,900	11.9	300	2	280	4,480	18.2	300	2	220	3,960	20.6
		350	1.5	350	4,900	11.9	350	1.5	280	4,480	13.7	350	2	220	3,960	20.6
		400	1	350	4,900	8.0	400	1.5	280	4,480	13.7	400	1.5	220	3,960	15.4
Die steel (1.2344,1.2379) Below 255HB	JC7560 (JC8118)	~150	2	480	6,720	21.8	~150	2	380	6,080	24.7	~150	2	300	5,400	28.1
		200	2	430	6,020	19.6	200	2	340	5,440	22.1	200	2	270	4,860	25.3
		250	2	380	5,320	17.3	250	2	300	4,800	19.5	250	2	240	4,320	22.5
		300	1.5	350	4,900	11.9	300	2	280	4,480	18.2	300	2	220	3,960	20.6
		350	1.5	350	4,900	11.9	350	1.5	280	4,480	13.7	350	2	220	3,960	20.6
		400	1	350	4,900	8.0	400	1.5	280	4,480	13.7	400	1.5	220	3,960	15.4
Mold steel (1.2311,P20) 30-36HRC	JC7560 (JC8118)	~150	2	410	5,740	21.3	~150	2	330	5,280	24.5	~150	2	260	4,680	27.8
		200	2	370	5,180	19.2	200	2	300	4,800	22.3	200	2	230	4,140	24.6
		250	2	330	4,620	17.2	250	2	260	4,160	19.3	250	2	210	3,780	22.5
		300	1.5	280	3,920	10.9	300	2	230	3,680	17.1	300	2	180	3,240	19.3
		350	1.5	280	3,920	10.9	350	1.5	230	3,680	12.8	350	2	180	3,240	19.3
		400	1	280	3,920	7.3	400	1.5	230	3,680	12.8	400	1.5	180	3,240	14.4
Mold steel (1.2311,P21) 38-43HRC	JC8118	~150	1.5	350	2,450	11.9	~150	1.5	280	2,240	13.7	~150	1.5	220	1,980	15.4
		200	1.5	310	2,170	10.6	200	1.5	250	2,000	12.2	200	1.5	200	1,800	14.0
		250	1.2	280	1,960	7.6	250	1.5	220	1,760	10.7	250	1.5	180	1,620	12.6
		300	1	250	1,750	5.7	300	1.5	200	1,600	9.8	300	1.5	150	1,350	10.5
		350	1	250	1,750	5.7	350	1	200	1,600	6.5	350	1.5	150	1,350	10.5
		400	0.7	250	1,750	4.0	400	1	200	1,600	6.5	400	1	150	1,350	7.0
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	250	1,750	11.4	~150	1.5	200	1,600	13.0	~150	1.5	160	1,440	15.0
		200	1.5	230	1,610	10.5	200	1.5	180	1,440	11.7	200	1.5	150	1,350	14.0
		250	1.2	200	1,400	7.3	250	1.5	160	1,280	10.4	250	1.5	130	1,170	12.2
		300	1	180	1,260	5.5	300	1.5	140	1,120	9.1	300	1.5	110	990	10.3
		350	1	180	1,260	5.5	350	1	140	1,120	6.1	350	1.5	110	990	10.3
		400	0.7	180	1,260	3.8	400	1	140	1,120	6.1	400	1	110	990	6.9
Grey cast iron (GG25, GG30) Below 300HB	JC8118 (JC7560)	~150	2.5	480	6,720	21.8	~150	2.5	380	6,080	24.7	~150	2.5	300	5,400	28.1
		200	2.5	430	6,020	19.6	200	2.5	340	5,440	22.1	200	2.5	270	4,860	25.3
		250	2	380	5,320	13.8	250	2.5	300	4,800	19.5	250	2.5	240	4,320	22.5
		300	2	350	4,900	12.7	300	2	280	4,480	14.6	300	2.5	220	3,960	20.6
		350	1.5	350	4,900	9.6	350	1.5	280	4,480	10.9	350	2	220	3,960	16.5
		400	1	350	4,900	6.4	400	1.5	280	4,480	10.9	400	1.5	220	3,960	12.4
Nodular cast iron (GGG50, GGG70) Below 300HB	JC8118	~150	2.5	480	6,720	21.8	~150	2.5	380	6,080	24.7	~150	2.5	300	5,400	28.1
		200	2.5	430	6,020	19.6	200	2.5	340	5,440	22.1	200	2.5	270	4,860	25.3
		250	2	380	5,320	13.8	250	2.5	300	4,800	19.5	250	2.5	240	4,320	22.5
		300	2	350	4,900	12.7	300	2	280	4,480	14.6	300	2.5	220	3,960	20.6
		350	1.5	350	4,900	9.6	350	1.5	280	4,480	10.9	350	2	220	3,960	16.5
		400	1	350	4,900	6.4	400	1.5	280	4,480	10.9	400	1.5	220	3,960	12.4
Stainless steel Below 250HB	JC7560	~150	2	480	5,040	26.2	~150	2	380	4,560	29.6	~150	2	300	4,050	33.7
		200	2	430	4,515	23.5	200	2	340	4,080	26.5	200	2	270	3,645	30.3
		250	2	380	3,990	20.7	250	2	300	3,600	23.4	250	2	240	3,240	27.0
		300	1.5	350	3,675	14.3	300	2	280	3,360	21.8	300	2	220	2,970	24.7
		350	1.5	350	3,675	14.3	350	1.5	280	3,360	16.4	350	2	220	2,970	24.7
		400	1	350	3,675	9.6	400	1.5	280	3,360	16.4	400	1.5	220	2,970	18.5

l : Overhang length, a_p : Depth of cut, n : Spindle speed, V_f : Feed speed, P_c : Net power consumption

NOTE

- 1) The figure to be adjusted according to the machine rigidity or work rigidity.
- 2) In case of chatter occurring, recommend to reduce the depth of cut a_p or Spindle speed and keep feed per tooth.
- 3) If machine does not have enough power, recommend to reduce the depth of cut a_p or Spindle speed and Feed speed.
- 4) Use air blow.