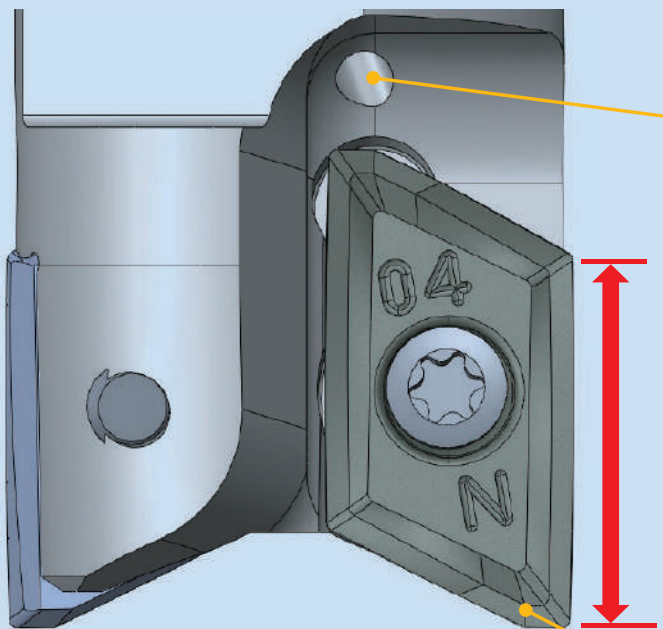




High Precision and High Efficient Machining on Aerospace tooling



Through coolant hole

High Precision

Combination of high accuracy body and ground insert gives excellent side wall finish.

High Efficiency

Sharp & Unique 3D geometry insert enables high efficiency and low cutting resistance machining. Key in insert gives added security allowing high speed spindle machining.

Multi function

Capable of ramping and helical interpolation.

AMX/MAM TYPE



- Bore type
Ø40-Ø80
- Modular Head type
Ø16-Ø42

MAX.ap = 8mm

XOET0803..PDFR

grade: FZ05

RE: 0.2-2.0



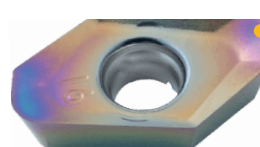
grade: DS217

RE: 0.4-2.0



grade: DN103

RE: 0.2-2.0



ALX/MAL TYPE



- Bore type
Ø50-Ø63
- Modular Head type
Ø20-Ø40
- Shank type
Ø20-Ø40

MAX.ap = 15mm

XOGT1605..PDFR

grade: FZ05

RE: 0.2-4.0



XOGT1605..PDER

grade: JC5118

RE: 0.2-3.2



AERO CHIPPER

AMX/MAM Type

AMX
TYPE

Bore Type

Through
coolant
holeG-
Body

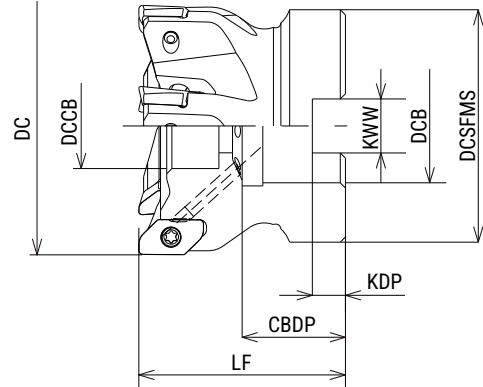
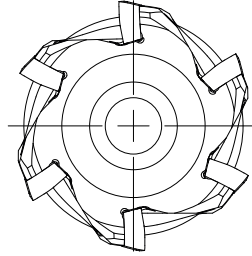
Shoulder Milling

Slotting

Copy Milling

Pocket Milling

Helical Interpolation



Cat.No.	Stock	No. of inserts	Dimensions(mm)								Max. spindle speed (min ⁻¹)	Weight (kg)	Inserts
			DC	LF	DCSFMS	DCB	DCCB	KWW	KDP	CDBP			
AMX-6040R-16	●	6	40	40	35	16	14	8.4	5.6	18	28,000	0.2	XOET0803**PDFR
AMX-7050R-22	●	7	50	40	45	22	16.5	10.4	6.3	20	24,000	0.3	
AMX-8063R-22	●	8	63	40	50	22	17	10.4	6.3	20	21,000	0.48	
AMX-9080R-22	○	9	80	40	50	22	17	10.4	6.3	20	18,000	0.68	
AMX-9080R-27	●	9	80	50	60	27	20	12.4	7	22	18,000	1.01	

Screw	Torque(N.m)	Wrench
TSW-2567H	1.1	A-08

MAM
TYPE

Modular Type

Through
coolant
hole

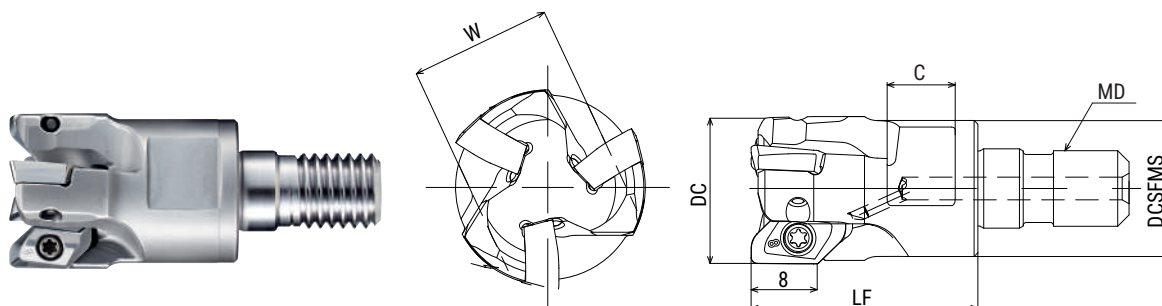
Shoulder Milling

Slotting

Copy Milling

Pocket Milling

Helical Interpolation



Cat.No.	Stock	No. of inserts	Dimensions(mm)						Max. spindle speed (min ⁻¹)	Parts	Inserts	
			DC	LF	DCSFMS	MD	C	W		Clamp screw		
MAM-2016-M8	●	2	16	23	14	M8	8	12	40,000	TSW-2556H	XOET0803**PDFR	
MAM-2018-M8	○	2	18	23	14	M8	8	12	40,000			
MAM-3020-M10	●	3	20	30	18	M10	9	14	40,000			
MAM-3022-M10	○	3	22	30	18	M10	9	14	40,000			
MAM-3025-M12	○	3	25	35	22	M12	11	19	40,000	TSW-2567H		XOET0803**PDFR
MAM-4025-M12	●	4	25	35	22	M12	11	19	40,000			
MAM-4028-M12	○	4	28	35	23.6	M12	11	19	36,000			
MAM-4030-M16	○	4	30	43	27	M16	12	22	34,000			
MAM-5032-M16	●	5	32	43	29	M16	12	22	33,000			
MAM-5035-M16	○	5	35	43	32	M16	14	26	31,000			
MAM-6040-M16	●	6	40	43	32	M16	14	26	28,000			
MAM-6042-M16	○	6	42	43	32	M16	14	26	27,000			

Screw	Torque(N.m)	Wrench
TSW-2556H	1.1	A-08
TSW-2567H		

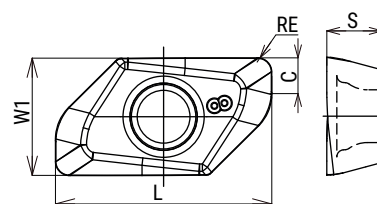
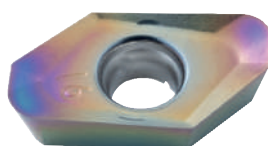
AMX/MAM
TYPE

Insert

FZ05

DS217

DN103



Cat.No.	Tolerance	Uncoated	PVD Coating	DLC Coating	Dimensions (mm)				
		FZ05	DS217	DN103	RE	L	W1	S	C
XOET080302PDFR	E	●		●	0.2	12.5	6.8	3.2	1.5
XOET080304PDFR	E	●		●	0.4	12.5	6.8	3.2	1.7
XOET080304PDER	E		●		0.4	12.5	6.8	3.2	1.5
XOET080308PDFR	E	●		●	0.8	12.5	6.8	3.2	2
XOET080308PDER	E		●		0.8	12.5	6.8	3.2	1.5
XOET080316PDFR	E	●		●	1.6	12.5	6.8	3.2	2.9
XOET080320PDFR	E	●		●	2.0	12.5	6.8	3.2	3
XOET080320PDER	E		●		2.0	12.5	6.8	3.2	2.5

AERO CHIPPER

ALX/MAL Type

ALX
TYPE

Bore Type

Through
coolant
holeG-
Body

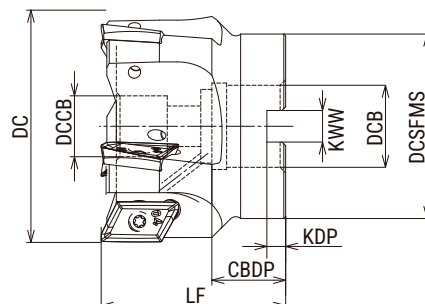
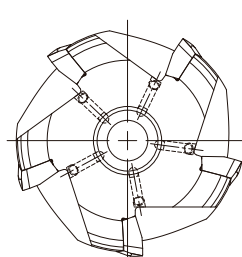
Shoulder Milling

Slotting

Copy Milling

Pocket Milling

Helical Interpolation

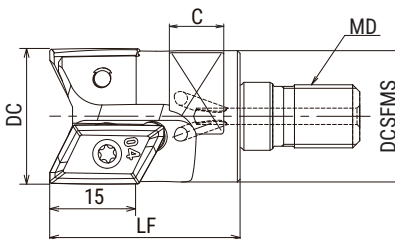
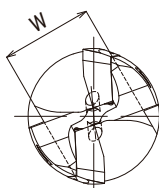


Cat.No.	Stock	No. of inserts	Dimensions(mm)								Max. spindle speed (min ⁻¹)	Weight (kg)	Inserts
			DC	LF	DCSFMS	DCB	DCCB	KWW	KDP	CDBP			
ALX4050R-22	●	4	50	50	45	22	16.5	10.4	6.3	20	24,000	0.4	XOGT1605**PD*R
ALX5063R-22	●	5	63	50	50	22	16.5	10.4	6.3	20	21,000	0.6	

Screw	Torque (N.m)	Wrench
DSW-4085	3.6	A-15T

MAL
TYPE

Modular Type

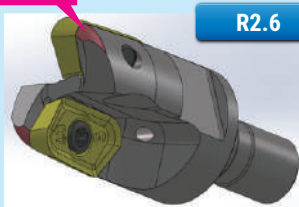
Through
coolant
holeG-
Body

Cat.No.	Stock	No. of inserts	Dimensions(mm)						Max. spindle speed (min ⁻¹)	Inserts
			DC	LF	DCSFMS	MD	C	W		
MAL-1020-M10	●	1	20	35	19.5	M10	9	14	15,000	XOGT1605**PD*R
MAL-2025-M12	●	2	25	35	24	M12	11	19	40,000	
MAL-2028-M12	○	2	28	35	24	M12	10	19	36,000	
MAL-2030-M16	○	2	30	43	28	M16	12	22	34,000	
MAL-2032-M16	●	2	32	43	29	M16	12	22	33,000	
MAL-2035-M16	○	2	35	43	29	M16	12	22	31,000	
MAL-3040-M16	●	3	40	43	32	M16	14	26	28,000	

Screw	Torque (N.m)	Wrench
DSW-4085	3.6	A-15

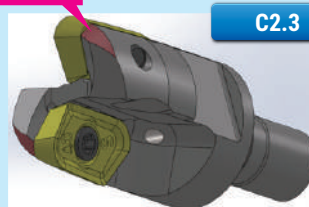
Part to be modified

R2.6



Part to be modified

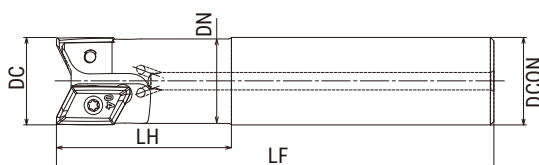
C2.3



When using inserts with corner radius RE 4 (XOGT160540PDFR), Standard cutter body has to be modified with R2.6 or C2.3

ALXM TYPE

Shank Type

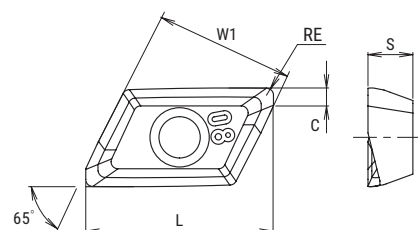


Cat.No.	Stock	No. of inserts	Dimensions(mm)					Max. spindle speed	Parts		Inserts
			DC	LH	LF	DN	DCON		Screw	Wrench	
ALXM1020S20	●	1	20	35	110	19.18	20	15,000	DSW-4075H	A-15	XOGT1605**PD*R
ALXM2025S25	●	2	25	50	125	24	25	40,000	DSW-4085		
ALXM2028S25	●	2	28	50	125	26.87	25	36,000			
ALXM2032S32	●	2	32	50	150	30.5	32	33,000			
ALXM2035S32	○	2	35	50	150	33.32	32	31,000			
ALXM3040S32	●	3	40	80	170	37.96	32	28,000			

Screw	Torque (N.m)
DSW-4075H	3.6
DSW-4085	3.6

ALX/MAL TYPE

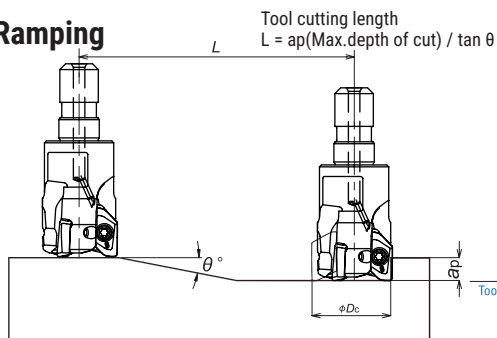
Insert



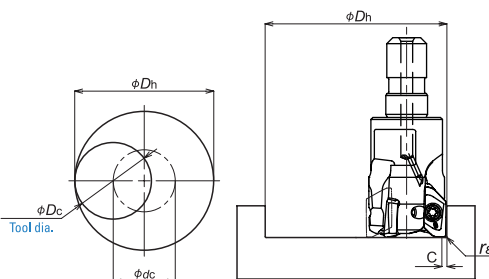
Cat.No.	Tolerance	PVD Coating	Uncoated	Dimensions (mm)				
		JC5118	FZ05	RE	L	W1	S	C
XOGT160502PDFR	G		●	0.2	20.8	16.35	5	2.5
XOGT160504PDFR	G		●	0.4	21.0	16.35	5	2.4
XOGT160508PDFR	G		●	0.8	21.0	16.35	5	2.4
XOGT160512PDFR	G		●	1.2	20.9	16.35	5	2.5
XOGT160516PDFR	G		●	1.6	20.7	16.35	5	2.6
XOGT160520PDFR	G		●	2.0	20.6	16.35	5	2.8
XOGT160525PDFR	G		○	2.5	20.3	16.35	5	3.0
XOGT160530PDFR	G		●	3.0	20.1	16.35	5	3.3
XOGT160532PDFR	G		●	3.2	19.9	16.35	5	3.5
XOGT160540PDFR	G		●	4.0	19.2	16.35	5	4.3
XOGT160502PDER	G	●		0.2	20.8	16.35	5	2.5
XOGT160504PDER	G	●		0.4	21.0	16.35	5	2.4
XOGT160508PDER	G	●		0.8	21.0	16.35	5	2.4
XOGT160512PDER	G	●		1.2	20.9	16.35	5	2.5
XOGT160516PDER	G	●		1.6	20.7	16.35	5	2.6
XOGT160520PDER	G	○		2.0	20.6	16.35	5	2.8
XOGT160530PDER	G	●		3.0	20.1	16.35	5	3.3
XOGT160532PDER	G	○		3.2	19.9	16.35	5	3.5

Recommended Data for Profile Milling

Ramping



Helical interpolation



- Calculation of tool pass dia.

$$\phi D_c = \phi D_h - \phi D_c$$

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, so tool pass rotation should be counterclockwise.

XOET080302PDFR

Tool dia.	Eff. Cutting dia. (mm)	Max. depth of cut (mm)	Ramping		Helical interpolation			Max. drilling depth
			Max. ramping angle θ°	Total cutting length at Max. ap L	Through hole Min. bore dia. Dh min (mm)	Flat bottom Min. bore dia. Dh min (mm)	Through hole Max. bore dia. Dh max (mm)	
16	15.5	5	18.0	15.4	20	29.5	31	2.5
18	17.5	5	17.5	15.9	24	33.5	35	2.5
20	19.5	5	14.0	20.1	28	37.5	39	2.5
22	21.5	5	12.5	22.6	32	41.5	43	2.5
25	24.5	5	10.0	28.4	38	47.5	49	2.5
28	27.5	5	8.5	33.5	44	53.5	55	2.5
30	29.5	5	7.5	38.0	48	57.5	59	2.5
32	31.5	5	7.0	40.7	52	61.5	63	2.5
35	34.5	5	6.0	47.6	58	67.5	69	2.5
40 (42)	39.5 (41.5)	5	5.0	57.2	68 (72)	77.5 (81.5)	79 (83)	2.5
50	49.5	5	4.0	71.5	88	97.5	99	2.5
63	62.5	5	3.0	95.4	114	123.5	125	2.5
80	79.5	5	2.5	114.5	148	160.0	159	2.5

XOET080304PDFR

Tool dia.	Eff. Cutting dia. (mm)	Max. depth of cut (mm)	Ramping		Helical interpolation			Max. drilling depth
			Max. ramping angle θ°	Total cutting length at Max. ap L	Through hole Min. bore dia. Dh min (mm)	Flat bottom Min. bore dia. Dh min (mm)	Through hole Max. bore dia. Dh max (mm)	
16	15.1	5	18.0	15.4	20	29.0	31	2.5
18	17.1	5	17.5	15.9	24	33.0	35	2.5
20	19.1	5	14.0	20.1	28	37.0	39	2.5
22	21.1	5	12.5	22.6	32	37.0	43	2.5
25	24.1	5	10.0	28.4	38	47.0	49	2.5
28	27.1	5	8.5	33.5	44	53.0	55	2.5
30	29.1	5	7.5	38.0	48	57.0	59	2.5
32	31.1	5	7.0	40.7	52	61.0	63	2.5
35	34.1	5	6.0	47.6	58	67.0	69	2.5
40 (42)	39.1 (41.1)	5	5.0	57.2	68 (72)	77.0 (81.0)	79 (83)	2.5
50	49.1	5	4.0	71.5	88	97.0	99	2.5
63	62.1	5	3.0	95.4	114	123.0	125	2.5
80	79.1	5	2.5	114.5	148	157.5	159	2.5

XOET080308PDFR

Tool dia.	Eff. Cutting dia. (mm)	Max.depth of cut (mm)	Ramping		Helical interpolation			Max. drilling depth
			Max. ramping angle θ°	Total cutting length at Max.ap L	Through hole Min. bore dia. Dh min (mm)	Flat bottom Min.bore dia. Dh min (mm)	Through hole Max. bore dia. Dh max (mm)	
16	14.3	5	18.0	15.4	20	28.5	31	2.5
18	16.3	5	17.5	15.9	24	32.5	35	2.5
20	18.3	5	14.0	20.1	28	36.5	39	2.5
22	18.3	5	12.5	22.6	32	36.5	43	2.5
25	23.3	5	10.0	28.4	38	46.5	49	2.5
28	26.3	5	8.5	33.5	44	52.5	55	2.5
30	28.3	5	7.5	38.0	48	56.5	59	2.5
32	30.3	5	7.0	40.7	52	60.5	63	2.5
35	33.3	5	6.0	47.6	58	66.5	69	2.5
40 (42)	38.3 (40.3)	5	5.0	57.2	68 (72)	76.5 (80.5)	79 (83)	2.5
50	48.3	5	4.0	71.5	88	96.5	99	2.5
63	61.3	5	3.0	95.4	114	122.5	125	2.5
80	78.3	5	2.5	114.5	148	156.5	159	2.5

XOET080316PDFR

Tool dia.	Eff. Cutting dia. (mm)	Max.depth of cut (mm)	Ramping		Helical interpolation			Max. drilling depth
			Max. ramping angle θ°	Total cutting length at Max.ap L	Through hole Min. bore dia. Dh min (mm)	Flat bottom Min.bore dia. Dh min (mm)	Through hole Max. bore dia. Dh max (mm)	
16	12.7	5	18.0	15.4	20	27.0	31	2.5
18	14.7	5	17.5	15.9	24	31.0	35	2.5
20	16.7	5	14.0	20.1	28	35.0	39	2.5
22	16.7	5	12.5	22.6	32	35.0	43	2.5
25	21.7	5	10.0	28.4	38	45.0	49	2.5
28	24.7	5	8.5	33.5	44	51.0	55	2.5
30	26.7	5	7.5	38.0	48	55.0	59	2.5
32	28.7	5	7.0	40.7	52	59.0	63	2.5
35	31.7	5	6.0	47.6	58	65.0	69	2.5
40 (42)	36.7 (38.7)	5	5.0	57.2	68 (72)	75.0 (79.0)	79 (83)	2.5
50	46.7	5	4.0	71.5	88	94.5	99	2.5
63	59.7	5	3.0	95.4	114	120.5	125	2.5
80	76.7	5	2.5	114.5	148	157.5	159	2.5

XOET080320PDFR

Tool dia.	Eff. Cutting dia. (mm)	Max.depth of cut (mm)	Ramping		Helical interpolation			Max. drilling depth
			Max. ramping angle θ°	Total cutting length at Max.ap L	Through hole Min. bore dia. Dh min (mm)	Flat bottom Min.bore dia. Dh min (mm)	Through hole Max. bore dia. Dh max (mm)	
16	11.9	5	18.0	15.4	20	26.5	31	2.5
18	13.9	5	17.5	15.9	24	30.5	35	2.5
20	15.9	5	14.0	20.1	28	34.5	39	2.5
22	15.9	5	12.5	22.6	32	34.5	43	2.5
25	20.9	5	10.0	28.4	38	44.5	49	2.5
28	23.9	5	8.5	33.5	44	50.5	55	2.5
30	25.9	5	7.5	38.0	48	54.5	59	2.5
32	27.9	5	7.0	40.7	52	58.5	63	2.5
35	30.9	5	6.0	47.6	58	64.5	69	2.5
40 (42)	35.9 (37.9)	5	5.0	57.2	68 (72)	74.5 (78.5)	79 (83)	2.5
50	45.9	5	4.0	71.5	88	94.5	99	2.5
63	58.9	5	3.0	95.4	114	120.5	125	2.5
80	75.9	5	2.5	114.5	148	156.5	159	2.5

AERO CHIPPER

AMX/MAM Type

■ Recommended Cutting Conditions | Shoulder Milling

● Bore Type

Material	Grade	Tool dia. (mm)									
		40					50				
		6N					7N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	100	8	80	6,000	5,400	100	8	100	5,700	5,990
		150	6	42	6,000	5,400	150	8	80	5,700	5,990
		200	5	30	4,800	4,320	200	6	60	4,600	4,830
Austenitic Stainless Steel	DS217	100	6	27	800	480	100	6	30	760	530
		150	5	18	800	480	150	6	24	760	530
		200	4	9	660	400	200	4	16	640	450
Titanium Alloy	DS217	100	6	27	530	250	100	6	30	510	290
		150	5	18	530	250	150	6	24	510	290
		200	4	9	400	190	200	4	16	380	210

Material	Grade	Tool dia. (mm)									
		63					80				
		8N					9N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	100	8	126	4,500	5,400	100	8	160	3,600	4,860
		150	8	126	4,500	5,400	150	8	160	3,600	4,860
		200	8	96	4,500	5,400	200	8	160	2,900	3,920
Austenitic Stainless Steel	DS217	100	6	36	610	490	100	6	42	480	430
		150	6	36	610	490	150	6	42	480	430
		200	6	27	610	490	200	6	36	480	430
Titanium Alloy	DS217	100	6	36	400	260	100	6	42	320	230
		150	6	36	400	260	150	6	42	320	230
		200	6	27	400	260	200	6	36	320	230

Note) 1. The figure to be adjusted according to the machine rigidity or work rigidity.

2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed

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 of water soluble cutting oil is recommended.

Recommended Cutting Conditions | Shoulder Milling

Modular Type + MSN Type carbide shank holder

Material	Grade	Tool dia. (mm)														
		16 / 18					20 / 22					25				
		2N					3N					3N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	50	8	32	17,900	5,370	60	8	40	14,300	6,440	75	8	50	11,500	5,180
		80	6	15	17,900	5,370	100	6	18	14,300	6,440	125	6	24	11,500	5,180
		130	4	6	14,300	4,290	160	4	8	11,500	5,180	200	4	10	9,200	4,140
Austenitic Stainless Steel	DS217	50	6	12	2,400	480	60	6	15	1,900	570	75	6	18	1,500	450
		80	5	8	2,400	480	100	5	10	1,900	570	125	5	12	1,500	450
		130	4	4	2,000	400	160	4	5	1,600	480	200	4	6	1,300	390
Titanium Alloy	DS217	50	6	12	1,600	260	60	6	15	1,300	310	75	6	18	1,000	240
		80	5	8	1,600	260	100	5	10	1,300	310	125	5	12	1,000	240
		130	4	4	1,200	190	160	4	5	1,000	240	200	4	6	760	180

Material	Grade	Tool dia. (mm)									
		25 / 28					30				
		4N					4N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	75	8	50	11,500	6,900	90	8	60	9,500	5,700
		125	6	24	11,500	6,900	150	6	30	9,500	5,700
		200	4	10	9,200	5,520	240	4	12	7,600	4,560
Austenitic Stainless Steel	DS217	75	6	18	1,500	600	90	6	21	1,300	520
		125	5	12	1,500	600	150	5	14	1,300	520
		200	4	6	1,300	520	240	4	7	1,100	440
Titanium Alloy	DS217	75	6	18	1,020	330	90	6	21	850	270
		125	5	12	1,020	330	150	5	14	850	270
		200	4	6	760	240	240	4	7	640	200

Material	Grade	Tool dia. (mm)									
		32 / 35					40 / 42				
		5N					6N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	100	8	64	9,000	6,750	100	8	80	6,000	5,400
		160	6	30	9,000	6,750	160	6	36	6,000	5,400
		260	4	12	7,200	5,400	260	4	16	4,800	4,320
Austenitic Stainless Steel	DS217	100	6	21	1,200	600	100	6	27	800	480
		160	5	14	1,200	600	160	5	18	800	480
		260	4	7	1,000	500	260	4	9	660	400
Titanium Alloy	DS217	100	6	21	800	320	100	6	27	530	250
		160	5	14	800	320	160	5	18	530	250
		260	4	7	600	240	260	4	9	400	190

Note) 1. The figure to be adjusted according to the machine rigidity or work rigidity.

2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed

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 of water soluble cutting oil is recommended.

Recommended Cutting Conditions | Face Milling

Bore Type

Material	Grade	Tool dia. (mm)									
		40					50				
		6N					7N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	100	5	28	6,000	5,400	100	5	35	5,700	5,990
		150	2.5	28	6,000	5,400	150	3.5	35	5,700	5,990
		200	1.5	28	4,800	4,320	200	2.5	35	4,600	4,830
Austenitic Stainless Steel	DS217	100	2	24	800	380	100	2	30	760	430
		150	1	24	800	380	150	1	30	760	430
		200	1	24	660	320	200	1	30	640	360
Titanium Alloy	DS217	100	2	24	530	190	100	2	30	510	210
		150	1	24	530	190	150	1	30	510	210
		200	1	24	400	140	200	1	30	380	160

Material	Grade	Tool dia. (mm)									
		63					80				
		8N					9N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	100	5	44	4,500	5,400	100	5	56	3,600	4,320
		150	5	44	4,500	5,400	150	5	56	3,600	4,320
		200	3	44	4,500	5,400	200	4	56	2,900	4,320
Austenitic Stainless Steel	DS217	100	2	38	610	390	100	2	48	480	310
		150	2	38	610	390	150	2	48	480	310
		200	1	38	610	390	200	2	48	480	310
Titanium Alloy	DS217	100	2	38	400	190	100	2	48	320	150
		150	2	38	400	190	150	2	48	320	150
		200	1	38	400	190	200	2	48	320	150

Note) 1. The figure to be adjusted according to the machine rigidity or work rigidity.

2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed

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 of water soluble cutting oil is recommended.

Recommended Cutting Conditions | Face Milling

Modular Type + MSN Type carbide shank holder

Material	Grade	Tool dia. (mm)														
		16 / 18					20 / 22					25				
		2N					3N					3N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	50	5	11	17,900	5,370	60	5	14	14,300	6,440	75	5	17.5	11,500	5,180
		80	2.5	11	17,900	5,370	100	2.5	14	14,300	6,440	125	2.5	17.5	11,500	5,180
		130	1	11	14,300	4,290	160	1	14	11,500	5,180	200	1	17.5	9,200	4,140
Austenitic Stainless Steel	DS217	50	2	10	2,400	380	60	2	12	1,900	460	75	2	15	1,500	360
		80	1	10	2,400	380	100	1	12	1,900	460	125	1	15	1,500	360
		130	1	10	2,000	320	160	1	12	1,600	380	200	1	15	1,300	310
Titanium Alloy	DS217	50	2	10	1,600	190	60	2	12	1,300	230	75	2	15	1,000	180
		80	1	10	1,600	190	100	1	12	1,300	230	125	1	15	1,000	180
		130	1	10	1,200	140	160	1	12	1,000	180	200	1	15	760	140

Material	Grade	Tool dia. (mm)									
		25 / 28					30				
		4N					4N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	75	5	17.5	11,500	6,900	90	5	21	9,500	5,700
		125	2.5	17.5	11,500	6,900	150	2.5	21	9,500	5,700
		200	1	17.5	9,200	5,520	240	1	21	7,600	4,560
Austenitic Stainless Steel	DS217	75	2	15	1,500	480	90	2	18	1,300	420
		125	1	15	1,500	480	150	1	18	1,300	420
		200	1	15	1,300	420	240	1	18	1,100	350
Titanium Alloy	DS217	75	2	15	1,000	240	90	2	18	850	200
		125	1	15	1,000	240	150	1	18	850	200
		200	1	15	760	180	240	1	18	640	150

Material	Grade	Tool dia. (mm)									
		32 / 35					40 / 42				
		5N					6N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110HB	FZ05 DN103	100	5	22.5	9,000	6,750	100	5	28	6,000	5,400
		160	2.5	22.5	9,000	6,750	160	2.5	28	6,000	5,400
		260	1	22.5	7,200	5,400	260	1	28	4,800	4,320
Austenitic Stainless Steel	DS217	100	2	19	1,200	480	100	2	24	800	380
		160	1	19	1,200	480	160	1	24	800	380
		260	1	19	1,000	400	260	1	24	660	320
Titanium Alloy	DS217	100	2	19	800	240	100	2	24	530	190
		160	1	19	800	240	160	1	24	530	190
		260	1	19	600	180	260	1	24	400	140

Note) 1. The figure to be adjusted according to the machine rigidity or work rigidity.

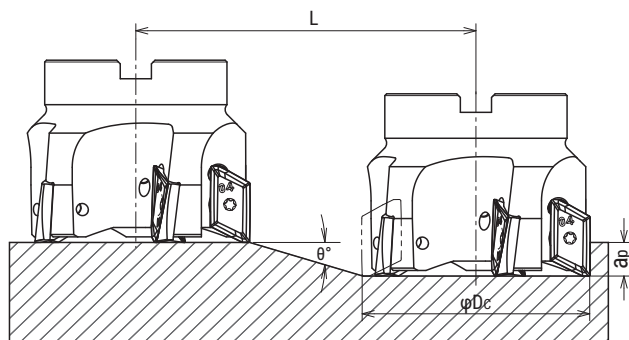
2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed

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 of water soluble cutting oil is recommended.

Recommended Data for Profile Milling

Ramping

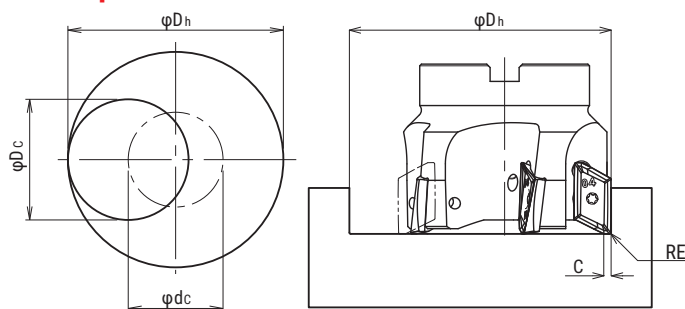


Tool dia. (mm)	Aluminium		Stainless steel		Titanium alloy		Max. Depth of cut (mm)
	Max. ramping angle (°)	Cutting length (mm)	Max. ramping angle (°)	Cutting length (mm)	Max. ramping angle (°)	Cutting length (mm)	
φDc	θ°	L	θ°	L	θ°	L	ap
20	16	28	10	45	10	45	8
25	11	41	9	51	9	51	8
28	9	51	7	65	7	65	8
30	8	57	6	76	6	76	8
32	7	65	6	76	6	76	8
35	6	76	6	76	6	76	8
40	5	91	5	91	5	91	8
50	4	114	4	114	4	114	8
63	3	153	3	153	3	153	8

Note

1. In case of ramping, apply 70% or less feed (Vf) from standard cutting condition table.
2. When cutting Titanium/Stainless steel, apply 0.005mm or less (fz) from standard cutting condition table.
3. Wet cutting is recommended.

Helical interpolation



- Calculation of tool pass dia.

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

Tool pass dia. Bore dia. Tool dia.

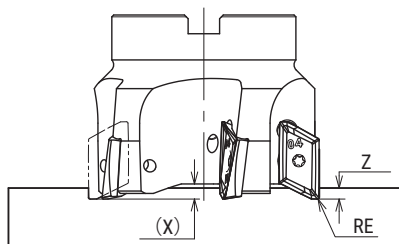
- Depth of cut per one circuit should not exceed max. depth of cut Ap
- Down cutting is recommended, tool pass rotation should be counterclockwise

Tool dia. (mm)	Min.bore dia. (mm)	Max. Bore dia. (mm)	Max.Depth of cut (mm)		
			Aluminium	Stainless steel	Titanium alloy
φDc	φDh min.	φDh max.			
20	35.8	38.6	15	9	9
25	45.8	48.6	13	11	11
28	51.8	54.6	12	10	10
30	55.8	58.6	11	10	10
32	59.8	62.6	11	10	10
35	65.8	68.6	11	11	11
40	75.8	78.6	10	10	10
50	96.8	98.6	10	10	10
63	122.8	124.6	10	10	10

Note

1. In case of helical interpolation, apply 70% or less feed (Vf) from standard cutting condition table.
2. When cutting Titanium/Stainless steel, apply 0.005mm or less (fz) from standard cutting condition table.
3. Wet cutting is recommended.

Drilling



Coner radius R (mm)	Max. depth of cut: Z (mm)
RE	Z
R2.5 or below	3
R3 / R3.2	2
R4	1.5

Note

1. Do not combine drilling and ramping together.
2. In case of drilling, apply 50% or less feed (Vf) from standard cutting condition table.
3. Long chips may come out in case of drilling, confirm safe operating conditions.

Recommended Cutting Conditions | Shoulder Milling

● Bore Type

Material	Grade	Tool dia. (mm)									
		50					63				
		4N					5N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	100	15	150	5,700	4,560	100	15	225	4,500	4,500
		150	12	96	5,700	4,560	150	12	168	4,500	4,500
		200	9	54	5,700	4,560	200	9	108	4,500	4,500
Stainless Steel Below 250HB	JC5118	100	10	80	640	260	100	10	120	510	260
		150	8	48	640	260	150	8	88	510	260
		200	6	27	640	260	200	6	54	510	260
Titanium Alloy 35-43 HRC	JC5118	100	15	120	380	120	100	15	180	300	120
		150	12	72	380	120	150	12	132	300	120
		200	9	40	380	120	200	9	81	300	120

● Shank Type

Material	Grade	Tool dia. (mm)									
		20					25/28				
		2N					2N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	35	12	40	14,300	1,430	50	15	75	11,500	4,600
		60	9	25	14,300	1,430	75	12	48	11,500	4,600
Stainless Steel Below 250HB	JC5118	35	2	12	1,590	160	50	10	40	1,270	250
		60	1.2	12	1,590	160	75	8	24	1,270	250
Titanium Alloy 35-43 HRC	JC5118	35	4	12	950	76	50	15	60	760	120
		60	2.5	12	950	76	75	12	36	760	120

Material	Grade	Tool dia. (mm)									
		32/35					40				
		2N					3N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	50	15	120	9,000	3,600	80	15	125	7,200	4,320
		100	12	60	9,000	3,600	120	12	75	7,200	4,320
Stainless Steel Below 250HB	JC5118	50	10	60	990	200	80	10	65	800	240
		100	8	30	990	200	120	8	40	800	240
Titanium Alloy 35-43 HRC	JC5118	50	15	96	600	96	80	15	100	480	120
		100	12	48	600	96	120	12	60	480	120

Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed
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 of water soluble cutting oil is recommended when machining Aluminium alloy or Titanium alloy.

■ Recommended Cutting Conditions | Shoulder Milling

● Modular Type + MSN Type carbide shank holder

Material	Grade	Tool dia. (mm)									
		20					25/28				
		1N					2N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	60	12	40	14,300	1,430	75	15	75	11,500	4,600
		100	9	18	14,300	1,430	125	12	36	11,500	4,600
		160	5	8	11,500	1,150	200	6	15	9,200	3,680
Stainless Steel Below 250HB	JC5118	60	8	20	1,590	160	75	10	40	1,270	250
		100	6	10	1,590	160	125	8	20	1,270	250
		160	3	4	1,270	130	200	4	8	1,020	200
Titanium Alloy 35-43 HRC	JC5118	60	12	32	950	76	75	15	60	760	120
		100	9	15	950	76	125	12	30	760	120
		160	5	6	760	61	200	6	12	610	98

Material	Grade	Tool dia. (mm)									
		30/32/35					40				
		2N					3N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	100	15	96	9,000	3,600	100	15	120	6,000	3,600
		160	12	48	9,000	3,600	160	12	60	6,000	3,600
		260	6	18	7,200	2,880	260	6	24	4,800	2,880
Stainless Steel Below 250HB	JC5118	100	10	50	990	200	100	10	65	660	200
		160	8	24	990	200	160	8	32	660	200
		260	4	10	800	160	260	4	12	530	160
Titanium Alloy 35-43 HRC	JC5118	100	15	75	600	96	100	15	96	400	96
		160	12	36	600	96	160	12	45	400	96
		260	6	15	480	77	260	6	18	320	77

Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed
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 of water soluble cutting oil is recommended when machining Aluminium alloy or Titanium alloy.

Recommended Cutting Conditions | Face Milling

● Bore Type

Material	Grade	Tool dia. (mm)									
		50					63				
		4N					5N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	100	6	35	5,700	4,560	100	7	44	4,500	4,500
		150	4	35	5,700	4,560	150	5	44	4,500	4,500
		200	2	35	5,700	4,560	200	3	44	4,500	4,500
Stainless Steel Below 250HB	JC5118	100	3	30	640	260	100	4	38	510	260
		150	2	30	640	260	150	2.5	38	510	260
		200	1	30	640	260	200	1.5	38	510	260
Titanium Alloy 35-43 HRC	JC5118	100	6	30	380	120	100	7	38	300	120
		150	4	30	380	120	150	5	38	300	120
		200	2	30	380	120	200	3	38	300	120

● Shank Type

Material	Grade	Tool dia. (mm)									
		20					25/28				
		1N					2N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	35	4	14	14,300	1,430	50	6	17.5	11,500	4,600
		60	2.5	14	14,300	1,430	75	4	17.5	11,500	4,600
Stainless Steel Below 250HB	JC5118	35	2	12	1,590	160	50	3	15	1,270	250
		60	1.2	12	1,590	160	75	2	15	1,270	250
Titanium Alloy 35-43 HRC	JC5118	35	4	12	950	76	50	6	15	760	120
		60	2.5	12	950	76	75	4	15	760	120

Material	Grade	Tool dia. (mm)									
		32/35					40				
		2N					3N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	50	7	22.5	9,000	3,600	80	6	28	7,200	4,320
		100	4	22.5	9,000	3,600	120	4	28	7,200	4,320
Stainless Steel Below 250HB	JC5118	50	4	19	990	200	80	3	24	800	240
		100	2	19	990	200	120	2	24	800	240
Titanium Alloy 35-43 HRC	JC5118	50	7	19	600	96	80	6	24	480	120
		100	4	19	600	96	120	4	24	480	120

Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed
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 of water soluble cutting oil is recommended when machining Aluminium alloy or Titanium alloy.

■ Recommended Cutting Conditions | Face Milling

● Modular Type + MSN Type carbide shank holder

Material	Grade	Tool dia. (mm)									
		20					25/28				
		1N					2N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	60	4	14	14,300	1,430	75	6	17.5	11,500	4,600
		100	2	14	14,300	1,430	125	3	17.5	11,500	4,600
		160	0.8	14	11,500	1,150	200	1.2	17.5	9,200	3,680
Stainless Steel Below 250HB	JC5118	60	2	12	1,590	160	75	3	15	1,270	250
		100	1	12	1,590	160	125	1.5	15	1,270	250
		160	0.5	12	1,270	130	200	0.6	15	1,020	200
Titanium Alloy 35-43 HRC	JC5118	60	4	12	950	76	75	6	15	760	120
		100	2	12	950	76	125	3	15	760	120
		160	0.8	12	760	61	200	1.2	15	610	98

Material	Grade	Tool dia. (mm)									
		30/32/35					40				
		2N					3N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (mm ⁻¹)	V_f (mm/min)
Aluminium Alloy 50-110 HB	FZ05	100	6	22.5	9,000	3,600	100	6	28	6,000	3,600
		160	3	22.5	9,000	3,600	160	3	28	6,000	3,600
		260	1.2	22.5	7,200	2,880	260	1.2	28	4,800	2,880
Stainless Steel Below 250HB	JC5118	100	3	19	990	200	100	3	24	660	200
		160	1.5	19	990	200	160	1.5	24	660	200
		260	0.6	19	800	160	260	0.6	24	530	160
Titanium Alloy 35-43 HRC	JC5118	100	6	19	600	96	100	6	24	400	96
		160	3	19	600	96	160	3	24	400	96
		260	1.2	19	480	77	260	1.2	24	320	77

Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce the depth of cut a_p or Spindle speed
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 of water soluble cutting oil is recommended when machining Aluminium alloy or Titanium alloy.