TIZ IMPLEMENTS

MILLING
FREZOWANIE

MILLING
FREZOWANIE

SOLID CARBIDE END MILLS
FREZY WĘGLIKOWE MONOLITYCZNE

UFG	Hard Twarde	<70HRC
UFX	Hard Twarde	65HRC (Possible, Możliwe) <55HRC (Recommended, Zalecane)
UFI		30-40HRC
UFJ	Difficult to cut materials Materiały ciężko obrabialne	<45HRC
UFA		Aluminuim Aluminium
UFD		Graphite Grafit
UFC		Copper Miedź
UCX		Multi purpose Uniwersalne
PMT		Powder Metal End Mills Frezy proszkowe
HSS		HSSCo8 End Mills Frezy HSSCo8
TSLOT		T-slot T-slot
CBN		CBN Milling Cutters Narzędzia frezarskie CBN

GROUP GRUPA					ISO	PAGE STRONA
UFG04		R	4		P M K N S H	21
UFG86			2		P M K N S H	25
UFG54			2		P M K N S H	28
UFG28			2		P M K N S H	31
UFG38			2		P M K N S H	34
UFG53			2		P M K N S H	37
UFG59			3		P M K N S H	40
UFG41			4		P M K N S H	42
UFG01		R	2		P M K N S H	44
UFG01		R	2		P M K N S H	46
UFG36		R	2		P M K N S H	49
UFG52		R	2		P M K N S H	53
UFG50		R	2		P M K N S H	55
UFG47		R	4		P M K N S H	57
UFG37		R	4		P M K N S H	59
UFG18		R	4		P M K N S H	61
UFG39		R	6		P M K N S H	63
UFG83			2		P M K N S H	65
UFG31			2		P M K N S H	70
UFG95			2		P M K N S H	74
UFG40			6		P M K N S H	76

GROUP GRUPA				ISO	PAGE STRONA
UFG40 LONG			6	P M K N S H	78
UFX51			2	P M K N S H	85
UFX56			2	P M K N S H	91
UFX54		R	2	P M K N S H	113
UFX58		R	2	P M K N S H	123
UFX61		R	4	P M K N S H	144
UFX62		R	4	P M K N S H	151
UFX67			2	P M K N S H	165
UFX71			2	P M K N S H	174
UFX69			2	P M K N S H	184
UFX70			4	P M K N S H	201
UFX75			4	P M K N S H	207
UFX73			4	P M K N S H	214
UFX74			4	P M K N S H	224
UFX77			6	P M K N S H	234
UFX60		R	4-5	P M K N S H	239
UFX21			2	P M K N S H	241
UFX13			2	P M K N S H	244
UFX24			2	P M K N S H	247
UFX02			2	P M K N S H	250
UFX15			4	P M K N S H	253

GROUP GRUPA				ISO	PAGE STRONA
UFX27		R	2	P M K N S H	256
UFX28		R	2	P M K N S H	258
UFX29		R	4	P M K N S H	261
UFX41		R	4	P M K N S H	263
UFX42			2	P M K N S H	265
UFX44			2	P M K N S H	269
UFX46			3	P M K N S H	273
UFX11			4	P M K N S H	276
UFX17			4	P M K N S H	278
UFX59			6-8	P M K N S H	280
UFX81			6	P M K N S H	282
UFX91			3-4	P M K N S H	284
UFI40		R	4	P M K N S H	289
UFI28		R	5	P M K N S H	293
UFI30		R	5	P M K N S H	295
UFI20		R	5	P M K N S H	299
UFI25		R	5	P M K N S H	301
UFI60		R	6	P M K N S H	303
UFI80		R	6	P M K N S H	305
UFI12			6	P M K N S H	307
UFI14			6	P M K N S H	309

GROUP GRUPA				ISO	PAGE STRONA
UFJ35		R	5	P M K N S H	314
UFJ11			2	P M K N S H	315
UFJ13			4	P M K N S H	317
UFJ15			6-8	P M K N S H	319
UFJ31			3-5	P M K N S H	322
UFJ17			4-6	P M K N S H	324
UFJ19			3-6	P M K N S H	326
UFJ21			4-6	P M K N S H	329
UFJ40			4	P M K N S H	331
UFJ79		R	4	P M K N S H	333
UFJ81		R	4	P M K N S H	336
UFJ83		R	4	P M K N S H	339
UFJ78			4	P M K N S H	343
UFJ80			4	P M K N S H	346
UFJ82			4	P M K N S H	349
UFJ74			5	P M K N S H	352
UFA60			3	P M K N S H	357
UFA61			3	P M K N S H	357
UFA62			3	P M K N S H	360
UFA63			3	P M K N S H	360
UFA64			3	P M K N S H	363
UFA65			3	P M K N S H	363

GROUP GRUPA				ISO	PAGE STRONA
UFA58			3	P M K N S H	365
UFA59			3	P M K N S H	365
UFA15			2	P M K N S H	367
UFA31			3	P M K N S H	368
UFA18		R	2	P M K N S H	369
UFA14		R	2	P M K N S H	370
UFA21		R	3	P M K N S H	371
UFA11			1	P M K N S H	373
UFA17			2	P M K N S H	374
UFA12			2	P M K N S H	375
UFA20			3	P M K N S H	376
UFA19			3	P M K N S H	377
UFA27			3	P M K N S H	378
UFA32			3	P M K N S H	379
UFD97			2	P M K N S H	384
UFD16			2	P M K N S H	386
UFD80			2	P M K N S H	387
UFD51			2	P M K N S H	388
UFD50			2	P M K N S H	389
UFD28			2	P M K N S H	390
UFD81			3	P M K N S H	391

GROUP GRUPA					ISO	PAGE STRONA
UFD96		R	2		N	392
UFD24			2		N	394
UFD13		R	3		N	395
UFD14		R	3		N	396
UFD25		R	4		N	397
UFD27		R	2		N	398
UFC11			2		N	403
UFC10			2		N	404
UFC12		R	2		N	406
UFC14			2		N	408
UFC13			2		N	410
UCX13			2		P M K N S H	416
UCX86			2		P M K N	428
UCX15			4		P M K N S H	431
UCX18		R	2		P M K N H	433
UCX19		R	4		P M K N H	439
UCX10			2		P M K N S H	443
UCX83			2		P M K N	459
UCX95			3		P M K N S H	462
UCX96			3		P M K N S H	486
UCX11			4		P M K N S H	492
UCX32			4-6		P K H	508

GROUP GRUPA					ISO	PAGE STRONA
UCX14			3-5		P M K N S H	510
UCX34			2		P M K N	512
PMT50			2		P M K N H	519
PMT51			2		P M K N H	521
PMT64			3		P M K N H	523
PMT52			4		P M K N H	526
PMT53			4		P M K N H	528
PMT54			4		P M K N H	531
PMT55		R	4-5		P M K N H	533
PMT56			3-5		P M K N H	535
PMT58			3-5		P M K N H	539
PMT60			2		P M K N	541
PMT62			2		P M K N	544
PMT66			2		P M K N	547
PMT69			2		P M K N	550
PMT82			3		P M K N	553
PMT84			3		P M K N	558
PMT88			4		P M K N	563
PMT61			4		P M K N	566
PMT81			3-5		P M K N	569
PMT85			3-5		P M K N	572
PMT26			3-6		P M K N	575

GROUP GRUPA				ISO	PAGE STRONA
PMT83			3-5	P M K N S H	578
PMT74			3-5	P M K N S H	581
PMT77			4-5	P M K N S H	584
HM035/ HMF35			2	P M K N S H	591
HM092/ HMF92			2	P M K N S H	594
HM61			1	P M K N S H	597
HM070/ HMF70			2	P M K N S H	598
HM071/ HMF71			2	P M K N S H	604
HM010/ HMF10			2	P M K N S H	614
HM064			2	P M K N S H	619
HM009			2	P M K N S H	621
HM072/ HMF72			3	P M K N S H	623
HM073/ HMF73			3	P M K N S H	632
HM016/ HMF16			3	P M K N S H	641
HM053/ HMF53			3	P M K N S H	650
HM054/ HMF54			3	P M K N S H	659
HM095/ HMF95			4	P M K N S H	668
HM097/ HMF97			4	P M K N S H	673
HM098/ HMF98			6	P M K N S H	678
HM0A3/ HMFA3			3-6	P M K N S H	683
HM0B2/ HMFB2			3-6	P M K N S H	688
HM0A5			3	P M K N S H	693

GROUP GRUPA				ISO	PAGE STRONA
HM0A1/ HMFA1			3-6	P M K N S H	695
HM0A2/ HMFA2			3-6	P M K N S H	700
JO10			10	P M K N S H	708
SLO03			10	P M K N S H	710
SLO12			10	P M K N S H	712
SLO07			10	P M K N S H	715
MON10			18-24	P M K N S H	717
MON15			14-18	P M K N S H	719
MOE10			6-10	P M K N S H	725
MOE16			4-6	P M K N S H	727
MOE12			6-12	P M K N S H	728
MOE14			6-12	P M K N S H	730
MOE18			6-12	P M K N S H	732
HM20			4	P M K N S H	734
CBN01			2	P M K N S H	739
CBN02		R	2	P M K N S H	740

SYMBOLS SYMBOLE

TOLERANCE / TOLERANCJA

Outside diameter tolerance indicates diameter tolerance of end mill, (µm)
Tolerancja średnicy zewnętrznej wskazuje tolerancję średnicy freza palcowego, (µm)

R tolerance indicates the Radius tolerance of a ball nose end mill, (mm)
Tolerancja promienia określa tolerancję promienia freza kulistego, (mm)

Tolerance of Taper angle indicates the tolerance of taper angle on the side of a taper end mill in decimal minutes
Tolerancja stożka określa tolerancję kąta stożka dla boku freza stożkowego w minutach kątowych

Tolerance of Point angle indicates the tolerance of the point angle of the taper end mill, (µm)
Tolerancja wierzchołka określa tolerancję wierzchołka stożka dla freza stożkowego, (µm)

MATERIAL / MATERIAŁ

UF Ultra micro grain solid carbide end mills
Frezy walcowo-czołowe z ultra drobnoziarnistego węglika spiekanego

CBN Cubic Boron Nitride CBN
Frezy z azotkiem boru

PM Powder Metal End Mills
Frezy walcowo-czołowe proszkowe

GEOMETRY / GEOMETRIA

Helix angle
Kąt pochylenia rowka wiórowego

Center cut
Skrawanie walcowo-czołowe

Non center cut
Skrawanie obwodowe

SHANK / CHWYT

A Plain Shank
Chwyt walcowy (HA)

B Flat Shank
Chwyt typu Weldon (HB)

PERFORMANCE / WYDAJNOŚĆ

HPM Qmax — High Performance Machining
Obróbka wydajnościowa

XSM Fmax — Ultra High-Feed Machining
Obróbka z dużym posuwem

HSM Vmax — High Speed Machining
Obróbka szybkościowa

CSM Standard — Conventional Speed Machining
Obróbka konwencjonalna

MACHINIG / TYP OBRÓBKI

Rough — Roughing
Zgrubna

Medium — Semi-Finishing
Półwykańczająca

Finish — Finishing
Wykańczająca

MILLING TOOL SHAPE / KSZTAŁT FREZA

Square type
Frez walcowo-czołowy

Square type with radius
Frez walcowo czołowy z promieniem

Ball nose
Frez kulisty

Cone shape
Frez stożkowy

Cone shape with ball nose
Frez stożkowy z zaokrągleniem

COOLING / CHŁODZENIE

AIR — Air cooling
Chłodzenie powietrzem

No cooling
Brak chłodzenia

Oil cooling
Chłodzenie olejowe

Normal liquid cooling
Normalne chłodzenie emulsją

max — Maximal liquid cooling
Maksymalne chłodzenie emulsją

min — Minimal liquid cooling
Minimalne chłodzenie emulsją

CUTTING SHAPES / RODZAJ OBRÓBKI

Facing
Planowanie

Spot Facing
Pogłębianie czołowe

Side Cutting
Frezowanie boku

Taper Cutting
Frezowanie rowka stożkowego

Slotting
Frezowanie rowka

Radius Taper Cutting cartridge
Frezowanie rowka stożkowego z promieniem

Die sinking
Frezowanie form

Side-open Cavity Cutting
Frezowanie zagłębień otwartych

Profiling
Obróbka kształtowa

Corner Recessing
Frezowanie naroży

Radius Cutting
Frezowanie zaokrągleń

Miniature Cutting
Frezowanie miniaturowe

Chamfering
Fazowanie

Ramp down
Zagłębianie skośne

Helical Cutting
Obróbka helikalna

Plunging&Recessing
Zagłębienie narzędzia i obróbka wybrania

Contour line cutting
Obróbka profilowa warstwowa

TOOL LENGHT / DŁUGOŚĆ NARZĘDZIA

Short lenght tool
Narzędzie krótkie

Long lenght tool
Narzędzie długie

Normal lenght tool
Narzędzie standardowe

Extra long lenght tool
Narzędzie bardzo długie

NUMBER OF TEETH / LICZBA ZĘBÓW

6 — Number indicates number of theeth
Liczba wskazuje liczbę zębów

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

APPLICATION / ZASTOSOWANIA

Material Materiał	Coating Powłoka	G	X	J	D	A	C	T
	Hardness Twardość HRC	30 ~ 70	≤ 65	≤ 45	-	-	-	≤ 40
Carbon steels Stale węglowe		●	●	●				●
Alloy steels Stale stopowe		●	●	●				●
Prehardened Steels Stale ulepszane		●	●	●				●
Hardened Steels Stale hartowane		●	●					
Cooper Miedź			○			●	●	○
Graphite Grafit					●	○		
Plastics Tworzywa sztuczne					●	●		
Cast Iron Żeliwo		●	●					●
Aluminium alloy Si>10% Stopy aluminium Si>10%			○		●	●		
Aluminium alloy Si<10% Stopy aluminium Si<10%						●		
Stainless Steel Stale nierdzewne				●				●
Heat resistant steels Stale żaroodporne		●	●					○
Titanium Tytan				●				○

● Recommended Zalecane

○ Possible Możliwe

N no coating brak powłoki

P M K N S H

UFG END MILLS are designed for HSM and dry machining of high hardened materials from 25 up to 70 HRC.

Frezy UFG przeznaczone są do obróbki HSM i na sucho materiałów o wysokiej twardości od 25 do 70 HRC.

UFG END MILLS
FREZY UFG

UFG END MILLS are designed for HSM and dry machining of high hardened materials from 25 up to 70 HRC.

FREZY WALCOWO-CZOŁOWE UFG przede wszystkim zalecane są do obróbki szybkościowej (OS) na sucho materiałów utwardzonych o twardości 25 - 70HRC.

NOTE:

- If the rigidity of the machine or the work material installation is very low, or chattering and noise is generated, please reduce RPM and FEED rate proportionally
- Cutting conditions may be considerably different due to the tool overhang, depth of cut, and machining tool condition, please use the catalogue cutting parameters as a reference starting point
- If the depth of cut is shallow, the RPM and FEED rate can be increased
- For hardened materials air blow/air oil mist is recommended
- A high-speed spindle is recommended, when using a reduced RPM, the FEED rate must be reduced proportionally
- Use a rigid machine and work clamping method
- Down (climb) cutting is recommended
- We recommend that you set the width of cut as small as possible (about 5% of dia.) and divide the machining into several passes and work on high cutting parameters. There will be much higher tool life and surface roughness
- When drilling, please set the FEED rate 30% below the normal rate

- UWAGA:
- Jeżeli sztywność obrabiarki lub mocowanie obrabianego przedmiotu nie są wystarczające lubwystępują wibracje i nadmierny hałas, należy proporcjonalnie zmniejszyć obroty i posuw
- Parametry skrawania mogą być różne w zależności od długości narzędzia wystającegoz oprawki, głębokości skrawania oraz stanu obrabiarki. Proszę stosować parametry skra-wania podane w katalogu jako wyjściowy punkt odniesienia
- Jeżeli głębokość skrawania jest mała, obroty i posuw mogą być zwiększone
- Przy obróbce twardych materiałów zaleca się stosowanie nadmuchu powietrza lub mgły olejowej
- Zalecane jest stosowanie wysokoobrotowych obrabiarek; w przypadku mniejszych prędkościobrotowych, posuw powinien być zmniejszony proporcjonalnie
- Zalecane jest stosowanie sztywnych obrabiarek oraz systemów mocowania
- Zalecane jest frezowanie współbieżne
- Zalecamy stosowanie możliwie najmniejszej szerokości skrawania - około 5% średnicy roboczej narzędzia i podzielenie operacji obróbki na kilka przejść przy większych parametrach skrawania, co znacznie wydłuży żywotność narzędzia oraz polepszy jakość obrabianej powierzchni
- Przy zagłębianiu zalecane jest ustawienie posuwu wgłębnego na poziomie o 30% mniejszym od posuwu roboczego

Group					ISO	PAGE
UFG04		R	4		P M K N S H	21
UFG86			2		P M K N S H	25
UFG54			2		P M K N S H	28
UFG28			2		P M K N S H	31
UFG38			2		P M K N S H	34
UFG53			2		P M K N S H	37
UFG59			3		P M K N S H	40
UFG41			4		P M K N S H	42
UFG01		R	2		P M K N S H	44
UFG01		R	2		P M K N S H	46
UFG36		R	2		P M K N S H	49
UFG52		R	2		P M K N S H	53
UFG50		R	2		P M K N S H	55
UFG47		R	4		P M K N S H	57
UFG37		R	4		P M K N S H	59
UFG18		R	4		P M K N S H	61
UFG39		R	6		P M K N S H	63
UFG83			2		P M K N S H	65
UFG31			2		P M K N S H	70
UFG95			2		P M K N S H	74

Group					ISO	PAGE
UFG40			6		P M K N S H	76
UFG40 LONG			6		P M K N S H	78

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

UFG04

R 4 Finish Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																												●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG04002005A06001050	0,5	2	6	1	6	50	1,8
UFG04003005A06001050	0,5	3	6	1,2	8	50	2,8
UFG04004005A06002050	0,5	4	6	1,5	10	50	3,8
UFG04060005A06012060	0,5	6	6	2,5	12	60	5,4
UFG04006010A06003060	1	6	6	2,5	12	60	5,4
UFG04080010A08016060	1	8	8	3,5	16	60	7,2
UFG04008020A08004060	2	8	8	3,5	16	60	7,2
UFG04100010A10020070	1	10	10	4	20	70	9
UFG04010020A10004070	2	10	10	4	20	70	9
UFG04120020A12025080	2	12	12	5	25	80	11
UFG04012030A12005080	3	12	12	5	25	80	11

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG04002005A06001070	0,5	2	6	1	6	70	1,8
UFG04003005A06001070	0,5	3	6	1,2	8	70	2,8
UFG04004005A06002070	0,5	4	6	1,5	10	70	3,8
UFG04005005A06002070	0,5	5	6	2	10	70	4,6
UFG04006005A06003090	0,5	6	6	2,5	12	90	5,4
UFG04006010A06003090	1	6	6	2,5	12	90	5,4
UFG04008010A08004010	1	8	8	3,5	16	100	7,2
UFG04008020A08004100	2	8	8	3,5	16	100	7,2
UFG04010010A10004100	1	10	10	4	20	100	9
UFG04010020A10004100	2	10	10	4	20	100	9
UFG04012020A12005110	2	12	12	5	25	110	11
UFG04012030A12005110	3	12	12	5	25	110	11
UFG04016030A16007130	3	16	16	6,5	30	130	15

MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	± 0.005	h5

UFG04

CUTTING CONDITIONS PARAMETRY SKRAWANIA

HIGH SPEED SIDE CUTTING / FREZOWANIE BOKIEM, OBRÓBKA SZYBKOŚCIOWA

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	5	0.3D	0.1R	Vc m/min	180	205	215	235	255	250	250	250	250
				fz mm/tooth	0.129	0.182	0.257	0.3	0.343	0.463	0.578	0.701	0.925
				rpm obr/min	28648	21751	17109	14961	13528	9947	7958	6631	4974
				feed posuw mm/min	14782	15835	17588	17953	18561	18422	18398	18595	18402
	8-9	0.3D	0.1R	Vc m/min	180	205	215	235	255	250	250	250	250
				fz mm/tooth	0.129	0.182	0.257	0.3	0.343	0.463	0.578	0.701	0.925
				rpm obr/min	28648	21751	17109	14961	13528	9947	7958	6631	4974
				feed posuw mm/min	14782	15835	17588	17953	18561	18422	18398	18595	18402
	11.1	0.3D	0.1R	Vc m/min	180	205	215	235	255	250	250	250	250
				fz mm/tooth	0.129	0.182	0.257	0.3	0.343	0.463	0.578	0.701	0.925
				rpm obr/min	28648	21751	17109	14961	13528	9947	7958	6631	4974
				feed posuw mm/min	14782	15835	17588	17953	18561	18422	18398	18595	18402
	11.2	0.3D	0.1R	Vc m/min	140	160	165	175	200	200	200	200	195
				fz mm/tooth	0.111	0.147	0.231	0.284	0.329	0.438	0.547	0.66	0.897
				rpm obr/min	22282	16977	13130	11141	10610	7958	6366	5305	3879
				feed posuw mm/min	9893	9982	12132	12656	13963	13942	13929	14006	13919
H	38.1	0.3D	0.1R	Vc m/min	140	160	165	175	200	200	200	200	195
				fz mm/tooth	0.111	0.147	0.231	0.284	0.329	0.438	0.547	0.66	0.897
				rpm obr/min	22282	16977	13130	11141	10610	7958	6366	5305	3879
				feed posuw mm/min	9893	9982	12132	12656	13963	13942	13929	14006	13919
	38.2	0.3D	0.1R	Vc m/min	95	200	140	155	170	170	170	170	165
				fz mm/tooth	0.131	0.16	0.209	0.25	0.306	0.404	0.509	0.611	0.833
				rpm obr/min	15120	21221	11141	9868	9019	6764	5411	4509	3283
				feed posuw mm/min	7923	13581	9314	9868	11039	10931	11017	11021	10938
	39.1	0.3D	0.05R	Vc m/min	70	90	100	110	120	120	120	120	120
				fz mm/tooth	0.101	0.121	0.172	0.214	0.25	0.349	0.447	0.547	0.729
				rpm obr/min	11141	9549	7958	7003	6366	4775	3820	3183	2387
				feed posuw mm/min	4501	4622	5475	5994	6366	6665	6830	6965	6961
	39.2	0.3D	0.05R	Vc m/min	55	65	70	75	85	85	85	85	85
				fz mm/tooth	0.07	0.091	0.129	0.158	0.2	0.301	0.352	0.4	0.5
				rpm obr/min	8754	6897	5570	4775	4509	3382	2706	2255	1691
				feed posuw mm/min	2451	2510	2874	3018	3608	4072	3810	3608	3382
	40	0.3D	0.1R	Vc m/min	140	160	165	175	200	200	200	200	195
				fz mm/tooth	0.111	0.147	0.231	0.284	0.329	0.438	0.547	0.66	0.897
				rpm obr/min	22282	16977	13130	11141	10610	7958	6366	5305	3879
				feed posuw mm/min	9893	9982	12132	12656	13963	13942	13929	14006	13919
	41	0.3D	0.1R	Vc m/min	95	200	140	155	170	170	170	170	165
				fz mm/tooth	0.131	0.16	0.209	0.25	0.306	0.404	0.509	0.611	0.833
				rpm obr/min	15120	21221	11141	9868	9019	6764	5411	4509	3283
				feed posuw mm/min	7923	13581	9314	9868	11039	10931	11017	11021	10938

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG04

CUTTING CONDITIONS PARAMETRY SKRAWANIA

NORMAL SPEED SIDE CUTTING / FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	5	0.5D	0.2R	Vc m/min	85	90	100	100	110	110	110	110	110
				fz mm/tooth	0.12	0.17	0.22	0.281	0.33	0.44	0.546	0.659	0.869
				rpm obr/min	13528	9549	7958	6366	5836	4377	3501	2918	2188
				feed posuw mm/min	6494	6494	7003	7156	7703	7703	7647	7691	7607
	8-9	0.5D	0.2R	Vc m/min	85	90	100	100	110	110	110	110	110
				fz mm/tooth	0.12	0.17	0.22	0.281	0.33	0.44	0.546	0.659	0.869
				rpm obr/min	13528	9549	7958	6366	5836	4377	3501	2918	2188
				feed posuw mm/min	6494	6494	7003	7156	7703	7703	7647	7691	7607
	11.1	0.5D	0.2R	Vc m/min	85	90	100	100	110	110	110	110	110
				fz mm/tooth	0.12	0.17	0.22	0.281	0.33	0.44	0.546	0.659	0.869
				rpm obr/min	13528	9549	7958	6366	5836	4377	3501	2918	2188
				feed posuw mm/min	6494	6494	7003	7156	7703	7703	7647	7691	7607
	11.2	0.5D	0.2R	Vc m/min	60	65	70	75	75	75	75	75	80
				fz mm/tooth	0.099	0.15	0.2	0.25	0.299	0.402	0.5	0.598	0.79
				rpm obr/min	9549	6897	5570	4775	3979	2984	2387	1989	1592
				feed posuw mm/min	3782	4138	4456	4775	4759	4799	4775	4759	5029
H	38.1	0.5D	0.2R	Vc m/min	60	65	70	75	75	75	75	75	80
				fz mm/tooth	0.099	0.15	0.2	0.25	0.299	0.402	0.5	0.598	0.79
				rpm obr/min	9549	6897	5570	4775	3979	2984	2387	1989	1592
				feed posuw mm/min	3782	4138	4456	4775	4759	4799	4775	4759	5029
	38.2	0.5D	0.2R	Vc m/min	35	45	50	55	55	55	55	55	55
				fz mm/tooth	0.1	0.151	0.2	0.235	0.302	0.398	0.5	0.603	0.795
				rpm obr/min	5570	4775	3979	3501	2918	2188	1751	1459	1094
				feed posuw mm/min	2228	2884	3183	3291	3525	3484	3501	3519	3480
	39.1	0.5D	0.1R	Vc m/min	20	25	30	35	35	35	35	35	35
				fz mm/tooth	0.078	0.101	0.132	0.182	0.25	0.33	0.42	0.5	0.661
				rpm obr/min	3183	2653	2387	2228	1857	1393	1114	928	696
				feed posuw mm/min	993	1072	1261	1622	1857	1838	1872	1857	1841
	39.2	0.5D	0.1R	Vc m/min	15	20	20	25	25	25	25	25	25
				fz mm/tooth	0.063	0.08	0.1	0.117	0.147	0.2	0.25	0.299	0.398
				rpm obr/min	2387	2122	1592	1592	1326	995	796	663	497
				feed posuw mm/min	602	679	637	745	780	796	796	793	792
	40	0.5D	0.2R	Vc m/min	60	65	70	75	75	75	75	75	80
				fz mm/tooth	0.099	0.15	0.2	0.25	0.299	0.402	0.5	0.598	0.79
				rpm obr/min	9549	6897	5570	4775	3979	2984	2387	1989	1592
				feed posuw mm/min	3782	4138	4456	4775	4759	4799	4775	4759	5029
	41	0.5D	0.2R	Vc m/min	35	45	50	55	55	55	55	55	55
				fz mm/tooth	0.1	0.151	0.2	0.235	0.302	0.398	0.5	0.603	0.795
				rpm obr/min	5570	4775	3979	3501	2918	2188	1751	1459	1094
				feed posuw mm/min	2228	2884	3183	3291	3525	3484	3501	3519	3480

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG86

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG86001X50A04000045	0,05	0,1	4	0,1	0,3	45	0,085
UFG86001X50A04001045	0,05	0,1	4	0,1	0,5	45	0,085
UFG86002001A04000045	0,1	0,2	4	0,2	0,5	45	0,17
UFG86002001A04001045	0,1	0,2	4	0,2	1	45	0,17
UFG86002001A04002045	0,1	0,2	4	0,2	1,5	45	0,17
UFG86003002A04001045	0,15	0,3	4	0,3	1	45	0,27
UFG86003002A04002045	0,15	0,3	4	0,3	2	45	0,27
UFG86003002A04003045	0,15	0,3	4	0,3	3	45	0,27
UFG86004002A04001045	0,2	0,4	4	0,4	1	45	0,37
UFG86004002A04002045	0,2	0,4	4	0,4	2	45	0,37
UFG86004002A04003045	0,2	0,4	4	0,4	3	45	0,37
UFG86004002A04004045	0,2	0,4	4	0,4	4	45	0,37
UFG86004002A04005045	0,2	0,4	4	0,4	5	45	0,37
UFG86005003A04002045	0,25	0,5	4	0,4	2	45	0,45
UFG86005003A04003045	0,25	0,5	4	0,4	2,5	45	0,45
UFG86005003A04004045	0,25	0,5	4	0,4	4	45	0,45
UFG86005003A04006045	0,25	0,5	4	0,4	6	45	0,45
UFG86005003A04008045	0,25	0,5	4	0,4	8	45	0,45
UFG86006003A04002045	0,3	0,6	4	0,5	2	45	0,55
UFG86006003A04003045	0,3	0,6	4	0,5	3	45	0,55
UFG86006003A04004045	0,3	0,6	4	0,5	4	45	0,55
UFG86006003A04005045	0,3	0,6	4	0,5	5	45	0,55
UFG86006003A04006045	0,3	0,6	4	0,5	6	45	0,55
UFG86006003A04008045	0,3	0,6	4	0,5	8	45	0,55
UFG86006003A04010045	0,3	0,6	4	0,5	10	45	0,55
UFG86008004A04002045	0,4	0,8	4	0,6	2	45	0,75
UFG86008004A04004045	0,4	0,8	4	0,6	4	45	0,75
UFG86008004A04006045	0,4	0,8	4	0,6	6	45	0,75
UFG86008004A04008045	0,4	0,8	4	0,6	8	45	0,75
UFG86008004A04010045	0,4	0,8	4	0,6	10	45	0,75
UFG86010005A04003045	0,5	1	4	0,8	3	45	0,95
UFG86010005A04004045	0,5	1	4	0,8	4	45	0,95
UFG86010005A04005045	0,5	1	4	0,8	5	45	0,95
UFG86010005A04006045	0,5	1	4	0,8	6	45	0,95
UFG86010005A04007045	0,5	1	4	0,8	7	45	0,95
UFG86010005A04008045	0,5	1	4	0,8	8	45	0,95
UFG86010005A04009045	0,5	1	4	0,8	9	45	0,95
UFG86010005A04010045	0,5	1	4	0,8	10	45	0,95

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFG86

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG86010005A04012045	0,5	1	4	0,8	12	45	0,95
UFG86010005A04014050	0,5	1	4	0,8	14	50	0,95
UFG86010005A04016050	0,5	1	4	0,8	16	50	0,95
UFG86010005A04020055	0,5	1	4	0,8	20	55	0,95
UFG86012006A04006045	0,6	1,2	4	1	6	45	1,15
UFG86012006A04008045	0,6	1,2	4	1	8	45	1,15
UFG86012006A04010045	0,6	1,2	4	1	10	45	1,15
UFG86012006A04012045	0,6	1,2	4	1	12	45	1,15
UFG86015008A04006045	0,75	1,5	4	1,2	6	45	1,45
UFG86015008A04008045	0,75	1,5	4	1,2	8	45	1,45
UFG86015008A04010045	0,75	1,5	4	1,2	10	45	1,45
UFG86015008A04012045	0,75	1,5	4	1,2	12	45	1,45
UFG86015008A04014050	0,75	1,5	4	1,2	14	50	1,45
UFG86015008A04016050	0,75	1,5	4	1,2	16	50	1,45
UFG86015008A04020055	0,75	1,5	4	1,2	20	55	1,45
UFG86020010A04004045	1	2	4	1,6	4	45	1,95
UFG86020010A04006045	1	2	4	1,6	6	45	1,95
UFG86020010A04008045	1	2	4	1,6	8	45	1,95
UFG86020010A04010045	1	2	4	1,6	10	45	1,95
UFG86020010A04012050	1	2	4	1,6	12	50	1,95
UFG86020010A04014050	1	2	4	1,6	14	50	1,95
UFG86020010A04016050	1	2	4	1,6	16	50	1,95
UFG86020010A04018055	1	2	4	1,6	18	55	1,95
UFG86020010A04020055	1	2	4	1,6	20	55	1,95
UFG86020010A04022060	1	2	4	1,6	22	60	1,95
UFG86020010A04025060	1	2	4	1,6	25	60	1,95
UFG86020010A04030070	1	2	4	1,6	30	70	1,95
UFG86030015A06012050	1,5	3	6	2,4	12	50	2,85
UFG86030015A06014055	1,5	3	6	2,4	14	55	2,85
UFG86030015A06016055	1,5	3	6	2,4	16	55	2,85
UFG86030015A06018060	1,5	3	6	2,4	18	60	2,85
UFG86030015A06020060	1,5	3	6	2,4	20	60	2,85
UFG86030015A06025065	1,5	3	6	2,4	25	65	2,85
UFG86030015A06030070	1,5	3	6	2,4	30	70	2,85
UFG86030015A06035080	1,5	3	6	2,4	35	80	2,85
UFG86040020A06012060	2	4	6	3,2	12	60	3,85
UFG86040020A06016060	2	4	6	3,2	16	60	3,85
UFG86040020A06020065	2	4	6	3,2	20	65	3,85
UFG86040020A06025070	2	4	6	3,2	25	70	3,85
UFG86040020A06030070	2	4	6	3,2	30	70	3,85
UFG86040020A06035080	2	4	6	3,2	35	80	3,85
UFG86040020A06040090	2	4	6	3,2	40	90	3,85
UFG86040020A06045090	2	4	6	3,2	45	90	3,85
UFG86040020A06050100	2	4	6	3,2	50	100	3,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFG86

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE FOR RIB PROCESSING / FREZ KULOWY Z 2 ZĘBAMI DO OBRÓBKI ŻEBER

ISO	VDI 3323	Ae mm	DC	0.2	0.3	0.4	0.5	0.6
P	5	1.0D	Vc m/min	31	45~47	60~63	50~55	50~56
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	rpm obr/min	50000	48000~50000	48000~50000	31900~35200	26400~29700
		1.0D	feed posuw mm/min	265~310	440~460	450~550	450~540	440~540
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
	8-9	1.0D	Vc m/min	31	45~47	60~63	54~78	54~77
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	34100~49500	28600~40700
		1.0D	Feed Posuw mm/min	300~350	480~520	720~790	600~870	590~850
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
	11.1 - 11.2	1.0D	Vc m/min	31	45~47	60~63	54~78	54~77
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	34100~49500	28600~40700
		1.0D	Feed Posuw mm/min	300~350	480~520	720~790	600~870	590~850
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
H	38.1 - 38.2	1.0D	Vc m/min	31	45~47	60~63	50~55	50~56
		1.0D	fz mm/tooth	0.003~0.003	0.004~0.005	0.005~0.006	0.006~0.008	0.007~0.010
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	265~310	440~460	450~550	450~540	440~540
		1.0D	Ap mm	0.005~0.013	0.008~0.014	0.011~0.026	0.005~0.023	0.006~0.028
	39.1	1.0D	Vc m/min	31	43~47	58~63	50~55	50~56
		1.0D	fz mm/tooth	0.009~0.011	0.017~0.017	0.017~0.018	0.028~0.027	0.030~0.032
		1.0D	RPM obr/min	50000	46000~50000	46000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	225~265	390~420	400~460	440~480	400~480
		1.0D	Ap mm	0.005~0.012	0.007~0.013	0.010~0.024	0.005~0.021	0.006~0.025
	39.2	1.0D	Vc m/min	31	43~47	58~63	50~55	50~56
		1.0D	fz mm/tooth	0.009~0.011	0.017~0.017	0.017~0.018	0.028~0.027	0.030~0.032
		1.0D	RPM obr/min	50000	46000~50000	46000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	225~265	390~420	400~460	440~480	400~480
		1.0D	Ap mm	0.005~0.012	0.007~0.013	0.010~0.024	0.005~0.021	0.006~0.025
	40	1.0D	Vc m/min	31	45~47	60~63	54~78	54~77
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	34100~49500	28600~40700
		1.0D	Feed Posuw mm/min	300~350	480~520	720~790	600~870	590~850
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
	41	1.0D	Vc m/min	31	45~47	60~63	50~55	50~56
		1.0D	fz mm/tooth	0.003~0.003	0.004~0.005	0.005~0.006	0.006~0.008	0.007~0.010
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	265~310	440~460	450~550	450~540	440~540
		1.0D	Ap mm	0.005~0.013	0.008~0.014	0.011~0.026	0.005~0.023	0.006~0.028

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG86

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE FOR RIB PROCESSING / FREZ KULOWY Z 2 ZĘBAMI DO OBRÓBKI ŻEBER

ISO	VDI 3323	Ae mm	DC	0.8	1.0	12	1.5	2.0	3.0	4.0
P	5	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	50~55
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	rpm obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3950~4400
		1.0D	feed posuw mm/min	460~550	470~540	460~540	440~540	470~530	590~650	550~620
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
	8-9	1.0D	Vc m/min	55~77	55~76	54~70	52~67	53~69	54~77	54~78
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	RPM obr/min	22000~30800	17600~24200	14300~18700	11000~14300	8500~11000	5700~8200	4300~6200
		1.0D	Feed Posuw mm/min	640~890	600~850	590~780	580~760	590~800	730~1000	680~990
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
	11.1 - 11.2	1.0D	Vc m/min	55~77	55~76	54~70	52~67	53~69	54~77	54~78
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	RPM obr/min	22000~30800	17600~24200	14300~18700	11000~14300	8500~11000	5700~8200	4300~6200
		1.0D	Feed Posuw mm/min	640~890	600~850	590~780	580~760	590~800	730~1000	680~990
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
H	38.1 - 38.2	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	50~55
		1.0D	fz mm/tooth	0.010~0.014	0.013~0.018	0.016~0.023	0.019~0.027	0.027~0.034	0.051~0.061	0.063~0.078
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3950~4400
		1.0D	Feed Posuw mm/min	460~550	470~540	460~540	440~540	470~530	590~650	550~620
		1.0D	Ap mm	0.013~0.052	0.007~0.065	0.020~0.026	0.025~0.039	0.020~0.130	0.052~0.195	0.065~0.260
	39.1	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	48~55
		1.0D	fz mm/tooth	0.044~0.045	0.057~0.057	0.070~0.069	0.084~0.083	0.111~0.109	0.208~0.214	0.275~0.259
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3850~4400
		1.0D	Feed Posuw mm/min	440~500	440~500	420~480	420~480	440~480	550~620	530~570
		1.0D	Ap mm	0.012~0.048	0.006~0.060	0.018~0.024	0.023~0.036	0.018~0.120	0.048~0.120	0.060~0.240
	39.2	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	48~55
		1.0D	fz mm/tooth	0.044~0.045	0.057~0.057	0.070~0.069	0.084~0.083	0.111~0.109	0.208~0.214	0.275~0.259
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3850~4400
		1.0D	Feed Posuw mm/min	440~500	440~500	420~480	420~480	440~480	550~620	530~570
		1.0D	Ap mm	0.012~0.048	0.006~0.060	0.018~0.024	0.023~0.036	0.018~0.120	0.048~0.120	0.060~0.240
	40	1.0D	Vc m/min	55~77	55~76	54~70	52~67	53~69	54~77	54~78
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	RPM obr/min	22000~30800	17600~24200	14300~18700	11000~14300	8500~11000	5700~8200	4300~6200
		1.0D	Feed Posuw mm/min	640~890	600~850	590~780	580~760	590~800	730~1000	680~990
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
	41	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	50~55
		1.0D	fz mm/tooth	0.010~0.014	0.013~0.018	0.016~0.023	0.019~0.027	0.027~0.034	0.051~0.061	0.063~0.078
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3950~4400
		1.0D	Feed Posuw mm/min	460~550	470~540	460~540	440~540	470~530	590~650	550~620
		1.0D	Ap mm	0.013~0.052	0.007~0.065	0.020~0.026	0.025~0.039	0.020~0.130	0.052~0.195	0.065~0.260

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG54

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG54005003A06002050	0,25	0,5	6	0,5	1,5	50	0,45
UFG54005003A06003050	0,25	0,5	6	0,5	3,3	50	0,45
UFG54006003A06002050	0,3	0,6	6	0,6	2	50	0,55
UFG54006003A06004050	0,3	0,6	6	0,6	4	50	0,55
UFG54008004A06003050	0,4	0,8	6	0,8	2,5	50	0,75
UFG54008004A06006050	0,4	0,8	6	0,8	5,5	50	0,75
UFG54010005A06003050	0,5	1	6	1	3,3	50	0,95
UFG54010005A06007050	0,5	1	6	1	6,7	50	0,95
UFG54010005A06012050	0,5	1	6	1	12	50	0,95
UFG54012006A06004050	0,6	1,2	6	1,2	4,4	50	1,15
UFG54012006A06008050	0,6	1,2	6	1,2	8	50	1,15
UFG54015008A06005050	0,75	1,5	6	1,5	5	50	1,45
UFG54015008A06010050	0,75	1,5	6	1,5	9,7	50	1,45
UFG54015008A06015050	0,75	1,5	6	1,5	15	50	1,45
UFG54020010A06006050	1	2	6	2	6	50	1,95
UFG54020010A06013050	1	2	6	2	13	50	1,95
UFG54020010A06020060	1	2	6	2	20	60	1,95

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFG54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE FOR RIB PROCESSING / FREZ KULOWY Z 2 ZĘBAMI DO OBRÓBKI ŻEBER

ISO	VDI 3323	Ae mm	DC	0.2	0.3	0.4	0.5	0.6
P	5	1.0D	Vc m/min	31	45~47	60~63	50~55	50~56
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	rpm obr/min	50000	48000~50000	48000~50000	31900~35200	26400~29700
		1.0D	feed posuw mm/min	265~310	440~460	450~550	450~540	440~540
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
	8-9	1.0D	Vc m/min	31	45~47	60~63	54~78	54~77
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	34100~49500	28600~40700
		1.0D	Feed Posuw mm/min	300~350	480~520	720~790	600~870	590~850
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
	11.1 - 11.2	1.0D	Vc m/min	31	45~47	60~63	54~78	54~77
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	34100~49500	28600~40700
		1.0D	Feed Posuw mm/min	300~350	480~520	720~790	600~870	590~850
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
H	38.1 - 38.2	1.0D	Vc m/min	31	45~47	60~63	50~55	50~56
		1.0D	fz mm/tooth	0.003~0.003	0.004~0.005	0.005~0.006	0.006~0.008	0.007~0.010
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	265~310	440~460	450~550	450~540	440~540
		1.0D	Ap mm	0.005~0.013	0.008~0.014	0.011~0.026	0.005~0.023	0.006~0.028
	39.1	1.0D	Vc m/min	31	43~47	58~63	50~55	50~56
		1.0D	fz mm/tooth	0.009~0.011	0.017~0.017	0.017~0.018	0.028~0.027	0.030~0.032
		1.0D	RPM obr/min	50000	46000~50000	46000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	225~265	390~420	400~460	440~480	400~480
		1.0D	Ap mm	0.005~0.012	0.007~0.013	0.010~0.024	0.005~0.021	0.006~0.025
	39.2	1.0D	Vc m/min	31	43~47	58~63	50~55	50~56
		1.0D	fz mm/tooth	0.009~0.011	0.017~0.017	0.017~0.018	0.028~0.027	0.030~0.032
		1.0D	RPM obr/min	50000	46000~50000	46000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	225~265	390~420	400~460	440~480	400~480
		1.0D	Ap mm	0.005~0.012	0.007~0.013	0.010~0.024	0.005~0.021	0.006~0.025
	40	1.0D	Vc m/min	31	45~47	60~63	54~78	54~77
		1.0D	fz mm/tooth	0.003~0.004	0.005~0.005	0.007~0.008	0.006~0.013	0.007~0.015
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	34100~49500	28600~40700
		1.0D	Feed Posuw mm/min	300~350	480~520	720~790	600~870	590~850
		1.0D	Ap mm	0.006~0.016	0.010~0.017	0.013~0.032	0.007~0.028	0.007~0.034
	41	1.0D	Vc m/min	31	45~47	60~63	50~55	50~56
		1.0D	fz mm/tooth	0.003~0.003	0.004~0.005	0.005~0.006	0.006~0.008	0.007~0.010
		1.0D	RPM obr/min	50000	48000~50000	48000~50000	31900~35200	26400~29700
		1.0D	Feed Posuw mm/min	265~310	440~460	450~550	450~540	440~540
		1.0D	Ap mm	0.005~0.013	0.008~0.014	0.011~0.026	0.005~0.023	0.006~0.028

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE FOR RIB PROCESSING / FREZ KULOWY Z 2 ZĘBAMI DO OBRÓBKI ŻEBER

ISO	VDI 3323	Ae mm	DC	0.8	1.0	12	1.5	2.0	3.0	4.0
P	5	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	50~55
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	rpm obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3950~4400
		1.0D	feed posuw mm/min	460~550	470~540	460~540	440~540	470~530	590~650	550~620
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
	8-9	1.0D	Vc m/min	55~77	55~76	54~70	52~67	53~69	54~77	54~78
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	RPM obr/min	22000~30800	17600~24200	14300~18700	11000~14300	8500~11000	5700~8200	4300~6200
		1.0D	Feed Posuw mm/min	640~890	600~850	590~780	580~760	590~800	730~1000	680~990
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
	11.1 - 11.2	1.0D	Vc m/min	55~77	55~76	54~70	52~67	53~69	54~77	54~78
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	RPM obr/min	22000~30800	17600~24200	14300~18700	11000~14300	8500~11000	5700~8200	4300~6200
		1.0D	Feed Posuw mm/min	640~890	600~850	590~780	580~760	590~800	730~1000	680~990
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
H	38.1 - 38.2	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	50~55
		1.0D	fz mm/tooth	0.010~0.014	0.013~0.018	0.016~0.023	0.019~0.027	0.027~0.034	0.051~0.061	0.063~0.078
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3950~4400
		1.0D	Feed Posuw mm/min	460~550	470~540	460~540	440~540	470~530	590~650	550~620
		1.0D	Ap mm	0.013~0.052	0.007~0.065	0.020~0.026	0.025~0.039	0.020~0.130	0.052~0.195	0.065~0.260
	39.1	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	48~55
		1.0D	fz mm/tooth	0.044~0.045	0.057~0.057	0.070~0.069	0.084~0.083	0.111~0.109	0.208~0.214	0.275~0.259
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3850~4400
		1.0D	Feed Posuw mm/min	440~500	440~500	420~480	420~480	440~480	550~620	530~570
		1.0D	Ap mm	0.012~0.048	0.006~0.060	0.018~0.024	0.023~0.036	0.018~0.120	0.048~0.120	0.060~0.240
	39.2	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	48~55
		1.0D	fz mm/tooth	0.044~0.045	0.057~0.057	0.070~0.069	0.084~0.083	0.111~0.109	0.208~0.214	0.275~0.259
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3850~4400
		1.0D	Feed Posuw mm/min	440~500	440~500	420~480	420~480	440~480	550~620	530~570
		1.0D	Ap mm	0.012~0.048	0.006~0.060	0.018~0.024	0.023~0.036	0.018~0.120	0.048~0.120	0.060~0.240
	40	1.0D	Vc m/min	55~77	55~76	54~70	52~67	53~69	54~77	54~78
		1.0D	fz mm/tooth	0.010~0.020	0.012~0.024	0.016~0.027	0.020~0.035	0.027~0.047	0.045~0.088	0.055~0.115
		1.0D	RPM obr/min	22000~30800	17600~24200	14300~18700	11000~14300	8500~11000	5700~8200	4300~6200
		1.0D	Feed Posuw mm/min	640~890	600~850	590~780	580~760	590~800	730~1000	680~990
		1.0D	Ap mm	0.016~0.064	0.008~0.080	0.024~0.032	0.031~0.048	0.024~0.160	0.064~0.240	0.080~0.320
	41	1.0D	Vc m/min	50~55	48~55	45~53	47~54	50~55	50~55	50~55
		1.0D	fz mm/tooth	0.010~0.014	0.013~0.018	0.016~0.023	0.019~0.027	0.027~0.034	0.051~0.061	0.063~0.078
		1.0D	RPM obr/min	19800~22000	15400~17600	12000~14000	10000~11500	7900~8800	5300~5800	3950~4400
		1.0D	Feed Posuw mm/min	460~550	470~540	460~540	440~540	470~530	590~650	550~620
		1.0D	Ap mm	0.013~0.052	0.007~0.065	0.020~0.026	0.025~0.039	0.020~0.130	0.052~0.195	0.065~0.260

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG28

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG28001X50A04000040	0,05	0,1	4	0,2	-	40	-
UFG28002001A04000040	0,1	0,2	4	0,3	-	40	-
UFG28003002A04000040	0,15	0,3	4	0,5	-	40	-
UFG28004002A04000040	0,2	0,4	4	0,6	-	40	-
UFG28005003A04000040	0,25	0,5	4	0,7	-	40	-
UFG28006003A04000040	0,3	0,6	4	0,9	-	40	-
UFG28007004A04000040	0,35	0,7	4	1,1	-	40	-
UFG28008004A04000040	0,4	0,8	4	1,2	-	40	-
UFG28009005A04000040	0,45	0,9	4	1,4	-	40	-
UFG28010005A04003050	0,5	1	4	1,5	3	50	0,95
UFG28010005A06003050	0,5	1	6	1,5	3	50	0,95
UFG28015008A04004050	0,75	1,5	4	2	4	50	1,45
UFG28015008A06004050	0,75	1,5	6	2	4	50	1,45
UFG28020010A04005050	1	2	4	2,5	5	50	1,95
UFG28020010A06005050	1	2	6	2,5	5	50	1,95
UFG28025013A04007050	1,25	2,5	4	3	7	50	2,4
UFG28025013A06007050	1,25	2,5	6	3	7	50	2,4
UFG28030015A06010060	1,5	3	6	4	10	60	2,85
UFG28035018A06010060	1,75	3,5	6	4,5	10	60	3,35
UFG28040020A06010060	2	4	6	5	10	60	3,85
UFG28045023A06010060	2,25	4,5	6	5,5	10	60	4,35
UFG28050025A06012060	2,5	5	6	6	12	60	4,85
UFG28055028A06012060	2,75	5,5	6	6,5	12	60	5,35
UFG28060030A06015060	3	6	6	7	15	60	5,85
UFG28060030A06030090	3	6	6	9	30	90	5,85
UFG28080040A08015060	4	8	8	9	15	60	7,7
UFG28080040A08015080	4	8	8	9	15	80	7,7
UFG28080040A08030100	4	8	8	12	30	100	7,7
UFG28100050A10025060	5	10	10	11	25	60	9,7
UFG28100050A10025080	5	10	10	11	25	80	9,7
UFG28100050A10030100	5	10	10	15	30	100	9,7
UFG28120060A12025080	6	12	12	14	25	80	11,7

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFG28

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY Z 2 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	0.2	0.3	0.4	0.5	0.6	0.8	1.0
P	5	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	8-9	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	11.1	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	11.2	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
H	38.1	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
	38.2	0.05D	0.02D	Vc m/min	30	40	55	70	85	115	140
				fz mm/tooth	0.011	0.013	0.017	0.021	0.024	0.033	0.042
				rpm obr/min	47746	42441	43768	44563	45094	45757	44563
				feed posuw mm/min	1050	1103	1488	1872	2165	3020	3743
	39.1	0.05D	0.02D	Vc m/min	25	40	50	65	75	100	125
				fz mm/tooth	0.01	0.012	0.015	0.019	0.023	0.03	0.038
				rpm obr/min	39789	42441	39789	41380	39789	39789	39789
				feed posuw mm/min	796	1019	1194	1572	1830	2387	3024
	39.2	0.05D	0.02D	Vc m/min	20	35	45	55	65	90	110
				fz mm/tooth	0.01	0.012	0.015	0.019	0.023	0.03	0.037
				rpm obr/min	31831	37136	35810	35014	34484	35810	35014
				feed posuw mm/min	637	891	1074	1331	1586	2149	2591
	39.3	0.05D	0.02D	Vc m/min	20	30	40	50	60	80	110
				fz mm/tooth	0.009	0.011	0.014	0.017	0.022	0.029	0.033
				rpm obr/min	31831	31831	31831	31831	31831	31831	35014
				feed posuw mm/min	573	700	891	1082	1401	1846	2311
	40	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
	41	0.05D	0.02D	Vc m/min	30	40	55	70	85	115	140
				fz mm/tooth	0.011	0.013	0.017	0.021	0.024	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG28

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY Z 2 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	1.2	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	8-9	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	11.1	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	11.2	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
H	38.1	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
	38.2	0.05D	0.02D	Vc m/min	160	205	250	250	250	235	205	225	235	210	225	225
				fz mm/tooth	0.045	0.047	0.05	0.075	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
				rpm obr/min	42441	43502	39789	26526	19894	14961	10876	8952	7480	5570	4476	3581
				feed posuw mm/min	3820	4089	3979	3979	3979	3740	3067	2686	2394	1894	1692	1490
	39.1	0.05D	0.02D	Vc m/min	145	175	220	220	220	210	190	200	205	190	200	200
				fz mm/tooth	0.039	0.042	0.045	0.067	0.09	0.113	0.125	0.134	0.144	0.155	0.169	0.188
				rpm obr/min	38462	37136	35014	23343	17507	13369	10080	7958	6525	5040	3979	3183
				feed posuw mm/min	3000	3119	3151	3128	3151	3021	2520	2133	1879	1562	1345	1197
	39.2	0.05D	0.02D	Vc m/min	130	155	200	200	200	180	165	175	180	165	175	175
				fz mm/tooth	0.04	0.041	0.044	0.067	0.088	0.111	0.122	0.132	0.142	0.142	0.143	0.143
				rpm obr/min	34484	32892	31831	21221	15915	11459	8754	6963	5730	4377	3482	2785
				feed posuw mm/min	2759	2697	2801	2844	2801	2544	2136	1838	1627	1243	996	797
	39.3	0.05D	0.02D	Vc m/min	115	140	180	180	180	165	150	165	165	150	160	160
				fz mm/tooth	0.038	0.039	0.04	0.061	0.079	0.1	0.109	0.119	0.13	0.131	0.133	0.129
				rpm obr/min	30505	29709	28648	19099	14324	10504	7958	6565	5252	3979	3183	2546
				feed posuw mm/min	2318	2317	2292	2330	2263	2101	1735	1562	1366	1042	847	657
	40	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
	41	0.05D	0.02D	Vc m/min	160	205	250	250	250	235	205	225	235	210	225	225
				fz mm/tooth	0.045	0.047	0.05	0.075	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG38

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG38010005A04002050	0,5	1	4	1	2,2	50	0,95
UFG38012006A04003050	0,6	1,2	4	1,2	2,6	50	1,15
UFG38015008A04003050	0,75	1,5	4	1,5	3	50	1,45
UFG38020010A04004050	1	2	4	2	4	50	1,95
UFG38020010A06004050	1	2	6	2	4	50	1,95
UFG38030015A06006060	1,5	3	6	3	6	60	2,85
UFG38040020A06008070	2	4	6	4	8	70	3,85
UFG38050025A06010080	2,5	5	6	5	10	80	4,85
UFG38060030A06012090	3	6	6	6	12	90	5,85
UFG38070035A08014090	3,5	7	8	7	14	90	6,7
UFG38080040A08016100	4	8	8	8	16	100	7,7
UFG38090045A10018100	4,5	9	10	9	18	100	8,7
UFG38100050A10020100	5	10	10	10	20	100	9,7
UFG38120060A12024110	6	12	12	12	24	110	11,7
UFG38140070A14028110	7	14	14	14	28	110	13,7
UFG38160080A16032140	8	16	16	16	32	140	15,7
UFG38180090A18036140	9	18	18	18	36	140	17,7
UFG38200100A20040160	10	20	20	20	40	160	19,7
UFG38250125A25050180	12,5	25	25	25	50	180	24,7

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFG38

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY Z 2 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	0.2	0.3	0.4	0.5	0.6	0.8	1.0
P	5	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	8-9	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	11.1	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	11.2	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
H	38.1	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
	38.2	0.05D	0.02D	Vc m/min	30	40	55	70	85	115	140
				fz mm/tooth	0.011	0.013	0.017	0.021	0.024	0.033	0.042
				rpm obr/min	47746	42441	43768	44563	45094	45757	44563
				feed posuw mm/min	1050	1103	1488	1872	2165	3020	3743
	39.1	0.05D	0.02D	Vc m/min	25	40	50	65	75	100	125
				fz mm/tooth	0.01	0.012	0.015	0.019	0.023	0.03	0.038
				rpm obr/min	39789	42441	39789	41380	39789	39789	39789
				feed posuw mm/min	796	1019	1194	1572	1830	2387	3024
	39.2	0.05D	0.02D	Vc m/min	20	35	45	55	65	90	110
				fz mm/tooth	0.01	0.012	0.015	0.019	0.023	0.03	0.037
				rpm obr/min	31831	37136	35810	35014	34484	35810	35014
				feed posuw mm/min	637	891	1074	1331	1586	2149	2591
	39.3	0.05D	0.02D	Vc m/min	20	30	40	50	60	80	110
				fz mm/tooth	0.009	0.011	0.014	0.017	0.022	0.029	0.033
				rpm obr/min	31831	31831	31831	31831	31831	31831	35014
				feed posuw mm/min	573	700	891	1082	1401	1846	2311
	40	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
	41	0.05D	0.02D	Vc m/min	30	40	55	70	85	115	140
				fz mm/tooth	0.011	0.013	0.017	0.021	0.024	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG38

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY Z 2 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	1.2	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	8-9	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	11.1	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	11.2	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
H	38.1	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
	38.2	0.05D	0.02D	Vc m/min	160	205	250	250	250	235	205	225	235	210	225	225
				fz mm/tooth	0.045	0.047	0.05	0.075	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
				rpm obr/min	42441	43502	39789	26526	19894	14961	10876	8952	7480	5570	4476	3581
				feed posuw mm/min	3820	4089	3979	3979	3979	3740	3067	2686	2394	1894	1692	1490
	39.1	0.05D	0.02D	Vc m/min	145	175	220	220	220	210	190	200	205	190	200	200
				fz mm/tooth	0.039	0.042	0.045	0.067	0.09	0.113	0.125	0.134	0.144	0.155	0.169	0.188
				rpm obr/min	38462	37136	35014	23343	17507	13369	10080	7958	6525	5040	3979	3183
				feed posuw mm/min	3000	3119	3151	3128	3151	3021	2520	2133	1879	1562	1345	1197
	39.2	0.05D	0.02D	Vc m/min	130	155	200	200	200	180	165	175	180	165	175	175
				fz mm/tooth	0.04	0.041	0.044	0.067	0.088	0.111	0.122	0.132	0.142	0.142	0.143	0.143
				rpm obr/min	34484	32892	31831	21221	15915	11459	8754	6963	5730	4377	3482	2785
				feed posuw mm/min	2759	2697	2801	2844	2801	2544	2136	1838	1627	1243	996	797
	39.3	0.05D	0.02D	Vc m/min	115	140	180	180	180	165	150	165	165	150	160	160
				fz mm/tooth	0.038	0.039	0.04	0.061	0.079	0.1	0.109	0.119	0.13	0.131	0.133	0.129
				rpm obr/min	30505	29709	28648	19099	14324	10504	7958	6565	5252	3979	3183	2546
				feed posuw mm/min	2318	2317	2292	2330	2263	2101	1735	1562	1366	1042	847	657
	40	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
	41	0.05D	0.02D	Vc m/min	160	205	250	250	250	235	205	225	235	210	225	225
				fz mm/tooth	0.045	0.047	0.05	0.075	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG53

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	OAL
UFG53004002A06000050	0,2	0,4	6	0,4	50
UFG53005003A06000050	0,25	0,5	6	0,5	50
UFG53006003A06000050	0,3	0,6	6	0,6	50
UFG53008004A06000050	0,4	0,8	6	0,8	50
UFG53010005A06001050	0,5	1	6	1	50
UFG53012006A06001050	0,6	1,2	6	1,2	50
UFG53015008A06001050	0,75	1,5	6	1,5	50
UFG53020010A06002050	1	2	6	2	50

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFG53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY Z 2 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	0.2	0.3	0.4	0.5	0.6	0.8	1.0
P	5	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	8-9	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	11.1	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.012	0.015	0.019	0.024	0.029	0.039	0.048
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1146	1432	1966	2445	2923	3879	4736
	11.2	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
H	38.1	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
	38.2	0.05D	0.02D	Vc m/min	30	40	55	70	85	115	140
				fz mm/tooth	0.011	0.013	0.017	0.021	0.024	0.033	0.042
				rpm obr/min	47746	42441	43768	44563	45094	45757	44563
				feed posuw mm/min	1050	1103	1488	1872	2165	3020	3743
	39.1	0.05D	0.02D	Vc m/min	25	40	50	65	75	100	125
				fz mm/tooth	0.01	0.012	0.015	0.019	0.023	0.03	0.038
				rpm obr/min	39789	42441	39789	41380	39789	39789	39789
				feed posuw mm/min	796	1019	1194	1572	1830	2387	3024
	39.2	0.05D	0.02D	Vc m/min	20	35	45	55	65	90	110
				fz mm/tooth	0.01	0.012	0.015	0.019	0.023	0.03	0.037
				rpm obr/min	31831	37136	35810	35014	34484	35810	35014
				feed posuw mm/min	637	891	1074	1331	1586	2149	2591
	39.3	0.05D	0.02D	Vc m/min	20	30	40	50	60	80	110
				fz mm/tooth	0.009	0.011	0.014	0.017	0.022	0.029	0.033
				rpm obr/min	31831	31831	31831	31831	31831	31831	35014
				feed posuw mm/min	573	700	891	1082	1401	1846	2311
	40	0.05D	0.02D	Vc m/min	30	45	65	80	95	125	155
				fz mm/tooth	0.011	0.014	0.017	0.021	0.025	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144
	41	0.05D	0.02D	Vc m/min	30	40	55	70	85	115	140
				fz mm/tooth	0.011	0.013	0.017	0.021	0.024	0.033	0.042
				rpm obr/min	47746	47746	51725	50930	50399	49736	49338
				feed posuw mm/min	1050	1337	1759	2139	2520	3283	4144

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY Z 2 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	1.2	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	8-9	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	11.1	0.05D	0.02D	Vc m/min	190	235	310	310	315	290	260	280	290	260	280	280
				fz mm/tooth	0.051	0.054	0.057	0.091	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
				rpm obr/min	50399	49869	49338	32892	25067	18462	13793	11141	9231	6897	5570	4456
				feed posuw mm/min	5141	5386	5625	5986	6016	5760	4800	4211	3674	2924	2652	2353
	11.2	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
H	38.1	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
	38.2	0.05D	0.02D	Vc m/min	160	205	250	250	250	235	205	225	235	210	225	225
				fz mm/tooth	0.045	0.047	0.05	0.075	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
				rpm obr/min	42441	43502	39789	26526	19894	14961	10876	8952	7480	5570	4476	3581
				feed posuw mm/min	3820	4089	3979	3979	3979	3740	3067	2686	2394	1894	1692	1490
	39.1	0.05D	0.02D	Vc m/min	145	175	220	220	220	210	190	200	205	190	200	200
				fz mm/tooth	0.039	0.042	0.045	0.067	0.09	0.113	0.125	0.134	0.144	0.155	0.169	0.188
				rpm obr/min	38462	37136	35014	23343	17507	13369	10080	7958	6525	5040	3979	3183
				feed posuw mm/min	3000	3119	3151	3128	3151	3021	2520	2133	1879	1562	1345	1197
	39.2	0.05D	0.02D	Vc m/min	130	155	200	200	200	180	165	175	180	165	175	175
				fz mm/tooth	0.04	0.041	0.044	0.067	0.088	0.111	0.122	0.132	0.142	0.142	0.143	0.143
				rpm obr/min	34484	32892	31831	21221	15915	11459	8754	6963	5730	4377	3482	2785
				feed posuw mm/min	2759	2697	2801	2844	2801	2544	2136	1838	1627	1243	996	797
	39.3	0.05D	0.02D	Vc m/min	115	140	180	180	180	165	150	165	165	150	160	160
				fz mm/tooth	0.038	0.039	0.04	0.061	0.079	0.1	0.109	0.119	0.13	0.131	0.133	0.129
				rpm obr/min	30505	29709	28648	19099	14324	10504	7958	6565	5252	3979	3183	2546
				feed posuw mm/min	2318	2317	2292	2330	2263	2101	1735	1562	1366	1042	847	657
	40	0.05D	0.02D	Vc m/min	180	225	300	300	300	280	255	270	280	250	270	270
				fz mm/tooth	0.045	0.047	0.05	0.083	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951
	41	0.05D	0.02D	Vc m/min	160	205	250	250	250	235	205	225	235	210	225	225
				fz mm/tooth	0.045	0.047	0.05	0.075	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
				rpm obr/min	47746	47746	47746	31831	23873	17825	13528	10743	8913	6631	5371	4297
				feed posuw mm/min	4297	4488	4775	5284	5300	4920	4140	3524	3102	2480	2213	1951

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG59

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	OAL
UFG59030015A06008060	1,5	3	6	8	60
UFG59040020A06008070	2	4	6	8	70
UFG59050025A06010080	2,5	5	6	10	80
UFG59060030A06012090	3	6	6	12	90
UFG59080040A08014100	4	8	8	14	100
UFG59100050A10018100	5	10	10	18	100
UFG59120060A12022110	6	12	12	22	110
UFG59160080A16030140	8	16	16	30	140
UFG59200100A20038160	10	20	20	38	160

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFG59

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE BALL NOSE / FREZ KULOWY Z 3 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.05D	0.02D	Vc m/min	300	305	315	340	340	340	340	335	340
				fz mm/tooth	0.09	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
				rpm obr/min	31831	24271	20054	18038	13528	10823	9019	6665	5411
				feed posuw mm/min	8594	7791	7279	8604	7346	6558	6088	4579	3604
	8-9	0.05D	0.02D	Vc m/min	300	305	315	340	340	340	340	335	340
				fz mm/tooth	0.09	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
				rpm obr/min	31831	24271	20054	18038	13528	10823	9019	6665	5411
				feed posuw mm/min	8594	7791	7279	8604	7346	6558	6088	4579	3604
	11.1 - 11.2	0.05D	0.02D	Vc m/min	300	305	315	340	340	340	340	335	340
				fz mm/tooth	0.09	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
				rpm obr/min	31831	24271	20054	18038	13528	10823	9019	6665	5411
				feed posuw mm/min	8594	7791	7279	8604	7346	6558	6088	4579	3604
H	38.1 - 38.2	0.05D	0.02D	Vc m/min	255	255	265	285	285	285	285	285	285
				fz mm/tooth	0.072	0.09	0.108	0.136	0.155	0.168	0.187	0.19	0.192
				rpm obr/min	27056	20292	16870	15120	11340	9072	7560	5670	4536
				feed posuw mm/min	5844	5479	5466	6169	5273	4572	4241	3232	2613
	39.1	0.05D	0.02D	Vc m/min	185	185	195	230	230	230	230	230	230
				fz mm/tooth	0.072	0.087	0.099	0.123	0.144	0.156	0.173	0.18	0.18
				rpm obr/min	19629	14722	12414	12202	9151	7321	6101	4576	3661
				feed posuw mm/min	4240	3842	3687	4502	3953	3426	3166	2471	1977
	39.2	0.05D	0.02D	Vc m/min	175	180	185	210	210	210	210	210	205
				fz mm/tooth	0.072	0.086	0.099	0.115	0.134	0.144	0.145	0.144	0.145
				rpm obr/min	18568	14324	11777	11141	8356	6685	5570	4178	3263
				feed posuw mm/min	4011	3696	3498	3844	3359	2888	2423	1805	1419
	39.3	0.05D	0.02D	Vc m/min	120	120	125	145	145	145	145	145	145
				fz mm/tooth	0.072	0.087	0.099	0.108	0.125	0.144	0.144	0.144	0.143
				rpm obr/min	12732	9549	7958	7692	5769	4615	3846	2885	2308
				feed posuw mm/min	2750	2492	2363	2492	2164	1994	1662	1246	990
	40	0.05D	0.02D	Vc m/min	300	305	315	340	340	340	340	335	340
				fz mm/tooth	0.09	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
				rpm obr/min	31831	24271	20054	18038	13528	10823	9019	6665	5411
				feed posuw mm/min	8594	7791	7279	8604	7346	6558	6088	4579	3604
	41	0.05D	0.02D	Vc m/min	255	255	265	285	285	285	285	285	285
				fz mm/tooth	0.072	0.09	0.108	0.136	0.155	0.168	0.187	0.19	0.192
				rpm obr/min	27056	20292	16870	15120	11340	9072	7560	5670	4536
				feed posuw mm/min	5844	5479	5466	6169	5273	4572	4241	3232	2613

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG41

4 Finish Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	OAL
UFG41030015A06008060	1,5	3	6	8	60
UFG41040020A06008070	2	4	6	8	70
UFG41050025A06010080	2,5	5	6	10	80
UFG41060030A06012090	3	6	6	12	90
UFG41080040A08014100	4	8	8	14	100
UFG41100050A10018100	5	10	10	18	100
UFG41120060A12022110	6	12	12	22	110
UFG41160080A16030140	8	16	16	30	140
UFG41200100A20038160	10	20	20	38	160

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFG41

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE BALL NOSE / FREZ KULOWY Z 4 ZĘBAMI

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.05D	0.02D	Vc m/min	340	340	340	340	340	340	340	340	340
				fz mm/tooth	0.071	0.08	0.09	0.101	0.116	0.128	0.145	0.144	0.144
				rpm obr/min	36075	27056	21645	18038	13528	10823	9019	6764	5411
				feed posuw mm/min	10245	8658	7792	7287	6277	5541	5231	3896	3117
	8-9	0.05D	0.02D	Vc m/min	340	340	340	340	340	340	340	340	340
				fz mm/tooth	0.071	0.08	0.09	0.101	0.116	0.128	0.145	0.144	0.144
				rpm obr/min	36075	27056	21645	18038	13528	10823	9019	6764	5411
				feed posuw mm/min	10245	8658	7792	7287	6277	5541	5231	3896	3117
	11.1 - 11.2	0.05D	0.02D	Vc m/min	340	340	340	340	340	340	340	340	340
				fz mm/tooth	0.071	0.08	0.09	0.101	0.116	0.128	0.145	0.144	0.144
				rpm obr/min	36075	27056	21645	18038	13528	10823	9019	6764	5411
				feed posuw mm/min	10245	8658	7792	7287	6277	5541	5231	3896	3117
H	38.1 - 38.2	0.05D	0.02D	Vc m/min	285	285	280	285	285	285	285	285	285
				fz mm/tooth	0.06	0.07	0.081	0.092	0.103	0.111	0.125	0.129	0.126
				rpm obr/min	30239	22680	17825	15120	11340	9072	7560	5670	4536
				feed posuw mm/min	7257	6350	5775	5564	4672	4028	3780	2926	2286
	39.1	0.05D	0.02D	Vc m/min	230	230	230	230	230	230	230	230	230
				fz mm/tooth	0.05	0.06	0.071	0.082	0.096	0.104	0.115	0.119	0.119
				rpm obr/min	24404	18303	14642	12202	9151	7321	6101	4576	3661
				feed posuw mm/min	4881	4393	4158	4002	3514	3046	2806	2178	1743
	39.2	0.05D	0.02D	Vc m/min	210	210	210	210	210	210	210	210	205
				fz mm/tooth	0.045	0.055	0.067	0.077	0.089	0.095	0.097	0.096	0.096
				rpm obr/min	22282	16711	13369	11141	8356	6685	5570	4178	3263
				feed posuw mm/min	4011	3676	3583	3431	2975	2540	2161	1604	1253
	39.3	0.05D	0.02D	Vc m/min	145	145	145	145	145	145	145	145	140
				fz mm/tooth	0.04	0.05	0.062	0.072	0.082	0.096	0.094	0.096	0.097
				rpm obr/min	15385	11539	9231	7692	5769	4615	3846	2885	2228
				feed posuw mm/min	2462	2308	2289	2215	1892	1772	1446	1108	864
	40	0.05D	0.02D	Vc m/min	340	340	340	340	340	340	340	340	340
				fz mm/tooth	0.071	0.08	0.09	0.101	0.116	0.128	0.145	0.144	0.144
				rpm obr/min	36075	27056	21645	18038	13528	10823	9019	6764	5411
				feed posuw mm/min	10245	8658	7792	7287	6277	5541	5231	3896	3117
	41	0.05D	0.02D	Vc m/min	285	285	280	285	285	285	285	285	285
				fz mm/tooth	0.06	0.07	0.081	0.092	0.103	0.111	0.125	0.129	0.126
				rpm obr/min	30239	22680	17825	15120	11340	9072	7560	5670	4536
				feed posuw mm/min	7257	6350	5775	5564	4672	4028	3780	2926	2286

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG01

R 2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFG01

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG01030003A06012055	0,3	3	6	4	12	55	2,85
UFG01030003A06016055	0,3	3	6	4	16	55	2,85
UFG01030005A06010055	0,5	3	6	4	10	55	2,85
UFG01030005A06012055	0,5	3	6	4	12	55	2,85
UFG01030005A06016055	0,5	3	6	4	16	55	2,85
UFG01030005A06020055	0,5	3	6	4	20	55	2,85
UFG01040002A06012055	0,2	4	6	5	12	55	3,85
UFG01040002A06016055	0,2	4	6	5	16	55	3,85
UFG01040002A06020055	0,2	4	6	5	20	55	3,85
UFG01040003A06010055	0,3	4	6	5	10	55	3,85
UFG01040003A06012055	0,3	4	6	5	12	55	3,85
UFG01040003A06016055	0,3	4	6	5	16	55	3,85
UFG01040003A06020055	0,3	4	6	5	20	55	3,85
UFG01040005A06012055	0,5	4	6	5	12	55	3,85
UFG01040005A06016055	0,5	4	6	5	16	55	3,85
UFG01040005A06020055	0,5	4	6	5	20	55	3,85
UFG01040010A06012055	1	4	6	5	12	55	3,85
UFG01040010A06016055	1	4	6	5	16	55	3,85
UFG01060003A06020060	0,3	6	6	7	20	60	5,85
UFG01060005A06020060	0,5	6	6	7	20	60	5,85
UFG01060010A06020060	1	6	6	7	20	60	5,85
UFG01060015A06020060	1,5	6	6	7	20	60	5,85
UFG01060020A06020060	2	6	6	7	20	60	5,85
UFG01080003A08025060	0,3	8	8	9	25	60	7,7
UFG01080005A08025060	0,5	8	8	9	25	60	7,7
UFG01080010A08025060	1	8	8	9	25	60	7,7
UFG01080015A08025060	1,5	8	8	9	25	60	7,7
UFG01080020A08025060	2	8	8	9	25	60	7,7
UFG01100003A10032070	0,3	10	10	11	32	70	9,7
UFG01100005A10032070	0,5	10	10	11	32	70	9,7
UFG01100010A10032070	1	10	10	11	32	70	9,7
UFG01100015A10032070	1,5	10	10	11	32	70	9,7
UFG01100020A10032070	2	10	10	11	32	70	9,7
UFG01120005A12038080	0,5	12	12	12	38	80	11,7
UFG01120010A12038080	1	12	12	12	38	80	11,7
UFG01120015A12038080	1,5	12	12	12	38	80	11,7
UFG01120020A12038080	2	12	12	12	38	80	11,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFG01

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY Z 2 ZĘBAMI ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.5	0.6	0.8	10	1 2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	5	1.0D	0.05D	Vc m/min	80	95	125	150	210	205	210	245	245	250	245	250
				fz mm/tooth	0.001	0.002	0.002	0.006	0.01	0.015	0.021	0.026	0.029	0.037	0.043	0.051
				rpm obr/min	50930	50399	49736	47746	33423	21751	16711	15597	12998	9947	7799	6631
				feed posuw mm/min	102	202	199	573	668	653	702	811	754	736	671	676
	8-9	1.0D	0.05D	Vc m/min	80	95	125	150	210	205	210	245	245	250	245	250
				fz mm/tooth	0.001	0.002	0.002	0.006	0.01	0.015	0.021	0.026	0.029	0.037	0.043	0.051
				rpm obr/min	50930	50399	49736	47746	33423	21751	16711	15597	12998	9947	7799	6631
				feed posuw mm/min	102	202	199	573	668	653	702	811	754	736	671	676
	11.1	1.0D	0.05D	Vc m/min	80	95	125	150	210	205	210	245	245	250	245	250
				fz mm/tooth	0.001	0.002	0.002	0.006	0.01	0.015	0.021	0.026	0.029	0.037	0.043	0.051
				rpm obr/min	50930	50399	49736	47746	33423	21751	16711	15597	12998	9947	7799	6631
				feed posuw mm/min	102	202	199	573	668	653	702	811	754	736	671	676
	11.2	1.0D	0.05D	Vc m/min	70	85	100	120	165	165	165	195	195	195	195	200
				fz mm/tooth	0.001	0.002	0.002	0.006	0.01	0.016	0.021	0.026	0.03	0.037	0.044	0.051
				rpm obr/min	44563	45094	39789	38197	26261	17507	13130	12414	10345	7759	6207	5305
				feed posuw mm/min	89	180	159	458	525	560	551	646	621	574	546	541
H	38.1	1.0D	0.05D	Vc m/min	70	85	100	120	165	165	165	195	195	195	195	200
				fz mm/tooth	0.001	0.002	0.002	0.006	0.01	0.016	0.021	0.026	0.03	0.037	0.044	0.051
				rpm obr/min	44563	45094	39789	38197	26261	17507	13130	12414	10345	7759	6207	5305
				feed posuw mm/min	89	180	159	458	525	560	551	646	621	574	546	541
	38.2	1.0D	0.05D	Vc m/min	65	75	75	80	110	110	110	130	130	130	130	130
				fz mm/tooth	0.001	0.001	0.002	0.006	0.01	0.015	0.02	0.024	0.028	0.034	0.04	0.047
				rpm obr/min	41380	39789	29842	25465	17507	11671	8754	8276	6897	5173	4138	3448
				feed posuw mm/min	83	80	119	306	350	350	350	397	386	352	331	324
	39.1	1.0D	0.05D	Vc m/min	50	55	65	65	90	90	90	100	100	100	100	100
				fz mm/tooth	0.001	0.001	0.001	0.004	0.007	0.011	0.015	0.018	0.021	0.026	0.03	0.036
				rpm obr/min	31831	29178	25863	20690	14324	9549	7162	6366	5305	3979	3183	2653
				feed posuw mm/min	64	58	52	166	201	210	215	229	223	207	191	191
	39.2	1.0D	0.05D	Vc m/min	40	45	50	50	70	70	70	80	80	80	80	80
				fz mm/tooth	0.001	0.001	0.001	0.003	0.006	0.009	0.012	0.014	0.017	0.02	0.024	0.029
				rpm obr/min	25465	23873	19894	15915	11141	7427	5570	5093	4244	3183	2546	2122
				feed posuw mm/min	51	48	40	95	134	134	134	143	144	127	122	123
	39.3	1.0D	0.05D	Vc m/min	30	40	40	40	60	60	60	70	70	70	70	70
				fz mm/tooth	0.001	0.001	0.001	0.003	0.005	0.007	0.01	0.012	0.014	0.017	0.021	0.024
				rpm obr/min	19099	21221	15915	12732	9549	6366	4775	4456	3714	2785	2228	1857
				feed posuw mm/min	19	25	29	71	90	89	96	105	100	95	91	90
	40	1.0D	0.05D	Vc m/min	70	85	100	120	165	165	165	195	195	195	195	200
				fz mm/tooth	0.001	0.002	0.002	0.006	0.01	0.016	0.021	0.026	0.03	0.037	0.044	0.051
				rpm obr/min	44563	45094	39789	38197	26261	17507	13130	12414	10345	7759	6207	5305
				feed posuw mm/min	89	180	159	458	525	560	551	646	621	574	546	541
	41	1.0D	0.05D	Vc m/min	65	75	75	80	110	110	110	130	130	130	130	130
				fz mm/tooth	0.001	0.001	0.002	0.006	0.01	0.015	0.02	0.024	0.028	0.034	0.04	0.047
				rpm obr/min	41380	39789	29842	25465	17507	11671	8754	8276	6897	5173	4138	3448
				feed posuw mm/min	83	80	119	306	350	350	350	397	386	352	331	324

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG01

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY Z 2 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	0.5	0.6	0.8	10	1 2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	5	0.03D	1.0D	Vc m/min	80	95	125	150	210	205	210	245	245	250	245	250
				fz mm/tooth	0.002	0.003	0.003	0.009	0.014	0.022	0.03	0.037	0.041	0.053	0.062	0.072
				rpm obr/min	50930	50399	49736	47746	33423	21751	16711	15597	12998	9947	7799	6631
				feed posuw mm/min	204	302	298	859	936	957	1003	1154	1066	1054	967	955
	8-9	0.03D	1.0D	Vc m/min	80	95	125	150	210	205	210	245	245	250	245	250
				fz mm/tooth	0.002	0.003	0.003	0.009	0.014	0.022	0.03	0.037	0.041	0.053	0.062	0.072
				rpm obr/min	50930	50399	49736	47746	33423	21751	16711	15597	12998	9947	7799	6631
				feed posuw mm/min	204	302	298	859	936	957	1003	1154	1066	1054	967	955
	11.1	0.03D	1.0D	Vc m/min	80	95	125	150	210	205	210	245	245	250	245	250
				fz mm/tooth	0.002	0.003	0.003	0.009	0.014	0.022	0.03	0.037	0.041	0.053	0.062	0.072
				rpm obr/min	50930	50399	49736	47746	33423	21751	16711	15597	12998	9947	7799	6631
				feed posuw mm/min	204	302	298	859	936	957	1003	1154	1066	1054	967	955
	11.2	0.03D	1.0D	Vc m/min	70	85	100	120	165	165	165	195	195	195	195	200
				fz mm/tooth	0.002	0.002	0.003	0.009	0.015	0.022	0.03	0.037	0.043	0.053	0.063	0.074
				rpm obr/min	44563	45094	39789	38197	26261	17507	13130	12414	10345	7759	6207	5305
				feed posuw mm/min	178	180	239	688	788	770	788	919	890	822	782	785
H	38.1	0.03D	1.0D	Vc m/min	70	85	100	120	165	165	165	195	195	195	195	200
				fz mm/tooth	0.002	0.002	0.003	0.009	0.015	0.022	0.03	0.037	0.043	0.053	0.063	0.074
				rpm obr/min	44563	45094	39789	38197	26261	17507	13130	12414	10345	7759	6207	5305
				feed posuw mm/min	178	180	239	688	788	770	788	919	890	822	782	785
	38.2	0.03D	1.0D	Vc m/min	65	75	75	80	110	110	110	130	130	130	130	130
				fz mm/tooth	0.002	0.002	0.003	0.008	0.014	0.021	0.028	0.034	0.04	0.049	0.058	0.067
				rpm obr/min	41380	39789	29842	25465	17507	11671	8754	8276	6897	5173	4138	3448
				feed posuw mm/min	166	159	179	407	490	490	490	563	552	507	480	462
	39.1	0.03D	1.0D	Vc m/min	50	55	65	65	90	90	90	100	100	100	100	100
				fz mm/tooth	0.001	0.002	0.002	0.006	0.01	0.016	0.021	0.026	0.03	0.037	0.043	0.051
				rpm obr/min	31831	29178	25863	20690	14324	9549	7162	6366	5305	3979	3183	2653
				feed posuw mm/min	64	117	103	248	286	306	301	331	318	294	274	271
	39.2	0.03D	1.0D	Vc m/min	40	45	50	50	70	70	70	80	80	80	80	80
				fz mm/tooth	0.001	0.001	0.002	0.005	0.008	0.012	0.017	0.02	0.024	0.029	0.035	0.042
				rpm obr/min	25465	23873	19894	15915	11141	7427	5570	5093	4244	3183	2546	2122
				feed posuw mm/min	51	48	80	159	178	178	189	204	204	185	178	178
	39.3	0.03D	1.0D	Vc m/min	30	40	40	40	60	60	60	70	70	70	70	70
				fz mm/tooth	0.001	0.001	0.001	0.004	0.007	0.01	0.014	0.017	0.02	0.024	0.029	0.034
				rpm obr/min	19099	21221	15915	12732	9549	6366	4775	4456	3714	2785	2228	1857
				feed posuw mm/min	38	42	32	102	134	127	134	152	149	134	129	126
	40	0.03D	1.0D	Vc m/min	70	85	100	120	165	165	165	195	195	195	195	200
				fz mm/tooth	0.002	0.002	0.003	0.009	0.015	0.022	0.03	0.037	0.043	0.053	0.063	0.074
				rpm obr/min	44563	45094	39789	38197	26261	17507	13130	12414	10345	7759	6207	5305
				feed posuw mm/min	178	180	239	688	788	770	788	919	890	822	782	785
	41	0.03D	1.0D	Vc m/min	65	75	75	80	110	110	110	130	130	130	130	130
				fz mm/tooth	0.002	0.002	0.003	0.008	0.014	0.021	0.028	0.034	0.04	0.049	0.058	0.067
				rpm obr/min	41380	39789	29842	25465	17507	11671	8754	8276	6897	5173	4138	3448
				feed posuw mm/min	166	159	179	407	490	490	490	563	552	507	480	462

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG36

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG36003000A03000040	-	0,3	3	0,45	-	40	-
UFG36004000A03000040	-	0,4	3	0,6	-	40	-
UFG36005X50A03000040	0,05	0,5	3	0,7	-	40	-
UFG36005X50A04000040	0,05	0,5	4	1	-	40	-
UFG36006X50A03000040	0,05	0,6	3	0,9	-	40	-
UFG36006X50A04000040	0,05	0,6	4	1,2	-	40	-
UFG36007X50A04000040	0,05	0,7	4	1,4	-	40	-
UFG36008X50A03000040	0,05	0,8	3	1,2	-	40	-
UFG36008X50A04000040	0,05	0,8	4	1,6	-	40	-
UFG36009X50A04000040	0,05	0,9	4	2	-	40	-
UFG36010001A03000040	0,1	1	3	1,5	-	40	-
UFG36010001A04000040	0,1	1	4	1,5	-	40	-
UFG36010001A06000040	0,1	1	6	1,5	-	40	-
UFG36015001A03000040	0,1	1,5	3	2,2	-	40	-
UFG36015001A06000040	0,1	1,5	6	2,2	-	40	-
UFG36020001A03006040	0,1	2	3	3	6	40	1,95
UFG36020001A04006040	0,1	2	4	3	6	40	1,95
UFG36020001A06006040	0,1	2	6	3	6	40	1,95
UFG36025001A03006040	0,1	2,5	3	4	6	40	2,4
UFG36025001A06006040	0,1	2,5	6	4	6	40	2,4
UFG36030001A06007045	0,1	3	6	4	7	45	2,85
UFG36035001A06009045	0,1	3,5	6	5	9	45	3,35
UFG36040001A06009045	0,1	4	6	5	9	45	3,85
UFG36045001A06010045	0,1	4,5	6	6	10	45	4,35
UFG36050002A06011050	0,2	5	6	6	11	50	4,85
UFG36060002A06014050	0,2	6	6	7	14	50	5,85
UFG36080002A08018060	0,2	8	8	9	18	60	7,7
UFG36100002A10025075	0,2	10	10	12	25	75	9,7
UFG36120003A12030075	0,3	12	12	15	30	75	11,7
UFG36160003A16038090	0,3	16	16	18	38	90	15,7
UFG36200003A20045100	0,3	20	20	24	45	100	19,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFG36

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ Z 2 ZĘBAMI ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.2	0.3	0.4	0.5	0.6	0.8	09	1.0	2.0
P	5	1.0D	0.05D	Vc m/min	30	45	65	80	95	125	140	150	210
				fz mm/tooth	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.01	0.013
				rpm obr/min	47746	47746	51725	50930	50399	49736	49515	47746	33423
				feed posuw mm/min	95	191	207	407	504	597	693	955	869
	8-9	1.0D	0.05D	Vc m/min	30	45	65	80	95	125	140	150	210
				fz mm/tooth	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.01	0.013
				rpm obr/min	47746	47746	51725	50930	50399	49736	49515	47746	33423
				feed posuw mm/min	95	191	207	407	504	597	693	955	869
	11.1	1.0D	0.05D	Vc m/min	30	45	65	80	95	125	140	150	210
				fz mm/tooth	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.01	0.013
				rpm obr/min	47746	47746	51725	50930	50399	49736	49515	47746	33423
				feed posuw mm/min	95	191	207	407	504	597	693	955	869
	11.2	1.0D	0.05D	Vc m/min	30	40	55	70	85	100	110	120	165
				fz mm/tooth	0.001	0.002	0.002	0.003	0.004	0.006	0.007	0.008	0.013
				rpm obr/min	47746	42441	43768	44563	45094	39789	38905	38197	26261
				feed posuw mm/min	95	170	175	267	361	477	545	611	683
H	38.1	1.0D	0.05D	Vc m/min	30	40	55	70	85	100	110	120	165
				fz mm/tooth	0.001	0.002	0.002	0.003	0.004	0.006	0.007	0.008	0.013
				rpm obr/min	47746	42441	43768	44563	45094	39789	38905	38197	26261
				feed posuw mm/min	95	170	175	267	361	477	545	611	683
	38.2	1.0D	0.05D	Vc m/min	25	40	50	65	75	75	80	80	110
				fz mm/tooth	0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.012
				rpm obr/min	39789	42441	39789	41380	39789	29842	28294	25465	17507
				feed posuw mm/min	80	85	159	248	318	298	340	357	420
	39.1	1.0D	0.05D	Vc m/min	20	30	40	50	55	65	65	65	90
				fz mm/tooth	0.001	0.001	0.001	0.002	0.003	0.004	0.005	0.005	0.009
				rpm obr/min	31831	31831	31831	31831	29178	25863	22989	20690	14324
				feed posuw mm/min	64	64	64	127	175	207	230	207	258
	39.2	1.0D	0.05D	Vc m/min	20	25	30	40	45	50	50	50	70
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.007
				rpm obr/min	31831	26526	23873	25465	23873	19894	17684	15915	11141
				feed posuw mm/min	64	53	48	102	95	119	141	127	156
	39.3	1.0D	0.02D	Vc m/min	15	20	25	30	40	40	40	40	60
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.006
				rpm obr/min	23873	21221	19894	19099	21221	15915	14147	12732	9549
				feed posuw mm/min	29	38	40	57	81	83	91	87	116
	40	1.0D	0.05D	Vc m/min	30	40	55	70	85	100	110	120	165
				fz mm/tooth	0.001	0.002	0.002	0.003	0.004	0.006	0.007	0.008	0.013
				rpm obr/min	47746	42441	43768	44563	45094	39789	38905	38197	26261
				feed posuw mm/min	95	170	175	267	361	477	545	611	683
	41	1.0D	0.05D	Vc m/min	25	40	50	65	75	75	80	80	110
				fz mm/tooth	0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.012
				rpm obr/min	39789	42441	39789	41380	39789	29842	28294	25465	17507
				feed posuw mm/min	80	85	159	248	318	298	340	357	420

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG36

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ Z 2 ZĘBAMI ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	1.0D	0.05D	Vc m/min	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.019	0.026	0.032	0.036	0.047	0.054	0.064	0.074	0.085
				rpm obr/min	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	827	869	998	936	935	842	849	721	663
	8-9	1.0D	0.05D	Vc m/min	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.019	0.026	0.032	0.036	0.047	0.054	0.064	0.074	0.085
				rpm obr/min	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	827	869	998	936	935	842	849	721	663
	11.1	1.0D	0.05D	Vc m/min	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.019	0.026	0.032	0.036	0.047	0.054	0.064	0.074	0.085
				rpm obr/min	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	827	869	998	936	935	842	849	721	663
	11.2	1.0D	0.05D	Vc m/min	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.02	0.027	0.032	0.037	0.046	0.055	0.065	0.074	0.085
				rpm obr/min	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	700	709	794	766	714	683	690	574	528
H	38.1	1.0D	0.05D	Vc m/min	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.02	0.027	0.032	0.037	0.046	0.055	0.065	0.074	0.085
				rpm obr/min	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	700	709	794	766	714	683	690	574	528
	38.2	1.0D	0.05D	Vc m/min	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.018	0.025	0.03	0.035	0.043	0.051	0.059	0.07	0.082
				rpm obr/min	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	420	438	497	483	445	422	407	362	339
	39.1	1.0D	0.05D	Vc m/min	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.014	0.019	0.022	0.026	0.032	0.038	0.045	0.053	0.061
				rpm obr/min	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	267	272	280	276	255	242	239	211	194
	39.2	1.0D	0.05D	Vc m/min	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.011	0.015	0.018	0.021	0.026	0.03	0.037	0.042	0.048
				rpm obr/min	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	163	167	183	178	166	153	157	134	122
	39.3	1.0D	0.02D	Vc m/min	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.009	0.012	0.015	0.018	0.021	0.026	0.03	0.034	0.039
				rpm obr/min	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	115	118	132	131	119	114	112	94	86
	40	1.0D	0.05D	Vc m/min	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.02	0.027	0.032	0.037	0.046	0.055	0.065	0.074	0.085
				rpm obr/min	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	700	709	794	766	714	683	690	574	528
	41	1.0D	0.05D	Vc m/min	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.018	0.025	0.03	0.035	0.043	0.051	0.059	0.07	0.082
				rpm obr/min	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	420	438	497	483	445	422	407	362	339

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG36

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SIDE CUTTING / FREZ Z 2 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.011	0.018	0.028	0.037	0.046	0.052	0.067	0.077	0.09	0.107	0.122
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1050	1203	1218	1237	1435	1352	1333	1201	1194	1043	951
	8-9	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.011	0.018	0.028	0.037	0.046	0.052	0.067	0.077	0.09	0.107	0.122
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1050	1203	1218	1237	1435	1352	1333	1201	1194	1043	951
	11.1	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.011	0.018	0.028	0.037	0.046	0.052	0.067	0.08	0.09	0.107	0.122
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1050	1203	1218	1237	1435	1352	1333	1248	1194	1043	951
	11.2	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.011	0.019	0.028	0.038	0.046	0.053	0.066	0.079	0.092	0.108	0.121
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	840	998	980	998	1142	1097	1024	981	976	838	751
H	38.1	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.011	0.019	0.028	0.038	0.046	0.053	0.066	0.079	0.092	0.108	0.121
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	840	998	980	998	1142	1097	1024	981	976	838	751
	38.2	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.01	0.017	0.026	0.036	0.043	0.05	0.061	0.072	0.084	0.1	0.116
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	509	595	607	630	712	690	631	596	579	517	480
	39.1	0.03D	1.0D	Vc m/min	65	90	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.008	0.013	0.019	0.027	0.032	0.038	0.046	0.053	0.064	0.075	0.086
				rpm obr/min	20690	14324	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	331	372	363	387	407	403	366	337	340	298	274
	39.2	0.03D	1.0D	Vc m/min	50	70	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.006	0.01	0.015	0.021	0.025	0.03	0.037	0.043	0.052	0.059	0.067
				rpm obr/min	15915	11141	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	191	223	223	234	255	255	236	219	221	188	171
	39.3	0.03D	1.0D	Vc m/min	40	60	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.005	0.009	0.013	0.018	0.021	0.025	0.03	0.036	0.043	0.05	0.057
				rpm obr/min	12732	9549	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	127	172	166	172	187	186	167	160	160	139	127
	40	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.011	0.019	0.028	0.038	0.046	0.053	0.066	0.079	0.092	0.108	0.121
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	840	998	980	998	1142	1097	1024	981	976	838	751
	41	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.01	0.017	0.026	0.036	0.043	0.05	0.061	0.072	0.084	0.1	0.116
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	509	595	607	630	712	690	631	596	579	517	480

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG52

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG52005001A06002050	0,05	0,5	6	0,7	1,5	50	0,45
UFG52005001A06003050	0,05	0,5	6	0,7	3,3	50	0,45
UFG52006001A06002050	0,05	0,6	6	0,9	2	50	0,55
UFG52006001A06004050	0,05	0,6	6	0,9	4	50	0,55
UFG52008001A06003050	0,05	0,8	6	1,2	2,5	50	0,75
UFG52008001A06006050	0,05	0,8	6	1,2	5,5	50	0,75
UFG52010001A06003050	0,1	1	6	1,5	3,3	50	0,95
UFG52010001A06007050	0,1	1	6	1,5	6,7	50	0,95
UFG52012001A06004050	0,1	1,2	6	1,8	4,4	50	1,15
UFG52012001A06008050	0,1	1,2	6	1,8	8	50	1,15
UFG52015002A06005050	0,15	1,5	6	2,2	5	50	1,45
UFG52015002A06010050	0,15	1,5	6	2,2	9,7	50	1,45
UFG52020002A06006050	0,15	2	6	2,2	6	50	1,95
UFG52020002A06013050	0,15	2	6	2,2	13	50	1,95

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.012	h5

UFG52

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS FOR RIB PROCESSING SLOTTING / FREZ PROMIENIOWY DO OBRÓBKI ŻEBER ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.5	0.6	0.8	1 1.0	1.2	1.5	2.0
P	5	1.0D	Vc m/min	40~52	39~66	41~66	39~59	39~66	43~83	40~66
		1.0D	fz mm/tooth	0.006~0.009	0.005~0.013	0.007~0.018	0.009~0.022	0.010~0.028	0.012~0.046	0.016~0.045
		1.0D	rpm obr/min	25650~33000	20900~35200	16150~26400	12300~18700	10450~17600	9100~17600	6350~10550
		1.0D	feed posuw mm/min	370~470	330~560	360~590	350~540	350~590	430~830	340~570
		1.0D	Ap mm	0.0056~0.0350	0.0063~0.0294	0.0084~0.0392	0.0105~0.0280	0.0245~0.0700	0.0161~0.0770	0.0210~0.1400
	8-9	1.0D	Vc m/min	40~52	39~66	41~66	39~59	39~66	43~83	40~66
		1.0D	fz mm/tooth	0.006~0.009	0.005~0.013	0.007~0.018	0.009~0.022	0.010~0.028	0.012~0.046	0.016~0.045
		1.0D	RPM obr/min	25650~33000	20900~35200	16150~26400	12300~18700	10450~17600	9100~17600	6350~10550
		1.0D	Feed Posuw mm/min	370~470	330~560	360~590	350~540	350~590	430~830	340~570
		1.0D	Ap mm	0.0056~0.0350	0.0063~0.0294	0.0084~0.0392	0.0105~0.0280	0.0245~0.0700	0.0161~0.0770	0.0210~0.1400
	11.1 - 11.2	1.0D	Vc m/min	40~52	39~66	41~66	39~59	39~66	43~83	40~66
		1.0D	fz mm/tooth	0.006~0.009	0.005~0.013	0.007~0.018	0.009~0.022	0.010~0.028	0.012~0.046	0.016~0.045
		1.0D	RPM obr/min	25650~33000	20900~35200	16150~26400	12300~18700	10450~17600	9100~17600	6350~10550
		1.0D	Feed Posuw mm/min	370~470	330~560	360~590	350~540	350~590	430~830	340~570
		1.0D	Ap mm	0.0056~0.0350	0.0063~0.0294	0.0084~0.0392	0.0105~0.0280	0.0245~0.0700	0.0161~0.0770	0.0210~0.1400
H	38.1 - 38.2	1.0D	Vc m/min	37~41	38~41	38~42	33~36	34~38	33~38	38~42
		1.0D	fz mm/tooth	0.005~0.007	0.004~0.007	0.006~0.010	0.008~0.013	0.009~0.015	0.011~0.020	0.015~0.025
		1.0D	RPM obr/min	23750~26000	19900~22000	15200~16700	10500~11500	9100~10000	7000~8000	6100~6700
		1.0D	Feed Posuw mm/min	285~315	190~290	210~310	190~280	180~280	180~280	200~300
		1.0D	Ap mm	0.0040~0.0250	0.0450~0.0210	0.0060~0.0280	0.0075~0.0200	0.0150~0.0420	0.0115~0.0550	0.0150~0.1000
	39.1 - 39.3	1.0D	Vc m/min	22~28	22~29	23~29	20~25	20~26	20~26	23~30
		1.0D	fz mm/tooth	0.016~0.014	0.017~0.015	0.024~0.021	0.032~0.029	0.037~0.033	0.047~0.042	0.056~0.051
		1.0D	RPM obr/min	14200~18000	11900~15500	9000~11700	6300~8050	5400~7000	4300~5500	3600~4700
		1.0D	Feed Posuw mm/min	115~130	100~120	110~125	100~115	100~115	100~115	100~120
		1.0D	Ap mm	0.016~0.014	0.017~0.015	0.024~0.021	0.032~0.029	0.037~0.033	0.047~0.042	0.056~0.051
	40	1.0D	Vc m/min	40~52	39~66	41~66	39~59	39~66	43~83	40~66
		1.0D	fz mm/tooth	0.006~0.009	0.005~0.013	0.007~0.018	0.009~0.022	0.010~0.028	0.012~0.046	0.016~0.045
		1.0D	RPM obr/min	25650~33000	20900~35200	16150~26400	12300~18700	10450~17600	9100~17600	6350~10550
		1.0D	Feed Posuw mm/min	370~470	330~560	360~590	350~540	350~590	430~830	340~570
		1.0D	Ap mm	0.0056~0.0350	0.0063~0.0294	0.0084~0.0392	0.0105~0.0280	0.0245~0.0700	0.0161~0.0770	0.0210~0.1400
	41	1.0D	Vc m/min	37~41	38~41	38~42	33~36	34~38	33~38	38~42
		1.0D	fz mm/tooth	0.005~0.007	0.004~0.007	0.006~0.010	0.008~0.013	0.009~0.015	0.011~0.020	0.015~0.025
		1.0D	RPM obr/min	23750~26000	19900~22000	15200~16700	10500~11500	9100~10000	7000~8000	6100~6700
		1.0D	Feed Posuw mm/min	285~315	190~290	210~310	190~280	180~280	180~280	200~300
		1.0D	Ap mm	0.0040~0.0250	0.0450~0.0210	0.0060~0.0280	0.0075~0.0200	0.0150~0.0420	0.0115~0.0550	0.0150~0.1000

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG50

ISO	P										M			K					N									S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21									15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	OAL
UFG50003000A06000050	-	0.3	6	0.45	50
UFG50004000A06000050	-	0.4	6	0.6	50
UFG50005X50A06000050	R0.05	0.5	6	0.7	50
UFG50006X50A06000050	R0.05	0.6	6	0.9	50
UFG50008X50A06001050	R0.05	0.8	6	1.2	50
UFG50010001A06001050	R0.10	1.0	6	1.5	50
UFG50012001A06001050	R0.10	1.2	6	1.8	50
UFG50015002A06002050	R0.15	1.5	6	2.2	50
UFG50020002A06002050	R0.15	2.0	6	2.2	50

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.012	h5

UFG50

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY Z 2 ZĘBAMI ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.3	0.4	05	0.6	0.8	1.0	1.2	1.5	2.0
P	5	1.0D	0.05D	Vc m/min	45	65	80	95	125	150	160	175	210
				fz mm/tooth	0.002	0.002	0.004	0.005	0.006	0.008	0.009	0.011	0.013
				rpm obr/min	47746	51725	50930	50399	49736	47746	42441	37136	33423
				feed posuw mm/min	191	207	407	504	597	764	764	817	869
	8-9	1.0D	0.05D	Vc m/min	45	65	80	95	125	150	160	175	210
				fz mm/tooth	0.002	0.002	0.004	0.005	0.006	0.008	0.009	0.011	0.013
				rpm obr/min	47746	51725	50930	50399	49736	47746	42441	37136	33423
				feed posuw mm/min	191	207	407	504	597	764	764	817	869
	11.1	1.0D	0.05D	Vc m/min	45	65	80	95	125	150	160	175	210
				fz mm/tooth	0.002	0.002	0.004	0.005	0.006	0.008	0.009	0.011	0.013
				rpm obr/min	47746	51725	50930	50399	49736	47746	42441	37136	33423
				feed posuw mm/min	191	207	407	504	597	764	764	817	869
	11.2	1.0D	0.05D	Vc m/min	40	55	70	85	100	120	130	145	165
				fz mm/tooth	0.002	0.002	0.003	0.004	0.006	0.008	0.009	0.011	0.013
				rpm obr/min	42441	43768	44563	45094	39789	38197	34484	30770	26261
				feed posuw mm/min	170	175	267	361	477	611	621	677	683
H	38.1	1.0D	0.05D	Vc m/min	40	55	70	85	100	120	130	145	165
				fz mm/tooth	0.002	0.002	0.003	0.004	0.006	0.008	0.009	0.011	0.013
				rpm obr/min	42441	43768	44563	45094	39789	38197	34484	30770	26261
				feed posuw mm/min	170	175	267	361	477	611	621	677	683
	38.2	1.0D	0.05D	Vc m/min	40	50	65	75	75	80	85	100	110
				fz mm/tooth	0.001	0.002	0.003	0.004	0.005	0.007	0.008	0.01	0.012
				rpm obr/min	42441	39789	41380	39789	29842	25465	22547	21221	17507
				feed posuw mm/min	85	159	248	318	298	357	361	424	420
	39.1	1.0D	0.05D	Vc m/min	30	40	50	55	65	65	75	80	90
				fz mm/tooth	0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.009
				rpm obr/min	31831	31831	31831	29178	25863	20690	19894	16977	14324
				feed posuw mm/min	64	64	127	175	207	207	239	238	258
	39.2	1.0D	0.05D	Vc m/min	25	30	40	45	50	50	55	60	70
				fz mm/tooth	0.001	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
				rpm obr/min	26526	23873	25465	23873	19894	15915	14589	12732	11141
				feed posuw mm/min	53	48	102	95	119	127	146	153	156
	40	1.0D	0.05D	Vc m/min	40	55	70	85	100	120	130	145	165
				fz mm/tooth	0.002	0.002	0.003	0.004	0.006	0.008	0.009	0.011	0.013
				rpm obr/min	42441	43768	44563	45094	39789	38197	34484	30770	26261
				feed posuw mm/min	170	175	267	361	477	611	621	677	683
	41	1.0D	0.05D	Vc m/min	40	50	65	75	75	80	85	100	110
				fz mm/tooth	0.001	0.002	0.003	0.004	0.005	0.007	0.008	0.01	0.012
				rpm obr/min	42441	39789	41380	39789	29842	25465	22547	21221	17507
				feed posuw mm/min	85	159	248	318	298	357	361	424	420

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG47

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG47030003A06012055	0,3	3	6	4	12	55	2,85
UFG47030003A06016055	0,3	3	6	4	16	55	2,85
UFG47030003A06020055	0,3	3	6	4	20	55	2,85
UFG47030005A06010055	0,5	3	6	4	10	55	2,85
UFG47030005A06016055	0,5	3	6	4	16	55	2,85
UFG47030005A06020055	0,5	3	6	4	20	55	2,85
UFG47040003A06012055	0,3	4	6	5	12	55	3,85
UFG47040003A06016055	0,3	4	6	5	16	55	3,85
UFG47040003A06020055	0,3	4	6	5	20	55	3,85
UFG47040005A06012055	0,5	4	6	5	12	55	3,85
UFG47040005A06016055	0,5	4	6	5	16	55	3,85
UFG47040005A06020055	0,5	4	6	5	20	55	3,85
UFG47040010A06012055	1	4	6	5	12	55	3,85
UFG47060005A06020060	0,5	6	6	7	20	60	5,85
UFG47060010A06020060	1	6	6	7	20	60	5,85
UFG47060015A06020060	1,5	6	6	7	20	60	5,85
UFG47080005A08025060	0,5	8	8	9	25	60	7,7
UFG47080010A08025060	1	8	8	9	25	60	7,7
UFG47080015A08025060	1,5	8	8	9	25	60	7,7
UFG47080020A08025060	2	8	8	9	25	60	7,7
UFG47100005A10032070	0,5	10	10	11	32	70	9,7
UFG47100010A10032070	1	10	10	11	32	70	9,7
UFG47100015A10032070	1,5	10	10	11	32	70	9,7
UFG47100020A10032070	2	10	10	11	32	70	9,7
UFG47120005A12038080	0,5	12	12	12	38	80	11,7
UFG47120010A12038080	1	12	12	12	38	80	11,7
UFG47120015A12038080	1,5	12	12	12	38	80	11,7
UFG47120020A12038080	2	12	12	12	38	80	11,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFG47

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY Z 4 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.006	0.011	0.016	0.022	0.025	0.03	0.038	0.045	0.053	0.061	0.067
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1146	1471	1392	1471	1560	1560	1512	1404	1406	1189	1045
	8-9	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.006	0.011	0.016	0.022	0.025	0.03	0.038	0.045	0.053	0.061	0.067
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1146	1471	1392	1471	1560	1560	1512	1404	1406	1189	1045
	11.1	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.006	0.011	0.016	0.022	0.025	0.03	0.038	0.045	0.053	0.061	0.067
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1146	1471	1392	1471	1560	1560	1512	1404	1406	1189	1045
	11.2	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.006	0.01	0.014	0.02	0.024	0.027	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	917	1050	980	1050	1192	1117	1086	1018	1019	869	782
H	38.1	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.006	0.01	0.014	0.02	0.024	0.027	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	917	1050	980	1050	1192	1117	1086	1018	1019	869	782
	38.2	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.006	0.01	0.015	0.02	0.024	0.028	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	611	700	700	700	794	772	724	679	662	579	521
	39.1	0.03D	1.0D	Vc m/min	65	90	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.004	0.007	0.011	0.015	0.018	0.021	0.026	0.03	0.036	0.042	0.048
				rpm obr/min	20690	14324	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	331	401	420	430	458	446	414	382	382	334	306
	39.2	0.03D	1.0D	Vc m/min	50	70	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.003	0.006	0.009	0.012	0.015	0.017	0.021	0.024	0.029	0.034	0.038
				rpm obr/min	15915	11141	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	191	267	267	267	306	289	267	244	246	217	193
	39.3	0.03D	1.0D	Vc m/min	40	60	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.005	0.007	0.01	0.012	0.014	0.017	0.02	0.024	0.029	0.033
				rpm obr/min	12732	9549	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	153	191	178	191	214	208	189	178	178	162	147
	40	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.006	0.01	0.014	0.02	0.024	0.027	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	917	1050	980	1050	1192	1117	1086	1018	1019	869	782
	41	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.006	0.01	0.015	0.02	0.024	0.028	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	611	700	700	700	794	772	724	679	662	579	521

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG37

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG37010001A03000040	0,1	1	3	1,5	-	40	-
UFG37010001A06000040	0,1	1	6	1,5	-	40	-
UFG37015001A03000040	0,1	1,5	3	2,2	-	40	-
UFG37015001A06000040	0,1	1,5	6	2,2	-	40	-
UFG37020001A03006040	0,1	2	3	3	6	40	1,95
UFG37020001A06006040	0,1	2	6	3	6	40	1,95
UFG37025001A03006040	0,1	2,5	3	4	6	40	2,4
UFG37025001A06006040	0,1	2,5	6	4	6	40	2,4
UFG37030001A06007045	0,1	3	6	4	7	45	2,85
UFG37035001A06009045	0,1	3,5	6	5	9	45	3,35
UFG37040001A06009045	0,1	4	6	5	9	45	3,85
UFG37045001A06010045	0,1	4,5	6	6	10	45	4,35
UFG37050002A06011050	0,2	5	6	6	11	50	4,85
UFG37060002A06014050	0,2	6	6	7	14	50	5,85
UFG37080002A08018060	0,2	8	8	9	18	60	7,7
UFG37100002A10025075	0,2	10	10	12	25	75	9,7
UFG37120003A12030075	0,3	12	12	15	30	75	11,7
UFG37160003A16038090	0,3	16	16	18	38	90	15,7
UFG37200003A20045100	0,3	20	20	24	45	100	19,7
UFG36025001A06006040	0,1	2,5	6	4	6	40	2,4
UFG36030001A06007045	0,1	3	6	4	7	45	2,85
UFG36035001A06009045	0,1	3,5	6	5	9	45	3,35
UFG36040001A06009045	0,1	4	6	5	9	45	3,85
UFG36045001A06010045	0,1	4,5	6	6	10	45	4,35
UFG36050002A06011050	0,2	5	6	6	11	50	4,85
UFG36060002A06014050	0,2	6	6	7	14	50	5,85
UFG36080002A08018060	0,2	8	8	9	18	60	7,7
UFG36100002A10025075	0,2	10	10	12	25	75	9,7
UFG36120003A12030075	0,3	12	12	15	30	75	11,7
UFG36160003A16038090	0,3	16	16	18	38	90	15,7
UFG36200003A20045100	0,3	20	20	24	45	100	19,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFG37

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ Z 4 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.008	0.013	0.02	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1528	1738	1740	1805	1996	1924	1910	1747	1751	1501	1294
	8-9	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.008	0.013	0.02	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1528	1738	1740	1805	1996	1924	1910	1747	1751	1501	1294
	11.1	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.008	0.013	0.02	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1528	1738	1740	1805	1996	1924	1910	1747	1751	1501	1294
	11.2	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.071	0.078
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	1070	1261	1261	1313	1490	1407	1335	1266	1273	1102	968
H	38.1	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.071	0.078
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	1070	1261	1261	1313	1490	1407	1335	1266	1273	1102	968
	38.2	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.07	0.079
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	713	840	840	875	993	938	890	844	828	724	654
	39.1	0.03D	1.0D	Vc m/min	65	90	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.005	0.009	0.014	0.019	0.023	0.026	0.033	0.038	0.045	0.053	0.059
				rpm obr/min	20690	14324	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	414	516	535	544	586	552	525	484	478	422	376
	39.2	0.03D	1.0D	Vc m/min	50	70	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.004	0.007	0.011	0.015	0.018	0.021	0.026	0.03	0.036	0.042	0.048
				rpm obr/min	15915	11141	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	255	312	327	334	367	356	331	306	306	267	244
	39.3	0.03D	1.0D	Vc m/min	40	60	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.004	0.007	0.009	0.013	0.016	0.018	0.022	0.025	0.03	0.036	0.041
				rpm obr/min	12732	9549	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	204	267	229	248	285	267	245	223	223	201	183
	40	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.071	0.078
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	1070	1261	1261	1313	1490	1407	1335	1266	1273	1102	968
	41	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.07	0.079
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	713	840	840	875	993	938	890	844	828	724	654

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG18

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG18060005A06020090	0,5	6	6	9	20	90	5,85
UFG18060010A06020090	1	6	6	9	20	90	5,85
UFG18080005A08025100	0,5	8	8	12	25	100	7,7
UFG18080010A08025100	1	8	8	12	25	100	7,7
UFG18100005A10032100	0,5	10	10	15	32	100	9,7
UFG18100010A10032100	1	10	10	15	32	100	9,7
UFG18100020A10032100	2	10	10	15	32	100	9,7
UFG18120005A12038110	0,5	12	12	18	38	110	11,7
UFG18120010A12038110	1	12	12	18	38	110	11,7
UFG18120020A12038110	2	12	12	18	38	110	11,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFG18

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY Z 4 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.006	0.011	0.016	0.022	0.025	0.03	0.038	0.045	0.053	0.061	0.067
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1146	1471	1392	1471	1560	1560	1512	1404	1406	1189	1045
	8-9	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.006	0.011	0.016	0.022	0.025	0.03	0.038	0.045	0.053	0.061	0.067
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1146	1471	1392	1471	1560	1560	1512	1404	1406	1189	1045
	11.1	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.006	0.011	0.016	0.022	0.025	0.03	0.038	0.045	0.053	0.061	0.067
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1146	1471	1392	1471	1560	1560	1512	1404	1406	1189	1045
	11.2	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.006	0.01	0.014	0.02	0.024	0.027	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	917	1050	980	1050	1192	1117	1086	1018	1019	869	782
H	38.1	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.006	0.01	0.014	0.02	0.024	0.027	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	917	1050	980	1050	1192	1117	1086	1018	1019	869	782
	38.2	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.006	0.01	0.015	0.02	0.024	0.028	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	611	700	700	700	794	772	724	679	662	579	521
	39.1	0.03D	1.0D	Vc m/min	65	90	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.004	0.007	0.011	0.015	0.018	0.021	0.026	0.03	0.036	0.042	0.048
				rpm obr/min	20690	14324	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	331	401	420	430	458	446	414	382	382	334	306
	39.2	0.03D	1.0D	Vc m/min	50	70	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.003	0.006	0.009	0.012	0.015	0.017	0.021	0.024	0.029	0.034	0.038
				rpm obr/min	15915	11141	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	191	267	267	267	306	289	267	244	246	217	193
	39.3	0.03D	1.0D	Vc m/min	40	60	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.005	0.007	0.01	0.012	0.014	0.017	0.02	0.024	0.029	0.033
				rpm obr/min	12732	9549	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	153	191	178	191	214	208	189	178	178	162	147
	40	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.006	0.01	0.014	0.02	0.024	0.027	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	917	1050	980	1050	1192	1117	1086	1018	1019	869	782
	41	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.006	0.01	0.015	0.02	0.024	0.028	0.035	0.041	0.048	0.056	0.063
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	611	700	700	700	794	772	724	679	662	579	521

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG39

R 6 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFG39060003A06014050	0,25	6	6	6	14	50	5,85
UFG39060005A06014050	0,5	6	6	6	14	50	5,85
UFG39060005A06013070	0,5	6	6	13	-	70	-
UFG39060005A06026070	0,5	6	6	26	-	70	-
UFG39080005A08024060	0,5	8	8	8	24	60	7,7
UFG39080005A08019090	0,5	8	8	19	-	90	-
UFG39080005A08036090	0,5	8	8	36	-	90	-
UFG39100005A10022100	0,5	10	10	22	-	100	-
UFG39100010A10030070	1	10	10	10	30	70	9,7
UFG39100010A10022100	1	10	10	22	-	100	-
UFG39100010A10046100	1	10	10	46	-	100	-
UFG39120005A12026110	0,5	12	12	26	-	110	-
UFG39120010A12030075	1	12	12	12	30	75	11,7
UFG39120010A12026110	1	12	12	26	-	110	-
UFG39120010A12056110	1	12	12	56	-	110	-
UFG39160010A16032130	1	16	16	32	-	130	-
UFG39160015A16032130	1,5	16	16	32	-	130	-
UFG39160015A16066130	1,5	16	16	66	-	130	-
UFG39200010A20038140	1	20	20	38	-	140	-
UFG39200015A20038140	1,5	20	20	38	-	140	-
UFG39200020A20038140	2	20	20	38	-	140	-
UFG39200020A20076140	2	20	20	76	-	140	-

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFG39

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING / FREZ Z 6 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.05D	1.0D	Vc m/min	120	121	121	122	121	121
				fz mm/tooth	0.039	0.052	0.063	0.07	0.09	0.079
				rpm obr/min	6366	4814	3852	3236	2407	1926
				feed posuw mm/min	1490	1502	1456	1359	1300	913
	8-9	0.05D	1.0D	Vc m/min	120	121	121	122	121	121
				fz mm/tooth	0.039	0.052	0.063	0.07	0.09	0.079
				rpm obr/min	6366	4814	3852	3236	2407	1926
				feed posuw mm/min	1490	1502	1456	1359	1300	913
	11.1	0.05D	1.0D	Vc m/min	120	121	121	122	121	121
				fz mm/tooth	0.039	0.052	0.063	0.07	0.09	0.079
				rpm obr/min	6366	4814	3852	3236	2407	1926
				feed posuw mm/min	1490	1502	1456	1359	1300	913
	11.2	0.05D	1.0D	Vc m/min	106	108	106	106	108	110
				fz mm/tooth	0.036	0.049	0.058	0.065	0.083	0.095
				rpm obr/min	5623	4297	3374	2812	2149	1751
				feed posuw mm/min	1215	1263	1174	1097	1070	998
H	38.1	0.05D	1.0D	Vc m/min	106	108	106	106	108	110
				fz mm/tooth	0.036	0.049	0.058	0.065	0.083	0.095
				rpm obr/min	5623	4297	3374	2812	2149	1751
				feed posuw mm/min	1215	1263	1174	1097	1070	998
	38.2	0.05D	1.0D	Vc m/min	95	97	94	95	97	98
				fz mm/tooth	0.035	0.046	0.055	0.062	0.079	0.091
				rpm obr/min	5040	3860	2992	2520	1930	1560
				feed posuw mm/min	1058	1065	987	937	915	852
	39.1	0.03D	1.0D	Vc m/min	83	83	82	83	83	87
				fz mm/tooth	0.033	0.044	0.053	0.059	0.076	0.072
				rpm obr/min	4403	3302	2610	2202	1651	1385
				feed posuw mm/min	872	872	830	780	753	598
	39.2	0.03D	1.0D	Vc m/min	72	72	72	72	72	75
				fz mm/tooth	0.031	0.042	0.05	0.056	0.072	0.069
				rpm obr/min	3820	2865	2292	1910	1432	1194
				feed posuw mm/min	711	722	688	642	619	494
	39.3	0.03D	1.0D	Vc m/min	48	48	49	50	48	45
				fz mm/tooth	0.028	0.037	0.045	0.05	0.064	0.071
				rpm obr/min	2546	1910	1560	1326	955	716
				feed posuw mm/min	428	424	421	398	367	305
	40	0.05D	1.0D	Vc m/min	106	108	106	106	108	110
				fz mm/tooth	0.036	0.049	0.058	0.065	0.083	0.095
				rpm obr/min	5623	4297	3374	2812	2149	1751
				feed posuw mm/min	1215	1263	1174	1097	1070	998
	41	0.05D	1.0D	Vc m/min	95	97	94	95	97	98
				fz mm/tooth	0.035	0.046	0.055	0.062	0.079	0.091
				rpm obr/min	5040	3860	2992	2520	1930	1560
				feed posuw mm/min	1058	1065	987	937	915	852

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG83

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	DC	DCON	APMX	LU	OAL	DN
UFG83001000A0403X045	0,1	4	0,15	0,3	45	0,085
UFG83001000A0405X045	0,1	4	0,15	0,5	45	0,085
UFG83002000A04000045	0,2	4	0,3	0,5	45	0,17
UFG83002000A04001045	0,2	4	0,3	1	45	0,17
UFG83002000A04002045	0,2	4	0,3	1,5	45	0,17
UFG83003000A04000045	0,3	4	0,45	1	45	0,27
UFG83003000A04001045	0,3	4	0,45	1,5	45	0,27
UFG83003000A04002045	0,3	4	0,45	2	45	0,27
UFG83003000A04003045	0,3	4	0,45	3	45	0,27
UFG83003000A04004045	0,3	4	0,45	4	45	0,27
UFG83004000A04001045	0,4	4	0,6	1	45	0,37
UFG83004000A04002045	0,4	4	0,6	2	45	0,37
UFG83004000A04003045	0,4	4	0,6	3	45	0,37
UFG83004000A04004045	0,4	4	0,6	4	45	0,37
UFG83004000A04005045	0,4	4	0,6	5	45	0,37
UFG83005000A04002045	0,5	4	0,7	2	45	0,45
UFG83005000A04003045	0,5	4	0,7	2,5	45	0,45
UFG83005000A04004045	0,5	4	0,7	4	45	0,45
UFG83005000A04006045	0,5	4	0,7	6	45	0,45
UFG83005000A04008045	0,5	4	0,7	8	45	0,45
UFG83006000A04002045	0,6	4	0,9	2	45	0,55
UFG83006000A04003045	0,6	4	0,9	3	45	0,55

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.012	h5

UFG83

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	DC	DCON	APMX	LU	OAL	DN
UFG83006000A04004045	0,6	4	0,9	4	45	0,55
UFG83006000A04006045	0,6	4	0,9	6	45	0,55
UFG83006000A04008045	0,6	4	0,9	8	45	0,55
UFG83006000A04010045	0,6	4	0,9	10	45	0,55
UFG83008000A04002045	0,8	4	1,2	2	45	0,75
UFG83008000A04004045	0,8	4	1,2	4	45	0,75
UFG83008000A04006045	0,8	4	1,2	6	45	0,75
UFG83008000A04008045	0,8	4	1,2	8	45	0,75
UFG83008000A04010045	0,8	4	1,2	10	45	0,75
UFG83008000A04012045	0,8	4	1,2	12	45	0,75
UFG83010000A04004045	1	4	1,5	4	45	0,95
UFG83010000A04006045	1	4	1,5	6	45	0,95
UFG83010000A04008045	1	4	1,5	8	45	0,95
UFG83010000A04010045	1	4	1,5	10	45	0,95
UFG83010000A04012045	1	4	1,5	12	45	0,95
UFG83010000A04016050	1	4	1,5	16	50	0,95
UFG83010000A04020055	1	4	1,5	20	55	0,95
UFG83012000A04006045	1,2	4	1,8	6	45	1,15
UFG83012000A04008045	1,2	4	1,8	8	45	1,15
UFG83012000A04010045	1,2	4	1,8	10	45	1,15
UFG83012000A04012045	1,2	4	1,8	12	45	1,15
UFG83012000A04016050	1,2	4	1,8	16	50	1,15
UFG83015000A04006045	1,5	4	2,3	6	45	1,45
UFG83015000A04008045	1,5	4	2,3	8	45	1,45
UFG83015000A04010045	1,5	4	2,3	10	45	1,45
UFG83015000A04012045	1,5	4	2,3	12	45	1,45
UFG83015000A04014050	1,5	4	2,3	14	50	1,45
UFG83015000A04016050	1,5	4	2,3	16	50	1,45
UFG83015000A04018055	1,5	4	2,3	18	55	1,45
UFG83015000A04020055	1,5	4	2,3	20	55	1,45
UFG83020000A04006045	2	4	3	6	45	1,95
UFG83020000A04008045	2	4	3	8	45	1,95
UFG83020000A04010045	2	4	3	10	45	1,95
UFG83020000A04012045	2	4	3	12	45	1,95
UFG83020000A04014050	2	4	3	14	50	1,95
UFG83020000A04016050	2	4	3	16	50	1,95
UFG83020000A04018055	2	4	3	18	55	1,95

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.012	h5

UFG83

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
				○			○	○		○																												●	●	○	●

CODE	DC	DCON	APMX	LU	OAL	DN
UFG83020000A04020055	2	4	3	20	55	1,95
UFG83020000A04025060	2	4	3	25	60	1,95
UFG83020000A04030070	2	4	3	30	70	1,95
UFG83030000A06010045	3	6	4,5	10	45	2,85
UFG83030000A06012045	3	6	4,5	12	45	2,85
UFG83030000A06014050	3	6	4,5	14	50	2,85
UFG83030000A06016055	3	6	4,5	16	55	2,85
UFG83030000A06018055	3	6	4,5	18	55	2,85
UFG83030000A06020060	3	6	4,5	20	60	2,85
UFG83030000A06025065	3	6	4,5	25	65	2,85
UFG83030000A06030070	3	6	4,5	30	70	2,85
UFG83030000A06035080	3	6	4,5	35	80	2,85
UFG83030000A06040090	3	6	4,5	40	90	2,85
UFG83040000A06012050	4	6	6	12	50	3,85
UFG83040000A06016060	4	6	6	16	60	3,85
UFG83040000A06020060	4	6	6	20	60	3,85
UFG83040000A06025070	4	6	6	25	70	3,85
UFG83040000A06030070	4	6	6	30	70	3,85
UFG83040000A06035080	4	6	6	35	80	3,85
UFG83040000A06040090	4	6	6	40	90	3,85
UFG83040000A06045090	4	6	6	45	90	3,85
UFG83040000A06050100	4	6	6	50	100	3,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.012	h5

UFG83

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE FOR RIB PROCESSING SLOTTING / FREZ O 2 ZĘBACH DO OBRÓBKI ŻEBER ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.2	0.3	0.4	0.5	0.6	0.8
P	5	1.0D	Vc m/min	31	41~47	39~63	40~52	39~66	41~66
		1.0D	fz mm/tooth	0.003~0.004	0.004~0.004	0.006~0.006	0.007~0.007	0.008~0.008	0.011~0.011
		1.0D	rpm obr/min	50000	43000~50000	31400~50000	25650~33000	20900~35200	16150~26400
		1.0D	feed posuw mm/min	300~350	330~420	350~590	370~470	330~560	360~590
		1.0D	Ap mm	0.006~0.016	0.006~0.015	0.005~0.028	0.006~0.035	0.007~0.030	0.009~0.040
	8-9	1.0D	Vc m/min	31	41~47	39~63	40~52	39~66	41~66
		1.0D	fz mm/tooth	0.003~0.004	0.004~0.004	0.006~0.006	0.007~0.007	0.008~0.008	0.011~0.011
		1.0D	RPM obr/min	50000	43000~50000	31400~50000	25650~33000	20900~35200	16150~26400
		1.0D	Feed Posuw mm/min	300~350	330~420	350~590	370~470	330~560	360~590
		1.0D	Ap mm	0.006~0.016	0.006~0.015	0.005~0.028	0.006~0.035	0.007~0.030	0.009~0.040
	11.1 - 11.2	1.0D	Vc m/min	31	41~47	39~63	40~52	39~66	41~66
		1.0D	fz mm/tooth	0.003~0.004	0.004~0.004	0.006~0.006	0.007~0.007	0.008~0.008	0.011~0.011
		1.0D	RPM obr/min	50000	43000~50000	31400~50000	25650~33000	20900~35200	16150~26400
		1.0D	Feed Posuw mm/min	300~350	330~420	350~590	370~470	330~560	360~590
		1.0D	Ap mm	0.006~0.016	0.006~0.015	0.005~0.028	0.006~0.035	0.007~0.030	0.009~0.040
H	38.1 - 38.2	1.0D	Vc m/min	31	38~44	38~44	37~41	38~41	38~42
		1.0D	fz mm/tooth	0.003~0.003	0.003~0.003	0.005~0.005	0.006~0.006	0.007~0.007	0.009~0.009
		1.0D	RPM obr/min	50000	39900~46200	30500~35200	23750~26000	19900~22000	15200~16700
		1.0D	Feed Posuw mm/min	265~310	265~310	295~340	285~315	260~290	280~310
		1.0D	Ap mm	0.005~0.013	0.004~0.011	0.003~0.020	0.004~0.025	0.005~0.021	0.006~0.028
	39.1 - 39.3	1.0D	Vc m/min	31	23~30	23~31	22~28	22~29	23~29
		1.0D	fz mm/tooth	0.002~0.003	0.002~0.003	0.003~0.004	0.004~0.004	0.004~0.004	0.006~0.005
		1.0D	RPM obr/min	50000	23900~32300	18300~24600	14200~18000	11900~15500	9000~11700
		1.0D	Feed Posuw mm/min	225~265	105~185	120~200	115~130	100~120	110~125
		1.0D	Ap mm	0.005~0.012	0.003~0.007	0.002~0.012	0.003~0.015	0.003~0.013	0.004~0.017
	40	1.0D	Vc m/min	31	41~47	39~63	40~52	39~66	41~66
		1.0D	fz mm/tooth	0.003~0.004	0.004~0.004	0.006~0.006	0.007~0.007	0.008~0.008	0.011~0.011
		1.0D	RPM obr/min	50000	43000~50000	31400~50000	25650~33000	20900~35200	16150~26400
		1.0D	Feed Posuw mm/min	300~350	330~420	350~590	370~470	330~560	360~590
		1.0D	Ap mm	0.006~0.016	0.006~0.015	0.005~0.028	0.006~0.035	0.007~0.030	0.009~0.040
	41	1.0D	Vc m/min	31	38~44	38~44	37~41	38~41	38~42
		1.0D	fz mm/tooth	0.003~0.003	0.003~0.003	0.005~0.005	0.006~0.006	0.007~0.007	0.009~0.009
		1.0D	RPM obr/min	50000	39900~46200	30500~35200	23750~26000	19900~22000	15200~16700
		1.0D	Feed Posuw mm/min	265~310	265~310	295~340	285~315	260~290	280~310
		1.0D	Ap mm	0.005~0.013	0.004~0.011	0.003~0.020	0.004~0.025	0.005~0.021	0.006~0.028

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG83

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE FOR RIB PROCESSING SLOTTING / FREZ O 2 ZĘBACH DO OBRÓBKI ŻEBER ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.0	1.2	1.5	2.0	3.0	4.0
P	5	1.0D	Vc m/min	39~59	39~66	43~83	40~66	41~66	40~67
		1.0D	fz mm/tooth	0.014~0.014	0.017~0.017	0.024~0.024	0.027~0.027	0.064~0.064	0.063~0.064
		1.0D	rpm obr/min	12300~18700	10450~17600	9100~17600	6350~10550	4300~7050	3200~5300
		1.0D	feed posuw mm/min	350~540	350~590	430~830	340~570	550~900	400~675
		1.0D	Ap mm	0.011~0.028	0.025~0.070	0.017~0.077	0.021~0.140	0.056~0.210	0.074~0.280
	8-9	1.0D	Vc m/min	39~59	39~66	43~83	40~66	41~66	40~67
		1.0D	fz mm/tooth	0.014~0.014	0.017~0.017	0.024~0.024	0.027~0.027	0.064~0.064	0.063~0.064
		1.0D	RPM obr/min	12300~18700	10450~17600	9100~17600	6350~10550	4300~7050	3200~5300
		1.0D	Feed Posuw mm/min	350~540	350~590	430~830	340~570	550~900	400~675
		1.0D	Ap mm	0.011~0.028	0.025~0.070	0.017~0.077	0.021~0.140	0.056~0.210	0.074~0.280
	11.1 - 11.2	1.0D	Vc m/min	39~59	39~66	43~83	40~66	41~66	40~67
		1.0D	fz mm/tooth	0.014~0.014	0.017~0.017	0.024~0.024	0.027~0.027	0.064~0.064	0.063~0.064
		1.0D	RPM obr/min	12300~18700	10450~17600	9100~17600	6350~10550	4300~7050	3200~5300
		1.0D	Feed Posuw mm/min	350~540	350~590	430~830	340~570	550~900	400~675
		1.0D	Ap mm	0.011~0.028	0.025~0.070	0.017~0.077	0.021~0.140	0.056~0.210	0.074~0.280
H	38.1 - 38.2	1.0D	Vc m/min	33~36	34~38	33~38	38~42	38~43	38~43
		1.0D	fz mm/tooth	0.012~0.012	0.014~0.014	0.018~0.018	0.022~0.022	0.056~0.056	0.056~0.056
		1.0D	RPM obr/min	10500~11500	9100~10000	7000~8000	6100~6700	3990~4600	3000~3400
		1.0D	Feed Posuw mm/min	250~280	250~280	250~280	270~300	445~515	335~380
		1.0D	Ap mm	0.008~0.020	0.015~0.042	0.012~0.055	0.015~0100	0.040~0.150	0.053~0.200
	39.1 - 39.3	1.0D	Vc m/min	20~25	20~26	20~26	23~30	23~30	23~30
		1.0D	fz mm/tooth	0.008~0.007	0.009~0.008	0.012~0.01	0.014~0.013	0.022~0.048	0.021~0.048
		1.0D	RPM obr/min	6300~8050	5400~7000	4300~5500	3600~4700	2400~3200	1800~2400
		1.0D	Feed Posuw mm/min	100~115	100~115	100~115	100~120	105~310	75~230
		1.0D	Ap mm	0.005~0.012	0.009~0.026	0.007~0.033	0.009~0.060	0.024~0.090	0.032~0.120
	40	1.0D	Vc m/min	39~59	39~66	43~83	40~66	41~66	40~67
		1.0D	fz mm/tooth	0.014~0.014	0.017~0.017	0.024~0.024	0.027~0.027	0.064~0.064	0.063~0.064
		1.0D	RPM obr/min	12300~18700	10450~17600	9100~17600	6350~10550	4300~7050	3200~5300
		1.0D	Feed Posuw mm/min	350~540	350~590	430~830	340~570	550~900	400~675
		1.0D	Ap mm	0.011~0.028	0.025~0.070	0.017~0.077	0.021~0.140	0.056~0.210	0.074~0.280
	41	1.0D	Vc m/min	33~36	34~38	33~38	38~42	38~43	38~43
		1.0D	fz mm/tooth	0.012~0.012	0.014~0.014	0.018~0.018	0.022~0.022	0.056~0.056	0.056~0.056
		1.0D	RPM obr/min	10500~11500	9100~10000	7000~8000	6100~6700	3990~4600	3000~3400
		1.0D	Feed Posuw mm/min	250~280	250~280	250~280	270~300	445~515	335~380
		1.0D	Ap mm	0.008~0.020	0.015~0.042	0.012~0.055	0.015~0100	0.040~0.150	0.053~0.200

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG31

2 Finish Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N											S						H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	DC	DCON	APMX	LU	OAL	DN
UFG31001000A04000040	0,1	4	0,2	-	40	-
UFG31002000A04000040	0,2	4	0,4	-	40	-
UFG31003000A04000040	0,3	4	0,6	-	40	-
UFG31004000A04000040	0,4	4	0,8	-	40	-
UFG31005000A04000040	0,5	4	1	-	40	-
UFG31006000A04000040	0,6	4	1,2	-	40	-
UFG31007000A04000040	0,7	4	1,4	-	40	-
UFG31008000A04000040	0,8	4	1,6	-	40	-
UFG31009000A04000040	0,9	4	2	-	40	-
UFG31010000A04003050	1	4	1,5	3	50	0,95
UFG31010000A06003050	1	6	1,5	3	50	0,95
UFG31015000A04004050	1,5	4	1,7	4	50	1,45
UFG31015000A06004050	1,5	6	1,7	4	50	1,45
UFG31020000A04005050	2	4	2	5	50	1,95
UFG31020000A06005050	2	6	2	5	50	1,95
UFG31025000A04006055	2,5	4	2,5	6	55	2,4
UFG31025000A06006055	2,5	6	2,5	6	55	2,4
UFG31030000A06008055	3	6	3	8	55	2,85
UFG31035000A06009055	3,5	6	3,5	9	55	3,35
UFG31040000A06010055	4	6	4	10	55	3,85
UFG31050000A06013055	5	6	5	13	55	4,85
UFG31060000A06015055	6	6	6	15	55	5,85
UFG31080000A08020065	8	8	8	20	65	7,7
UFG31100000A10025075	10	10	10	25	75	9,7
UFG31120000A12028085	12	12	12	28	85	11,7
UFG31160000A16032090	16	16	16	32	90	15,7
UFG31200000A20040105	20	20	20	40	105	19,7

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFG31

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ Z 2 ZĘBAMI ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.2	0.3	0.4	0.5	0.6	0.8	09	1.0	2.0
P	5	1.0D	0.05D	Vc m/min	30	45	65	80	95	125	140	150	210
				fz mm/tooth	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.01	0.013
				rpm obr/min	47746	47746	51725	50930	50399	49736	49515	47746	33423
				feed posuw mm/min	95	191	207	407	504	597	693	955	869
	8-9	1.0D	0.05D	Vc m/min	30	45	65	80	95	125	140	150	210
				fz mm/tooth	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.01	0.013
				rpm obr/min	47746	47746	51725	50930	50399	49736	49515	47746	33423
				feed posuw mm/min	95	191	207	407	504	597	693	955	869
	11.1	1.0D	0.05D	Vc m/min	30	45	65	80	95	125	140	150	210
				fz mm/tooth	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.01	0.013
				rpm obr/min	47746	47746	51725	50930	50399	49736	49515	47746	33423
				feed posuw mm/min	95	191	207	407	504	597	693	955	869
	11.2	1.0D	0.05D	Vc m/min	30	40	55	70	85	100	110	120	165
				fz mm/tooth	0.001	0.002	0.002	0.003	0.004	0.006	0.007	0.008	0.013
				rpm obr/min	47746	42441	43768	44563	45094	39789	38905	38197	26261
				feed posuw mm/min	95	170	175	267	361	477	545	611	683
H	38.1	1.0D	0.05D	Vc m/min	30	40	55	70	85	100	110	120	165
				fz mm/tooth	0.001	0.002	0.002	0.003	0.004	0.006	0.007	0.008	0.013
				rpm obr/min	47746	42441	43768	44563	45094	39789	38905	38197	26261
				feed posuw mm/min	95	170	175	267	361	477	545	611	683
	38.2	1.0D	0.05D	Vc m/min	25	40	50	65	75	75	80	80	110
				fz mm/tooth	0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.012
				rpm obr/min	39789	42441	39789	41380	39789	29842	28294	25465	17507
				feed posuw mm/min	80	85	159	248	318	298	340	357	420
	39.1	1.0D	0.05D	Vc m/min	20	30	40	50	55	65	65	65	90
				fz mm/tooth	0.001	0.001	0.001	0.002	0.003	0.004	0.005	0.005	0.009
				rpm obr/min	31831	31831	31831	31831	29178	25863	22989	20690	14324
				feed posuw mm/min	64	64	64	127	175	207	230	207	258
	39.2	1.0D	0.05D	Vc m/min	20	25	30	40	45	50	50	50	70
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.007
				rpm obr/min	31831	26526	23873	25465	23873	19894	17684	15915	11141
				feed posuw mm/min	64	53	48	102	95	119	141	127	156
	39.3	1.0D	0.02D	Vc m/min	15	20	25	30	40	40	40	40	60
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.006
				rpm obr/min	23873	21221	19894	19099	21221	15915	14147	12732	9549
				feed posuw mm/min	29	38	40	57	81	83	91	87	116
	40	1.0D	0.05D	Vc m/min	30	40	55	70	85	100	110	120	165
				fz mm/tooth	0.001	0.002	0.002	0.003	0.004	0.006	0.007	0.008	0.013
				rpm obr/min	47746	42441	43768	44563	45094	39789	38905	38197	26261
				feed posuw mm/min	95	170	175	267	361	477	545	611	683
	41	1.0D	0.05D	Vc m/min	25	40	50	65	75	75	80	80	110
				fz mm/tooth	0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.012
				rpm obr/min	39789	42441	39789	41380	39789	29842	28294	25465	17507
				feed posuw mm/min	80	85	159	248	318	298	340	357	420

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = mimate feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG31

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ Z 2 ZĘBAMI ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	1.0D	0.05D	Vc m/min	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.019	0.026	0.032	0.036	0.047	0.054	0.064	0.074	0.085
				rpm obr/min	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	827	869	998	936	935	842	849	721	663
	8-9	1.0D	0.05D	Vc m/min	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.019	0.026	0.032	0.036	0.047	0.054	0.064	0.074	0.085
				rpm obr/min	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	827	869	998	936	935	842	849	721	663
	11.1	1.0D	0.05D	Vc m/min	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.019	0.026	0.032	0.036	0.047	0.054	0.064	0.074	0.085
				rpm obr/min	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	827	869	998	936	935	842	849	721	663
	11.2	1.0D	0.05D	Vc m/min	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.02	0.027	0.032	0.037	0.046	0.055	0.065	0.074	0.085
				rpm obr/min	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	700	709	794	766	714	683	690	574	528
H	38.1	1.0D	0.05D	Vc m/min	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.02	0.027	0.032	0.037	0.046	0.055	0.065	0.074	0.085
				rpm obr/min	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	700	709	794	766	714	683	690	574	528
	38.2	1.0D	0.05D	Vc m/min	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.018	0.025	0.03	0.035	0.043	0.051	0.059	0.07	0.082
				rpm obr/min	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	420	438	497	483	445	422	407	362	339
	39.1	1.0D	0.05D	Vc m/min	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.014	0.019	0.022	0.026	0.032	0.038	0.045	0.053	0.061
				rpm obr/min	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	267	272	280	276	255	242	239	211	194
	39.2	1.0D	0.05D	Vc m/min	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.011	0.015	0.018	0.021	0.026	0.03	0.037	0.042	0.048
				rpm obr/min	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	163	167	183	178	166	153	157	134	122
	39.3	1.0D	0.02D	Vc m/min	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.009	0.012	0.015	0.018	0.021	0.026	0.03	0.034	0.039
				rpm obr/min	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	115	118	132	131	119	114	112	94	86
	40	1.0D	0.05D	Vc m/min	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.02	0.027	0.032	0.037	0.046	0.055	0.065	0.074	0.085
				rpm obr/min	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	700	709	794	766	714	683	690	574	528
	41	1.0D	0.05D	Vc m/min	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.018	0.025	0.03	0.035	0.043	0.051	0.059	0.07	0.082
				rpm obr/min	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	420	438	497	483	445	422	407	362	339

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG31

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SIDE CUTTING / FREZ Z 2 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.011	0.018	0.028	0.037	0.046	0.052	0.067	0.077	0.09	0.107	0.122
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1050	1203	1218	1237	1435	1352	1333	1201	1194	1043	951
	8-9	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.011	0.018	0.028	0.037	0.046	0.052	0.067	0.077	0.09	0.107	0.122
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1050	1203	1218	1237	1435	1352	1333	1201	1194	1043	951
	11.1	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.011	0.018	0.028	0.037	0.046	0.052	0.067	0.08	0.09	0.107	0.122
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1050	1203	1218	1237	1435	1352	1333	1248	1194	1043	951
	11.2	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.011	0.019	0.028	0.038	0.046	0.053	0.066	0.079	0.092	0.108	0.121
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	840	998	980	998	1142	1097	1024	981	976	838	751
H	38.1	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.011	0.019	0.028	0.038	0.046	0.053	0.066	0.079	0.092	0.108	0.121
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	840	998	980	998	1142	1097	1024	981	976	838	751
	38.2	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.01	0.017	0.026	0.036	0.043	0.05	0.061	0.072	0.084	0.1	0.116
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	509	595	607	630	712	690	631	596	579	517	480
	39.1	0.03D	1.0D	Vc m/min	65	90	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.008	0.013	0.019	0.027	0.032	0.038	0.046	0.053	0.064	0.075	0.086
				rpm obr/min	20690	14324	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	331	372	363	387	407	403	366	337	340	298	274
	39.2	0.03D	1.0D	Vc m/min	50	70	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.006	0.01	0.015	0.021	0.025	0.03	0.037	0.043	0.052	0.059	0.067
				rpm obr/min	15915	11141	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	191	223	223	234	255	255	236	219	221	188	171
	39.3	0.03D	1.0D	Vc m/min	40	60	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.005	0.009	0.013	0.018	0.021	0.025	0.03	0.036	0.043	0.05	0.057
				rpm obr/min	12732	9549	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	127	172	166	172	187	186	167	160	160	139	127
	40	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.011	0.019	0.028	0.038	0.046	0.053	0.066	0.079	0.092	0.108	0.121
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	840	998	980	998	1142	1097	1024	981	976	838	751
	41	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.01	0.017	0.026	0.036	0.043	0.05	0.061	0.072	0.084	0.1	0.116
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	509	595	607	630	712	690	631	596	579	517	480

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG95

4 Finish Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	DC	DCON	APMX	LU	OAL	DN
UFG95010000A06003050	1	6	1,5	3	50	0,95
UFG95020000A06005050	2	6	2	5	50	1,95
UFG95030000A06008055	3	6	3	8	55	2,85
UFG95040000A06010055	4	6	4	10	55	3,85
UFG95050000A06013055	5	6	5	13	55	4,85
UFG95060000A06015055	6	6	6	15	55	5,85
UFG95080000A08020065	8	8	8	20	65	7,7
UFG95100000A10025075	10	10	10	25	75	9,7
UFG95120000A12028085	12	12	12	28	85	11,7
UFG95160000A16032090	16	16	16	32	90	15,7
UFG95200000A20040105	20	20	20	40	105	19,7

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFG95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ Z 4 ZĘBAMI FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	5	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.008	0.013	0.02	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1528	1738	1740	1805	1996	1924	1910	1747	1751	1501	1294
	8-9	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.008	0.013	0.02	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1528	1738	1740	1805	1996	1924	1910	1747	1751	1501	1294
	11.1	0.03D	1.0D	Vc m/min	150	210	205	210	245	245	250	245	250	245	245
				fz mm/tooth	0.008	0.013	0.02	0.027	0.032	0.037	0.048	0.056	0.066	0.077	0.083
				rpm obr/min	47746	33423	21751	16711	15597	12998	9947	7799	6631	4874	3899
				feed posuw mm/min	1528	1738	1740	1805	1996	1924	1910	1747	1751	1501	1294
	11.2	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.071	0.078
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	1070	1261	1261	1313	1490	1407	1335	1266	1273	1102	968
H	38.1	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.071	0.078
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	1070	1261	1261	1313	1490	1407	1335	1266	1273	1102	968
	38.2	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.07	0.079
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	713	840	840	875	993	938	890	844	828	724	654
	39.1	0.03D	1.0D	Vc m/min	65	90	90	90	100	100	100	100	100	100	100
				fz mm/tooth	0.005	0.009	0.014	0.019	0.023	0.026	0.033	0.038	0.045	0.053	0.059
				rpm obr/min	20690	14324	9549	7162	6366	5305	3979	3183	2653	1989	1592
				feed posuw mm/min	414	516	535	544	586	552	525	484	478	422	376
	39.2	0.03D	1.0D	Vc m/min	50	70	70	70	80	80	80	80	80	80	80
				fz mm/tooth	0.004	0.007	0.011	0.015	0.018	0.021	0.026	0.03	0.036	0.042	0.048
				rpm obr/min	15915	11141	7427	5570	5093	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	255	312	327	334	367	356	331	306	306	267	244
	39.3	0.03D	1.0D	Vc m/min	40	60	60	60	70	70	70	70	70	70	70
				fz mm/tooth	0.004	0.007	0.009	0.013	0.016	0.018	0.022	0.025	0.03	0.036	0.041
				rpm obr/min	12732	9549	6366	4775	4456	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	204	267	229	248	285	267	245	223	223	201	183
	40	0.03D	1.0D	Vc m/min	120	165	165	165	195	195	195	195	200	195	195
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.071	0.078
				rpm obr/min	38197	26261	17507	13130	12414	10345	7759	6207	5305	3879	3104
				feed posuw mm/min	1070	1261	1261	1313	1490	1407	1335	1266	1273	1102	968
	41	0.03D	1.0D	Vc m/min	80	110	110	110	130	130	130	130	130	130	130
				fz mm/tooth	0.007	0.012	0.018	0.025	0.03	0.034	0.043	0.051	0.06	0.07	0.079
				rpm obr/min	25465	17507	11671	8754	8276	6897	5173	4138	3448	2586	2069
				feed posuw mm/min	713	840	840	875	993	938	890	844	828	724	654

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG40

6-8 Finish Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	DC	DCON	APMX	OAL	#FLUTE
UFG40060000A06013057	6	6	13	57	6
UFG40080000A08019063	8	8	19	63	6
UFG40100000A10022072	10	10	22	72	6
UFG40120000A12026083	12	12	26	83	6
UFG40140000A14026083	14	14	26	83	6
UFG40160000A16032092	16	16	32	92	6
UFG40180000A18032092	18	18	32	92	8
UFG40200000A20038104	20	20	38	104	8
UFG40250000A25044104	25	25	44	104	8

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	h5

UFG40

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6&8 FLUTE LONG LENGHT SIDE CUTTING / FREZ DŁUGI O 6 I 8 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	5	0.04D	1.5D	Vc m/min	120	120	120	120	120	120	120	120	125
				fz mm/tooth	0.039	0.052	0.063	0.07	0.081	0.09	0.095	0.08	0.11
				rpm obr/min	6366	4775	3820	3183	2728	2387	2122	1910	1592
				feed posuw mm/min	1490	1490	1444	1337	1326	1289	1613	1222	1401
	8-9	0.04D	1.5D	Vc m/min	120	120	120	120	120	120	120	120	125
				fz mm/tooth	0.039	0.052	0.063	0.07	0.081	0.09	0.095	0.08	0.11
				RPM obr/min	6366	4775	3820	3183	2728	2387	2122	1910	1592
				Feed Posuw mm/min	1490	1490	1444	1337	1326	1289	1613	1222	1401
	11.1	0.04D	1.5D	Vc m/min	120	120	120	120	120	120	120	120	125
				fz mm/tooth	0.039	0.052	0.063	0.07	0.081	0.09	0.095	0.08	0.11
				RPM obr/min	6366	4775	3820	3183	2728	2387	2122	1910	1592
				Feed Posuw mm/min	1490	1490	1444	1337	1326	1289	1613	1222	1401
	11.2	0.04D	1.5D	Vc m/min	95	95	95	95	95	95	95	100	95
				fz mm/tooth	0.035	0.046	0.055	0.062	0.07	0.079	0.08	0.091	0.096
				RPM obr/min	5040	3780	3024	2520	2160	1890	1680	1592	1210
				Feed Posuw mm/min	1058	1043	998	937	907	896	1075	1159	929
H	38.1 - 38.2	0.04D	1.5D	Vc m/min	95	95	95	95	95	95	95	100	95
				fz mm/tooth	0.035	0.046	0.055	0.062	0.07	0.079	0.08	0.091	0.096
				RPM obr/min	5040	3780	3024	2520	2160	1890	1680	1592	1210
				Feed Posuw mm/min	1058	1043	998	937	907	896	1075	1159	929
	39.1 - 39.2	0.04D	1.5D	Vc m/min	70	70	70	70	70	70	70	75	75
				fz mm/tooth	0.031	0.042	0.05	0.056	0.066	0.072	0.073	0.069	0.087
				RPM obr/min	3714	2785	2228	1857	1592	1393	1238	1194	955
				Feed Posuw mm/min	691	702	668	624	630	602	723	659	665
	39.3	0.04D	1.5D	Vc m/min	50	50	50	50	45	50	50	45	50
				fz mm/tooth	0.028	0.037	0.045	0.05	0.051	0.064	0.066	0.071	0.079
				RPM obr/min	2653	1989	1592	1326	1023	995	884	716	637
				Feed Posuw mm/min	446	442	430	398	313	382	467	407	403
	40	0.04D	1.5D	Vc m/min	95	95	95	95	95	95	95	100	95
				fz mm/tooth	0.035	0.046	0.055	0.062	0.07	0.079	0.08	0.091	0.096
				RPM obr/min	5040	3780	3024	2520	2160	1890	1680	1592	1210
				Feed Posuw mm/min	1058	1043	998	937	907	896	1075	1159	929
	41	0.04D	1.5D	Vc m/min	95	95	95	95	95	95	95	100	95
				fz mm/tooth	0.035	0.046	0.055	0.062	0.07	0.079	0.08	0.091	0.096
				RPM obr/min	5040	3780	3024	2520	2160	1890	1680	1592	1210
				Feed Posuw mm/min	1058	1043	998	937	907	896	1075	1159	929

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFG40 LONG

6-8 Finish Medium Rough

HSM Vmax A min AIR

ISO	P											M			K							N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
					○			○	○		○																											●	●	○	●

CODE	DC	DCON	APMX	OAL	#FLUTE
UFG40060000A06026070	6	6	26	70	6
UFG40080000A08036090	8	8	36	90	6
UFG40100000A10046100	10	10	46	100	6
UFG40120000A12056110	12	12	56	110	6
UFG40160000A16066130	16	16	66	130	6
UFG40200000A20076140	20	20	76	140	8
UFG40250000A25092180	25	25	92	180	8

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFG40

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6&8 FLUTE EXTRA LONG LENGHT SIDE CUTTING / FREZ BARDZO DŁUGI O 6 I 8 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	5	0.01D	3.0D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.04	0.05	0.06	0.07	0.075	0.081	0.085	0.086	0.089
				rpm obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				feed posuw mm/min	764	716	688	669	614	580	721	657	544
	8-9	0.01D	3.0D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.04	0.05	0.06	0.07	0.075	0.081	0.085	0.086	0.089
				RPM obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				Feed Posuw mm/min	764	716	688	669	614	580	721	657	544
	11.1	0.01D	3.0D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.04	0.05	0.06	0.07	0.075	0.081	0.085	0.086	0.089
				RPM obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				Feed Posuw mm/min	764	716	688	669	614	580	721	657	544
	11.2	0.01D	3.0D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.03	0.04	0.05	0.061	0.066	0.071	0.08	0.09	0.08
				RPM obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				Feed Posuw mm/min	573	573	573	583	540	509	679	688	489
H	38.1 - 38.2	0.01D	3.0D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.03	0.04	0.05	0.061	0.066	0.071	0.08	0.09	0.08
				RPM obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				Feed Posuw mm/min	573	573	573	583	540	509	679	688	489
	39.1 - 39.2	0.01D	3.0D	Vc m/min	50	50	50	50	50	50	50	50	50
				fz mm/tooth	0.03	0.04	0.05	0.06	0.066	0.071	0.081	0.091	0.081
				RPM obr/min	2653	1989	1592	1326	1137	995	884	796	637
				Feed Posuw mm/min	478	477	478	477	450	424	573	579	413
	40	0.01D	3.0D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.03	0.04	0.05	0.061	0.066	0.071	0.08	0.09	0.08
				RPM obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				Feed Posuw mm/min	573	573	573	583	540	509	679	688	489
	41	0.01D	3.0D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.03	0.04	0.05	0.061	0.066	0.071	0.08	0.09	0.08
				RPM obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				Feed Posuw mm/min	573	573	573	583	540	509	679	688	489

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

P M K N S H

UFX END MILLS for HSM are designed to machine alloy steels, non-alloy steels, tool steels, heat resistant steels, hardened steels up to HRC 65 (Possible) / up to 55HRC (Recommended), cast iron, mold steels.

FREZY WALCOWO-CZOŁOWE UFX przeznaczone są do obróbki szybkościowej (OS) stali stopowej, niestopowej, narzędziowej, żaroodpornej, hartowanej <65 HRC (Możliwe) / <55HRC (Zalecane), żeliwa oraz stali do produkcji form i wykrojników.

UFX END MILLS
FREZY UFX

UFX END MILLS for HSM are designed to machine alloy steels, non-alloy steels, tool steels, heat resistant steels, hardened steels up to HRC 65 (Possible) / up to 55HRC
(Recommended), cast iron, mold steels.

FREZY WALCOWO-CZOŁOWE UFX przede wszystkim zalecane są do obróbki szybkościowej (OS) stali stopowej, niestopowej, narzędziowej, żaroodpornej, hartowanej do 65 HRC (Możliwe) / do 55HRC (Zalecane), żeliwa, stali do produkcji form i wykrojników.

NOTE:

- If the rigidity of the machine or the work material installation is very low, or chattering and noise is generated, please reduce RPM and FEED rate proportionally.
- Cutting conditions may be considerably different due to the tool overhang, depth of cut, and machining tool condition, please use the catalogue cutting parameters as a reference starting point.
- If the depth of cut is shallow, the RPM and FEED rate can be increased.
- For hardened materials air blow/air oil mist is recommended.
- A high-speed spindle is recommended, when using a reduced RPM, the FEED rate must be reduced proportionally.
- High pressure coolant and air blow are recommended to dispose of chips efficiency.
- Use a rigid machine and work clamping method.
- Down (climb) cutting is recommended.
- We recommend that you set the width of cut as small as possible (about 5% of dia.) and divide the machining into several passes and work on high cutting parameters. There will be much higher tool life and surface roughness.
- When drilling, please set the FEED rate 30% below the normal rate.
- When cutting austenitic stainless steel and heat resistant steel, the use of non-water soluble fluid is strongly recommended.

UWAGA:

- Jeżeli sztywność obrabiarki lub mocowanie obrabianego przedmiotu nie są wystarczające lub występują wibracje i nadmierny hałas, należy proporcjonalnie zmniejszyć obroty i posuw.
- Parametry skrawania mogą być różne w zależności od długości narzędzia wystającej z oprawki, głębokości skrawania oraz stanu obrabiarki. Proszę stosować parametry skra-wania podane w katalogu jako wyjściowy punkt odniesienia.
- Jeżeli głębokość skrawania jest mała, obroty i posuw mogą być zwiększone.
- Przy obróbce twardych materiałów zaleca się stosowanie mgły olejowej/nadmuchu powietrza.
- Zalecane jest stosowanie wysokoobrotowych obrabiarek, w przypadku mniejszych prędkości obrotowych, posuw powinien być zmniejszony proporcjonalnie.
- Dla efektywnego odprowadzania wiórów zalecane jest stosowanie nadmuchu powietrza lub chłodziwa pod dużym ciśnieniem.
- Zalecane jest stosowanie sztywnych obrabiarek oraz systemów mocowania.
- Zalecane jest frezowanie współbieżne.
- Zalecamy stosowanie możliwie najmniejszej szerokości skrawania - około 5% średnicy roboczej narzędzia i podzielenie operacji obróbki na kilka przejść przy większych parametrach skrawania, co znacznie wydłuży żywotność narzędzia oraz polepszy jakość obrabianej powierzchni.
- Przy zagłębianiu zalecane jest ustawienie posuwu wgłębnego na poziomie 30% mniejszym od posuwu roboczego.
- Przy obróbce stali austenitycznej, nierdzewnej i stali żaroodpornej zaleca się bez-względne stosowanie oleju nie emulgującego.

Group					ISO	PAGE
UFX51			2		P M K N S H	85
UFX56			2		P M K N S H	91
UFX54		R	2		P M K N S H	113
UFX58		R	2		P M K N S H	123
UFX61		R	4		P M K N S H	144
UFX62		R	4		P M K N S H	151
UFX67			2		P M K N S H	165
UFX71			2		P M K N S H	174
UFX69			2		P M K N S H	184
UFX70			4		P M K N S H	201
UFX75			4		P M K N S H	207
UFX73			4		P M K N S H	214
UFX74			4		P M K N S H	224
UFX77			6		P M K N S H	234
UFX60		R	4-5		P M K N S H	239
UFX21			2		P M K N S H	241
UFX13			2		P M K N S H	244
UFX24			2		P M K N S H	247
UFX02			2		P M K N S H	250
UFX15			4		P M K N S H	253
UFX27		R	2		P M K N S H	256

Group					ISO	PAGE
UFX28		R	2		P M K N S H	258
UFX29		R	4		P M K N S H	261
UFX41		R	4		P M K N S H	263
UFX42			2		P M K N S H	265
UFX44			2		P M K N S H	269
UFX46			3		P M K N S H	273
UFX11			4		P M K N S H	276
UFX17			4		P M K N S H	278
UFX59			6-8		P M K N S H	280
UFX81			6		P M K N S H	282
UFX91			3-4		P M K N S H	284

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

UFX51

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5100104Y50A001040	0,05	0,1	4	0,1	40
UFX5100104Y50A002040	0,05	0,1	4	0,2	40
UFX5100103Y50A002040	0,05	0,1	3	0,2	40
UFX5100204Y75A002040	0,075	0,15	4	0,15	40
UFX5100204Y75A003040	0,075	0,15	4	0,3	40
UFX5100203Y75A003040	0,075	0,15	3	0,3	40
UFX5100204001A002040	0,1	0,2	4	0,2	40
UFX5100204001A004040	0,1	0,2	4	0,4	40
UFX5100203001A004040	0,1	0,2	3	0,4	40
UFX5100304X15A003040	0,15	0,3	4	0,3	40
UFX5100304X15A006040	0,15	0,3	4	0,6	40
UFX5100303X15A006040	0,15	0,3	3	0,6	40
UFX5100404002A004040	0,2	0,4	4	0,4	40
UFX5100404002A008040	0,2	0,4	4	0,8	40
UFX5100403002A008040	0,2	0,4	3	0,8	40
UFX5100504X25A005040	0,25	0,5	4	0,5	40
UFX5100504X25A008040	0,25	0,5	6	0,8	40
UFX5100504X25A010040	0,25	0,5	4	1	40
UFX5100503X25A010040	0,25	0,5	3	1	40
UFX5100604003A006040	0,3	0,6	4	0,6	40
UFX5100604003A012040	0,3	0,6	4	1,2	40
UFX5100603003A012040	0,3	0,6	3	1,2	40
UFX5100704X35A007040	0,35	0,7	4	0,7	40
UFX5100704X35A014040	0,35	0,7	4	1,4	40
UFX5100703X35A014040	0,35	0,7	3	1,4	40
UFX5100804004A008040	0,4	0,8	4	0,8	40
UFX5100804004A016040	0,4	0,8	4	1,6	40
UFX5100803004A016040	0,4	0,8	3	1,6	40
UFX5100904X45A009040	0,45	0,9	4	0,9	40
UFX5100904X45A018040	0,45	0,9	4	1,8	40
UFX5100903X45A018040	0,45	0,9	3	1,8	40
UFX5101006005A015040	0,5	1	6	1,5	40
UFX5101003005A025050	0,5	1	3	2,5	50
UFX5101004005A015040	0,5	1	4	1,5	40
UFX5101004005A025050	0,5	1	4	2,5	50
UFX5101006005A025050	0,5	1	6	2,5	50

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX51

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5101006005A025070	0,5	1	6	2,5	70
UFX5101006005A025100	0,5	1	6	2,5	100
UFX5101206006A020040	0,6	1,2	6	2	40
UFX5101203006A030050	0,6	1,2	3	3	50
UFX5101204006A030050	0,6	1,2	4	3	50
UFX5101206006A030050	0,6	1,2	6	3	50
UFX5101206006A030070	0,6	1,2	6	3	70
UFX5101206006A030100	0,6	1,2	6	3	100
UFX5101506X75A025040	0,75	1,5	6	2,5	40
UFX5101503X75A040050	0,75	1,5	3	4	50
UFX5101504X75A040050	0,75	1,5	4	4	50
UFX5101506X75A040050	0,75	1,5	6	4	50
UFX5101506X75A040070	0,75	1,5	6	4	70
UFX5101506X75A040100	0,75	1,5	6	4	100
UFX5102006010A030040	1	2	6	3	40
UFX5102003010A050050	1	2	3	5	50
UFX5102004010A050050	1	2	4	5	50
UFX5102006010A050050	1	2	6	5	50
UFX5102006010A050080	1	2	6	5	80
UFX5102006010A050100	1	2	6	5	100
UFX5102506013A040040	1,25	2,5	6	4	40
UFX5102503013A060060	1,25	2,5	3	6	60
UFX5102504013A060060	1,25	2,5	4	6	60
UFX5102506013A060060	1,25	2,5	6	6	60
UFX5102506013A060080	1,25	2,5	6	6	80
UFX5102506013A060100	1,25	2,5	6	6	100
UFX5103006015A045040	1,5	3	6	4,5	40
UFX5103003015A060060	1,5	3	3	6	60
UFX5103004015A060060	1,5	3	4	6	60
UFX5103006015A060060	1,5	3	6	6	60
UFX5103006015A060080	1,5	3	6	6	80
UFX5103006015A060100	1,5	3	6	6	100
UFX5103506018A080070	1,75	3,5	6	8	70
UFX5104006020A060050	2	4	6	6	50
UFX5104004020A080070	2	4	4	8	70
UFX5104006020A080070	2	4	6	8	70

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX51

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5104004020A080100	2	4	4	8	100
UFX5104004020A080120	2	4	4	8	120
UFX5104006020A080100	2	4	6	8	100
UFX5104006020A080120	2	4	6	8	120
UFX5104506023A090080	2,25	4,5	6	9	80
UFX5105006025A075060	2,5	5	6	7,5	60
UFX5105006025A100080	2,5	5	6	10	80
UFX5105005025A100080	2,5	5	5	10	80
UFX5105506028A110090	2,75	5,5	6	11	90
UFX5106006030A090050	3	6	6	9	50
UFX5106006030A090060	3	6	6	9	60
UFX5106006030A090080	3	6	6	9	80
UFX5106006030A120090	3	6	6	12	90
UFX5106006030A120110	3	6	6	12	110
UFX5106006030A120130	3	6	6	12	130
UFX5106006030A120150	3	6	6	12	150
UFX5106508033A130090	3,25	6,5	8	13	90
UFX5107008035A140090	3,5	7	8	14	90
UFX5108008040A120050	4	8	8	12	50
UFX5108008040A120060	4	8	8	12	60
UFX5108008040A120080	4	8	8	12	80
UFX5108008040A120090	4	8	8	12	90
UFX5108008040A140100	4	8	8	14	100
UFX5108008040A140130	4	8	8	14	130
UFX5108008040A140150	4	8	8	14	150
UFX5108510043A160100	4,25	8,5	10	16	100
UFX5109010045A180100	4,5	9	10	18	100
UFX5110010050A150050	5	10	10	15	50
UFX5110010050A150060	5	10	10	15	60
UFX5110010050A150080	5	10	10	15	80
UFX5110010050A150090	5	10	10	15	90
UFX5110010050A180100	5	10	10	18	100
UFX5110010050A180130	5	10	10	18	130
UFX5110010050A180150	5	10	10	18	150
UFX5110010050A180180	5	10	10	18	180
UFX5110010050A180200	5	10	10	18	200

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX51

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5111012055A200100	5,5	11	12	20	100
UFX5112012060A180060	6	12	12	18	60
UFX5112012060A180080	6	12	12	18	80
UFX5112012060A180090	6	12	12	18	90
UFX5112012060A180100	6	12	12	18	100
UFX5112012060A220110	6	12	12	22	110
UFX5112012060A220130	6	12	12	22	130
UFX5112012060A220150	6	12	12	22	150
UFX5112012060A220180	6	12	12	22	180
UFX5112012060A220200	6	12	12	22	200
UFX5113012065A240100	6,5	13	12	24	100
UFX5114012070A260100	7	14	12	26	100
UFX5114014070A260100	7	14	14	26	100
UFX5114016070A260100	7	14	16	26	100
UFX5115016075A280140	7,5	15	16	28	140
UFX5116016080A240100	8	16	16	24	100
UFX5116016080A240130	8	16	16	24	130
UFX5116016080A300150	8	16	16	30	150
UFX5116016080A300180	8	16	16	30	180
UFX5116016080A300200	8	16	16	30	200
UFX5118016090A340150	9	18	16	34	150
UFX5118018090A340150	9	18	18	34	150
UFX5120020100A300100	10	20	20	30	100
UFX5120020100A300130	10	20	20	30	130
UFX5120020100A380150	10	20	20	38	150
UFX5120020100A380200	10	20	20	38	200
UFX5125025125A500120	12,5	25	25	50	120
UFX5125025125A500180	12,5	25	25	50	180

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX51

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.5	2.0	2.5
P	1-5	0.08D	0.05D	Vc m/min	13	19	28	38	47	57	66	75	85	94	113	141	187	187
				fz mm/tooth	0.007	0.012	0.015	0.019	0.024	0.029	0.034	0.039	0.044	0.048	0.051	0.054	0.057	0.074
				rpm obr/min	41380	30239	29709	30239	29921	30239	30012	29842	30063	29921	29974	29921	29762	23810
				feed posuw mm/min	579	726	891	1149	1436	1754	2041	2328	2646	2872	3057	3231	3393	3524
	6-8	0.08D	0.05D	Vc m/min	13	19	28	38	47	57	66	75	85	94	113	141	187	187
				fz mm/tooth	0.007	0.012	0.015	0.019	0.024	0.029	0.034	0.039	0.044	0.048	0.051	0.054	0.057	0.074
				rpm obr/min	41380	30239	29709	30239	29921	30239	30012	29842	30063	29921	29974	29921	29762	23810
				feed posuw mm/min	579	726	891	1149	1436	1754	2041	2328	2646	2872	3057	3231	3393	3524
	9	0.08D	0.05D	Vc m/min	13	19	28	38	47	57	66	75	85	94	109	136	180	180
				fz mm/tooth	0.006	0.011	0.014	0.017	0.021	0.025	0.029	0.033	0.038	0.042	0.045	0.047	0.05	0.066
				rpm obr/min	41380	30239	29709	30239	29921	30239	30012	29842	30063	29921	28913	28860	28648	22918
				feed posuw mm/min	497	665	832	1028	1257	1512	1741	1970	2285	2513	2602	2713	2865	3025
	10-11.1	0.08D	0.05D	Vc m/min	13	19	28	38	47	57	66	75	85	94	113	141	187	187
				fz mm/tooth	0.007	0.012	0.015	0.019	0.024	0.029	0.034	0.039	0.044	0.048	0.051	0.054	0.057	0.074
				rpm obr/min	41380	30239	29709	30239	29921	30239	30012	29842	30063	29921	29974	29921	29762	23810
				feed posuw mm/min	579	726	891	1149	1436	1754	2041	2328	2646	2872	3057	3231	3393	3524
	11.2	0.08D	0.05D	Vc m/min	13	19	28	38	47	57	66	75	85	94	109	136	180	180
				fz mm/tooth	0.006	0.011	0.014	0.017	0.021	0.025	0.029	0.033	0.038	0.042	0.045	0.047	0.05	0.066
				rpm obr/min	41380	30239	29709	30239	29921	30239	30012	29842	30063	29921	28913	28860	28648	22918
				feed posuw mm/min	497	665	832	1028	1257	1512	1741	1970	2285	2513	2602	2713	2865	3025
K	15-20	0.08D	0.05D	Vc m/min	13	19	28	38	47	57	66	75	85	94	113	141	187	187
				fz mm/tooth	0.007	0.012	0.015	0.019	0.024	0.029	0.034	0.039	0.044	0.048	0.051	0.054	0.057	0.074
				rpm obr/min	41380	30239	29709	30239	29921	30239	30012	29842	30063	29921	29974	29921	29762	23810
				feed posuw mm/min	579	726	891	1149	1436	1754	2041	2328	2646	2872	3057	3231	3393	3524
H	38.1-38.2	0.08D	0.05D	Vc m/min	10	17	25	34	42	51	59	68	76	85	97	122	151	151
				fz mm/tooth	0.006	0.011	0.013	0.017	0.021	0.024	0.029	0.033	0.038	0.042	0.045	0.047	0.05	0.063
				rpm obr/min	31831	27056	26526	27056	26738	27056	26829	27056	26880	27056	25730	25889	24032	19226
				feed posuw mm/min	382	595	690	920	1123	1299	1556	1786	2043	2273	2316	2434	2403	2422
	40	0.08D	0.05D	Vc m/min	13	19	28	38	47	57	66	75	85	94	109	136	180	180
				fz mm/tooth	0.006	0.011	0.014	0.017	0.021	0.025	0.029	0.033	0.038	0.042	0.045	0.047	0.05	0.066
				rpm obr/min	41380	30239	29709	30239	29921	30239	30012	29842	30063	29921	28913	28860	28648	22918
				feed posuw mm/min	497	665	832	1028	1257	1512	1741	1970	2285	2513	2602	2713	2865	3025
	41	0.08D	0.05D	Vc m/min	10	17	25	34	42	51	59	68	76	85	97	122	151	151
				fz mm/tooth	0.006	0.011	0.013	0.017	0.021	0.024	0.029	0.033	0.038	0.042	0.045	0.047	0.05	0.063
				rpm obr/min	31831	27056	26526	27056	26738	27056	26829	27056	26880	27056	25730	25889	24032	19226
				feed posuw mm/min	382	595	690	920	1123	1299	1556	1786	2043	2273	2316	2434	2403	2422

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX51

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	8.5	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	18.0	20.0	25.0
P	1-5	0.08D	0.05D	Vc m/min	187	187	187	184	175	168	157	159	159	167	168	168	175	168	157	162	165	167	168	170	168	167
				fz mm/tooth	0.091	0.106	0.121	0.136	0.156	0.164	0.174	0.179	0.184	0.189	0.192	0.195	0.199	0.205	0.212	0.218	0.224	0.23	0.238	0.25	0.264	0.27
				rpm obr/min	19841	17007	14881	13015	11141	9723	8329	7786	7230	6645	6291	5942	5570	4861	4165	3967	3752	3544	3342	3006	2674	2126
				feed posuw mm/min	3611	3605	3601	3540	3476	3189	2899	2788	2661	2512	2416	2317	2217	1993	1766	1729	1681	1630	1591	1503	1412	1148
	6-8	0.08D	0.05D	Vc m/min	187	187	187	184	175	168	157	159	159	167	168	168	175	168	157	162	165	167	168	170	168	167
				fz mm/tooth	0.091	0.106	0.121	0.136	0.156	0.164	0.174	0.179	0.184	0.189	0.192	0.195	0.199	0.205	0.212	0.218	0.224	0.23	0.238	0.25	0.264	0.27
				rpm obr/min	19841	17007	14881	13015	11141	9723	8329	7786	7230	6645	6291	5942	5570	4861	4165	3967	3752	3544	3342	3006	2674	2126
				feed posuw mm/min	3611	3605	3601	3540	3476	3189	2899	2788	2661	2512	2416	2317	2217	1993	1766	1729	1681	1630	1591	1503	1412	1148
	9	0.08D	0.05D	Vc m/min	180	180	180	177	168	162	152	153	153	161	162	161	168	161	151	155	158	160	161	164	162	162
				fz mm/tooth	0.083	0.097	0.111	0.122	0.138	0.144	0.153	0.156	0.159	0.164	0.167	0.17	0.174	0.18	0.188	0.197	0.208	0.221	0.206	0.215	0.227	0.231
				rpm obr/min	19099	16370	14324	12520	10695	9376	8064	7493	6957	6406	6067	5694	5348	4659	4005	3795	3592	3395	3203	2900	2578	2063
				feed posuw mm/min	3170	3176	3180	3055	2952	2700	2468	2338	2212	2101	2026	1936	1861	1677	1506	1495	1494	1501	1320	1247	1171	953
	10 - 11.1	0.08D	0.05D	Vc m/min	187	187	187	184	175	168	157	159	159	167	168	168	175	168	157	162	165	167	168	170	168	167
				fz mm/tooth	0.091	0.106	0.121	0.136	0.156	0.164	0.174	0.179	0.184	0.189	0.192	0.195	0.199	0.205	0.212	0.218	0.224	0.23	0.238	0.25	0.264	0.27
				rpm obr/min	19841	17007	14881	13015	11141	9723	8329	7786	7230	6645	6291	5942	5570	4861	4165	3967	3752	3544	3342	3006	2674	2126
				feed posuw mm/min	3611	3605	3601	3540	3476	3189	2899	2788	2661	2512	2416	2317	2217	1993	1766	1729	1681	1630	1591	1503	1412	1148
	11.2	0.08D	0.05D	Vc m/min	180	180	180	177	168	162	152	153	153	161	162	161	168	161	151	155	158	160	161	164	162	162
				fz mm/tooth	0.083	0.097	0.111	0.122	0.138	0.144	0.153	0.156	0.159	0.164	0.167	0.17	0.174	0.18	0.188	0.197	0.208	0.221	0.206	0.215	0.227	0.231
				rpm obr/min	19099	16370	14324	12520	10695	9376	8064	7493	6957	6406	6067	5694	5348	4659	4005	3795	3592	3395	3203	2900	2578	2063
				feed posuw mm/min	3170	3176	3180	3055	2952	2700	2468	2338	2212	2101	2026	1936	1861	1677	1506	1495	1494	1501	1320	1247	1171	953
K	15 - 20	0.08D	0.05D	Vc m/min	187	187	187	184	175	168	157	159	159	167	168	168	175	168	157	162	165	167	168	170	168	167
				fz mm/tooth	0.091	0.106	0.121	0.136	0.156	0.164	0.174	0.179	0.184	0.189	0.192	0.195	0.199	0.205	0.212	0.218	0.224	0.23	0.238	0.25	0.264	0.27
				rpm obr/min	19841	17007	14881	13015	11141	9723	8329	7786	7230	6645	6291	5942	5570	4861	4165	3967	3752	3544	3342	3006	2674	2126
				feed posuw mm/min	3611	3605	3601	3540	3476	3189	2899	2788	2661	2512	2416	2317	2217	1993	1766	1729	1681	1630	1591	1503	1412	1148
H	38.1 - 38.2	0.08D	0.05D	Vc m/min	151	151	151	148	141	135	124	127	128	136	136	136	141	136	127	131	133	135	136	137	136	136
				fz mm/tooth	0.075	0.088	0.1	0.111	0.125	0.132	0.141	0.144	0.147	0.15	0.153	0.156	0.16	0.164	0.17	0.173	0.178	0.183	0.189	0.198	0.208	0.211
				rpm obr/min	16022	13733	12016	10469	8976	7813	6578	6219	5821	5411	5093	4810	4488	3935	3369	3208	3024	2865	2706	2423	2165	1732
				feed posuw mm/min	2403	2417	2403	2324	2244	2063	1855	1791	1711	1623	1558	1501	1436	1291	1145	1110	1077	1049	1023	959	900	731
	40	0.08D	0.05D	Vc m/min	180	180	180	177	168	162	152	153	153	161	162	161	168	161	151	155	158	160	161	164	162	162
				fz mm/tooth	0.083	0.097	0.111	0.122	0.138	0.144	0.153	0.156	0.159	0.164	0.167	0.17	0.174	0.18	0.188	0.197	0.208	0.221	0.206	0.215	0.227	0.231
				rpm obr/min	19099	16370	14324	12520	10695	9376	8064	7493	6957	6406	6067	5694	5348	4659	4005	3795	3592	3395	3203	2900	2578	2063
				feed posuw mm/min	3170	3176	3180	3055	2952	2700	2468	2338	2212	2101	2026	1936	1861	1677	1506	1495	1494	1501	1320	1247	1171	953
	41	0.08D	0.05D	Vc m/min	151	151	151	148	141	135	124	127	128	136	136	136	141	136	127	131	133	135	136	137	136	136
				fz mm/tooth	0.075	0.088	0.1	0.111	0.125	0.132	0.141	0.144	0.147	0.15	0.153	0.156	0.16	0.164	0.17	0.173	0.178	0.183	0.189	0.198	0.208	0.211
				rpm obr/min	16022	13733	12016	10469	8976	7813	6578	6219	5821	5411	5093	4810	4488	3935	3369	3208	3024	2865	2706	2423	2165	1732
				feed posuw mm/min	2403	2417	2403	2324	2244	2063	1855	1791	1711	1623	1558	1501	1436	1291	1145	1110	1077	1049	1023	959	900	731

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S								H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5600104Y50A001002	0,05	0,1	4	0,1	0,2	40	0,085
UFX5600104Y50A001003	0,05	0,1	4	0,1	0,3	40	0,085
UFX5600104Y50A001005	0,05	0,1	4	0,1	0,5	40	0,085
UFX5600104Y50A001010	0,05	0,1	4	0,1	1	40	0,085
UFX5600204001A002005	0,1	0,2	4	0,2	0,5	40	0,17
UFX5600204001A002010	0,1	0,2	4	0,2	1	40	0,17
UFX5600204001A002015	0,1	0,2	4	0,2	1,5	40	0,17
UFX5600204001A002020	0,1	0,2	4	0,2	2	40	0,17
UFX5600204001A002030	0,1	0,2	4	0,2	3	40	0,17
UFX5600304X15A003010	0,15	0,3	4	0,3	1	40	0,27
UFX5600304X15A003015	0,15	0,3	4	0,3	1,5	40	0,27
UFX5600304X15A003020	0,15	0,3	4	0,3	2	40	0,27
UFX5600304X15A003025	0,15	0,3	4	0,3	2,5	40	0,27
UFX5600304X15A003030	0,15	0,3	4	0,3	3	40	0,27
UFX5600304X15A003040	0,15	0,3	4	0,3	4	40	0,27
UFX5600304X15A003050	0,15	0,3	4	0,3	5	40	0,27
UFX5600404002A004010	0,2	0,4	4	0,4	1	40	0,37
UFX5600404002A004015	0,2	0,4	4	0,4	1,5	40	0,37
UFX5600404002A004020	0,2	0,4	4	0,4	2	40	0,37
UFX5600404002A004025	0,2	0,4	4	0,4	2,5	40	0,37
UFX5600404002A004030	0,2	0,4	4	0,4	3	40	0,37
UFX5600404002A004040	0,2	0,4	4	0,4	4	40	0,37
UFX5600404002A004050	0,2	0,4	4	0,4	5	40	0,37
UFX5600404002A004060	0,2	0,4	4	0,4	6	40	0,37
UFX5600404002A004080	0,2	0,4	4	0,4	8	40	0,37
UFX5600404002A004100	0,2	0,4	4	0,4	10	40	0,37
UFX5600504X25A005010	0,25	0,5	4	0,5	1	45	0,45
UFX5600504X25A005015	0,25	0,5	4	0,5	1,5	45	0,45
UFX5600504X25A005020	0,25	0,5	4	0,5	2	45	0,45
UFX5600504X25A005025	0,25	0,5	4	0,5	2,5	45	0,45
UFX5600504X25A005030	0,25	0,5	4	0,5	3	45	0,45
UFX5600504X25A005040	0,25	0,5	4	0,5	4	45	0,45
UFX5600504X25A005050	0,25	0,5	4	0,5	5	45	0,45
UFX5600504X25A005060	0,25	0,5	4	0,5	6	45	0,45
UFX5600504X25A005080	0,25	0,5	4	0,5	8	45	0,45
UFX5600504X25A005100	0,25	0,5	4	0,5	10	45	0,45
UFX5600504X25A005120	0,25	0,5	4	0,5	12	45	0,45

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 –-0.012	± 0.005	h5
OVER TO R3	0 –-0.015	± 0.010	h5

UFX56

2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFX56

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5601504X75A015100	0,75	1,5	4	1,5	10	50	1,45
UFX5601504X75A015120	0,75	1,5	4	1,5	12	50	1,45
UFX5601504X75A015140	0,75	1,5	4	1,5	14	50	1,45
UFX5601504X75A015160	0,75	1,5	4	1,5	16	50	1,45
UFX5601504X75A015180	0,75	1,5	4	1,5	18	50	1,45
UFX5601504X75A015200	0,75	1,5	4	1,5	20	50	1,45
UFX5601504X75A015220	0,75	1,5	4	1,5	22	60	1,45
UFX5601504X75A015260	0,75	1,5	4	1,5	26	60	1,45
UFX5601504X75A015300	0,75	1,5	4	1,5	30	70	1,45
UFX5601504X75A015350	0,75	1,5	4	1,5	35	70	1,45
UFX5601504X75A015400	0,75	1,5	4	1,5	40	80	1,45
UFX5601604008A016040	0,8	1,6	4	1,6	4	50	1,55
UFX5601604008A016060	0,8	1,6	4	1,6	6	50	1,55
UFX5601604008A016080	0,8	1,6	4	1,6	8	50	1,55
UFX5601604008A016100	0,8	1,6	4	1,6	10	50	1,55
UFX5601604008A016120	0,8	1,6	4	1,6	12	50	1,55
UFX5601604008A016160	0,8	1,6	4	1,6	16	50	1,55
UFX5601604008A016200	0,8	1,6	4	1,6	20	50	1,55
UFX5601804009A018040	0,9	1,8	4	1,8	4	50	1,75
UFX5601804009A018060	0,9	1,8	4	1,8	6	50	1,75
UFX5601804009A018080	0,9	1,8	4	1,8	8	50	1,75
UFX5601804009A018100	0,9	1,8	4	1,8	10	50	1,75
UFX5601804009A018120	0,9	1,8	4	1,8	12	50	1,75
UFX5601804009A018160	0,9	1,8	4	1,8	16	50	1,75
UFX5601804009A018200	0,9	1,8	4	1,8	20	50	1,75
UFX5602004010A020040	1	2	4	2	4	50	1,95
UFX5602004010A020060	1	2	4	2	6	50	1,95
UFX5602004010A020080	1	2	4	2	8	50	1,95
UFX5602004010A020100	1	2	4	2	10	50	1,95
UFX5602004010A020120	1	2	4	2	12	50	1,95
UFX5602004010A020140	1	2	4	2	14	50	1,95
UFX5602004010A020160	1	2	4	2	16	50	1,95
UFX5602004010A020180	1	2	4	2	18	50	1,95
UFX5602004010A020200	1	2	4	2	20	50	1,95
UFX5602004010A020220	1	2	4	2	22	60	1,95
UFX5602004010A020260	1	2	4	2	26	60	1,95

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX56

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5602004010A020300	1	2	4	2	30	70	1,95
UFX5602004010A020350	1	2	4	2	35	70	1,95
UFX5602004010A020400	1	2	4	2	40	80	1,95
UFX5602004010A020450	1	2	4	2	45	90	1,95
UFX5602004010A020500	1	2	4	2	50	100	1,95
UFX5602004010A020600	1	2	4	2	60	110	1,95
UFX5602504013A025080	1,25	2,5	4	2,5	8	50	2,4
UFX5602504013A025100	1,25	2,5	4	2,5	10	50	2,4
UFX5602504013A025120	1,25	2,5	4	2,5	12	50	2,4
UFX5602504013A025160	1,25	2,5	4	2,5	16	50	2,4
UFX5602504013A025200	1,25	2,5	4	2,5	20	50	2,4
UFX5602504013A025220	1,25	2,5	4	2,5	22	60	2,4
UFX5602504013A025260	1,25	2,5	4	2,5	26	60	2,4
UFX5602504013A025300	1,25	2,5	4	2,5	30	70	2,4
UFX5602504013A025350	1,25	2,5	4	2,5	35	70	2,4
UFX5602504013A025400	1,25	2,5	4	2,5	40	80	2,4
UFX5602504013A025450	1,25	2,5	4	2,5	45	90	2,4
UFX5602504013A025500	1,25	2,5	4	2,5	50	100	2,4
UFX5603006015A030060	1,5	3	6	3	6	50	2,85
UFX5603006015A030080	1,5	3	6	3	8	50	2,85
UFX5603006015A030100	1,5	3	6	3	10	50	2,85
UFX5603006015A030120	1,5	3	6	3	12	50	2,85
UFX5603006015A030140	1,5	3	6	3	14	60	2,85
UFX5603006015A030150	1,5	3	6	3	15	60	2,85
UFX5603006015A030160	1,5	3	6	3	16	60	2,85
UFX5603006015A030180	1,5	3	6	3	18	60	2,85
UFX5603006015A030200	1,5	3	6	3	20	60	2,85
UFX5603006015A030220	1,5	3	6	3	22	65	2,85
UFX5603006015A030260	1,5	3	6	3	26	65	2,85
UFX5603006015A030300	1,5	3	6	3	30	70	2,85
UFX5603006015A030350	1,5	3	6	3	35	70	2,85
UFX5603006015A030400	1,5	3	6	3	40	80	2,85
UFX5603006015A030450	1,5	3	6	3	45	90	2,85
UFX5603006015A030500	1,5	3	6	3	50	100	2,85
UFX5603006015A030600	1,5	3	6	3	60	100	2,85

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX56

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5604006020A040080	2	4	6	4	8	50	3,85
UFX5604006020A040100	2	4	6	4	10	50	3,85
UFX5604006020A040120	2	4	6	4	12	50	3,85
UFX5604006020A040140	2	4	6	4	14	60	3,85
UFX5604006020A040160	2	4	6	4	16	60	3,85
UFX5604006020A040180	2	4	6	4	18	60	3,85
UFX5604006020A040200	2	4	6	4	20	60	3,85
UFX5604006020A040220	2	4	6	4	22	65	3,85
UFX5604006020A040260	2	4	6	4	26	65	3,85
UFX5604006020A040300	2	4	6	4	30	70	3,85
UFX5604006020A040350	2	4	6	4	35	70	3,85

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX56

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5604006020A040400	2	4	6	4	40	80	3,85
UFX5604006020A040450	2	4	6	4	45	90	3,85
UFX5604006020A040500	2	4	6	4	50	100	3,85
UFX5604006020A040550	2	4	6	4	55	100	3,85
UFX5604006020A040600	2	4	6	4	60	100	3,85
UFX5605006025A060150	2,5	5	6	6	15	60	4,85
UFX5605006025A060200	2,5	5	6	6	20	60	4,85
UFX5605006025A060260	2,5	5	6	6	26	65	4,85
UFX5605006025A060300	2,5	5	6	6	30	70	4,85
UFX5605006025A060350	2,5	5	6	6	35	70	4,85
UFX5605006025A060400	2,5	5	6	6	40	80	4,85
UFX5605006025A060450	2,5	5	6	6	45	90	4,85
UFX5605006025A060500	2,5	5	6	6	50	100	4,85
UFX5605006025A060550	2,5	5	6	6	55	100	4,85
UFX5605006025A060600	2,5	5	6	6	60	100	4,85
UFX5606006030A080200	3	6	6	8	20	60	5,85
UFX5606006030A080300	3	6	6	8	30	60	5,85
UFX5606006030A120200	3	6	6	12	20	90	5,85
UFX5606006030A120300	3	6	6	12	30	90	5,85
UFX5608008040A100250	4	8	8	10	25	70	7,7
UFX5608008040A100350	4	8	8	10	35	70	7,7
UFX5608008040A140250	4	8	8	14	25	100	7,7
UFX5608008040A140350	4	8	8	14	35	100	7,7
UFX5610010050A120300	5	10	10	12	30	75	9,7
UFX5610010050A120400	5	10	10	12	40	75	9,7
UFX5610010050A180300	5	10	10	18	30	100	9,7
UFX5610010050A180400	5	10	10	18	40	100	9,7
UFX5612012060A140320	6	12	12	14	32	80	11,7
UFX5612012060A140450	6	12	12	14	45	80	11,7
UFX5612012060A220320	6	12	12	22	32	110	11,7
UFX5612012060A220450	6	12	12	22	45	110	11,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	03	0.3
			LBS	02	0.3	0.5	1	0.5	1	1.5	2	3	1	1.5	2	2.5	3	4
P	1-5	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
	6-8	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
	9	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	399	399	357	357	357	242
			Ap mm	0.007	0.007	0.005	0.002	0.014	0.01	0.006	0.004	0.003	0.015	0.015	0.008	0.005	0.005	0.003
	10-11.1	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
	11.2	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	399	399	357	357	357	242
			Ap mm	0.007	0.007	0.005	0.002	0.014	0.01	0.006	0.004	0.003	0.015	0.015	0.008	0.005	0.005	0.003
K	15-20	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
H	38.1 - 38.2	1.0D	Vc m/min	16	16	16	14	27	27	24	24	24	40	40	36	36	36	32
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	42972	42972	38197	38197	38197	42441	42441	38197	38197	38197	33953
			feed posuw mm/min	204	204	204	178	258	258	229	229	229	340	340	306	306	306	204
			Ap mm	0.005	0.005	0.004	0.001	0.01	0.007	0.004	0.003	0.002	0.011	0.011	0.006	0.004	0.004	0.002
	40	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	399	399	357	357	357	242
			Ap mm	0.007	0.007	0.005	0.002	0.014	0.01	0.006	0.004	0.003	0.015	0.015	0.008	0.005	0.005	0.003
	41	1.0D	Vc m/min	16	16	16	14	27	27	24	24	24	40	40	36	36	36	32
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	42972	42972	38197	38197	38197	42441	42441	38197	38197	38197	33953
			feed posuw mm/min	204	204	204	178	258	258	229	229	229	340	340	306	306	306	204
			Ap mm	0.005	0.005	0.004	0.001	0.01	0.007	0.004	0.003	0.002	0.011	0.011	0.006	0.004	0.004	0.002

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5600506X25A005010	0,25	0,5	6	0,5	1	45	0,45
UFX5600506X25A005020	0,25	0,5	6	0,5	2	45	0,45
UFX5600506X25A005040	0,25	0,5	6	0,5	4	45	0,45
UFX5600606003A006010	0,3	0,6	6	0,6	1	45	0,55
UFX5600606003A006020	0,3	0,6	6	0,6	2	45	0,55
UFX5600606003A006030	0,3	0,6	6	0,6	3	45	0,55
UFX5600606003A006040	0,3	0,6	6	0,6	4	45	0,55
UFX5600606003A006050	0,3	0,6	6	0,6	5	45	0,55
UFX5600606003A006060	0,3	0,6	6	0,6	6	45	0,55
UFX5600606003A006080	0,3	0,6	6	0,6	8	45	0,55
UFX5600606003A006100	0,3	0,6	6	0,6	10	45	0,55
UFX5600606003A006120	0,3	0,6	6	0,6	12	45	0,55
UFX5600606003A006140	0,3	0,6	6	0,6	14	45	0,55
UFX5600606003A006160	0,3	0,6	6	0,6	16	45	0,55
UFX5600806004A008010	0,4	0,8	6	0,8	1	45	0,75
UFX5600806004A008020	0,4	0,8	6	0,8	2	45	0,75
UFX5600806004A008030	0,4	0,8	6	0,8	3	45	0,75
UFX5600806004A008040	0,4	0,8	6	0,8	4	45	0,75
UFX5600806004A008050	0,4	0,8	6	0,8	5	45	0,75
UFX5600806004A008060	0,4	0,8	6	0,8	6	45	0,75
UFX5600806004A008080	0,4	0,8	6	0,8	8	45	0,75
UFX5600806004A008100	0,4	0,8	6	0,8	10	45	0,75
UFX5600806004A008120	0,4	0,8	6	0,8	12	45	0,75
UFX5600806004A008140	0,4	0,8	6	0,8	14	45	0,75
UFX5600806004A008160	0,4	0,8	6	0,8	16	45	0,75
UFX5600806004A008200	0,4	0,8	6	0,8	20	45	0,75
UFX5601006005A010020	0,5	1	6	1	2	50	0,95
UFX5601006005A010030	0,5	1	6	1	3	50	0,95
UFX5601006005A010040	0,5	1	6	1	4	50	0,95
UFX5601006005A010050	0,5	1	6	1	5	50	0,95
UFX5601006005A010060	0,5	1	6	1	6	50	0,95
UFX5601006005A010070	0,5	1	6	1	7	50	0,95
UFX5601006005A010080	0,5	1	6	1	8	50	0,95
UFX5601006005A010090	0,5	1	6	1	9	50	0,95
UFX5601006005A010100	0,5	1	6	1	10	50	0,95
UFX5601006005A010120	0,5	1	6	1	12	50	0,95
UFX5601006005A010140	0,5	1	6	1	14	50	0,95

RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.005	0 ~-0.012	h5

UFX56

2 Finish Medium

HSM Vmax A min AIR

ISO	P											M			K						N											S								H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5601006005A010160	0,5	1	6	1	16	50	0,95
UFX5601006005A010180	0,5	1	6	1	18	50	0,95
UFX5601006005A010200	0,5	1	6	1	20	50	0,95
UFX5601006005A010220	0,5	1	6	1	22	60	0,95
UFX5601006005A010260	0,5	1	6	1	26	60	0,95
UFX5601006005A010300	0,5	1	6	1	30	70	0,95
UFX5601506X75A015030	0,75	1,5	6	1,5	3	50	1,45
UFX5601506X75A015040	0,75	1,5	6	1,5	4	50	1,45
UFX5601506X75A015060	0,75	1,5	6	1,5	6	50	1,45
UFX5601506X75A015080	0,75	1,5	6	1,5	8	50	1,45
UFX5601506X75A015100	0,75	1,5	6	1,5	10	50	1,45
UFX5601506X75A015120	0,75	1,5	6	1,5	12	50	1,45
UFX5601506X75A015140	0,75	1,5	6	1,5	14	50	1,45
UFX5601506X75A015160	0,75	1,5	6	1,5	16	50	1,45
UFX5601506X75A015180	0,75	1,5	6	1,5	18	50	1,45
UFX5601506X75A015200	0,75	1,5	6	1,5	20	50	1,45
UFX5601506X75A015220	0,75	1,5	6	1,5	22	60	1,45
UFX5601506X75A015260	0,75	1,5	6	1,5	26	60	1,45
UFX5601506X75A015300	0,75	1,5	6	1,5	30	70	1,45
UFX5601506X75A015350	0,75	1,5	6	1,5	35	70	1,45
UFX5601506X75A015400	0,75	1,5	6	1,5	40	80	1,45
UFX5602006010A020040	1	2	6	2	4	50	1,95
UFX5602006010A020060	1	2	6	2	6	50	1,95
UFX5602006010A020080	1	2	6	2	8	50	1,95
UFX5602006010A020100	1	2	6	2	10	50	1,95
UFX5602006010A020120	1	2	6	2	12	50	1,95
UFX5602006010A020140	1	2	6	2	14	50	1,95
UFX5602006010A020160	1	2	6	2	16	50	1,95
UFX5602006010A020180	1	2	6	2	18	50	1,95
UFX5602006010A020200	1	2	6	2	20	50	1,95
UFX5602006010A020220	1	2	6	2	22	60	1,95
UFX5602006010A020260	1	2	6	2	26	60	1,95
UFX5602006010A020300	1	2	6	2	30	70	1,95
UFX5602006010A020350	1	2	6	2	35	70	1,95
UFX5602006010A020400	1	2	6	2	40	80	1,95
UFX5602006010A020450	1	2	6	2	45	90	1,95
UFX5602006010A020500	1	2	6	2	50	100	1,95

RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.005	0 ~-0.012	h5

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	03	0.3
			LBS	02	0.3	0.5	1	0.5	1	1.5	2	3	1	1.5	2	2.5	3	4
P	1-5	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
	6-8	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
	9	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	399	399	357	357	357	242
			Ap mm	0.007	0.007	0.005	0.002	0.014	0.01	0.006	0.004	0.003	0.015	0.015	0.008	0.005	0.005	0.003
	10-11.1	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
	11.2	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	399	399	357	357	357	242
			Ap mm	0.007	0.007	0.005	0.002	0.014	0.01	0.006	0.004	0.003	0.015	0.015	0.008	0.005	0.005	0.003
K	15-20	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.004
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	499	499	357	357	357	323
			Ap mm	0.009	0.009	0.006	0.002	0.018	0.013	0.007	0.005	0.003	0.019	0.019	0.011	0.007	0.007	0.004
H	38.1 - 38.2	1.0D	Vc m/min	16	16	16	14	27	27	24	24	24	40	40	36	36	36	32
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	42972	42972	38197	38197	38197	42441	42441	38197	38197	38197	33953
			feed posuw mm/min	204	204	204	178	258	258	229	229	229	340	340	306	306	306	204
			Ap mm	0.005	0.005	0.004	0.001	0.01	0.007	0.004	0.003	0.002	0.011	0.011	0.006	0.004	0.004	0.002
	40	1.0D	Vc m/min	16	16	16	14	31	31	28	28	28	47	47	42	42	42	38
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	49338	49338	44563	44563	44563	49869	49869	44563	44563	44563	40319
			feed posuw mm/min	204	204	204	178	296	296	267	267	267	399	399	357	357	357	242
			Ap mm	0.007	0.007	0.005	0.002	0.014	0.01	0.006	0.004	0.003	0.015	0.015	0.008	0.005	0.005	0.003
	41	1.0D	Vc m/min	16	16	16	14	27	27	24	24	24	40	40	36	36	36	32
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003
			rpm obr/min	50930	50930	50930	44563	42972	42972	38197	38197	38197	42441	42441	38197	38197	38197	33953
			feed posuw mm/min	204	204	204	178	258	258	229	229	229	340	340	306	306	306	204
			Ap mm	0.005	0.005	0.004	0.001	0.01	0.007	0.004	0.003	0.002	0.011	0.011	0.006	0.004	0.004	0.002

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
			LBS	5	1	1.5	2	2.5	3	4	5	6	8	10	1	1.5	2	25	3	4	5	6	8
P	1-5	1.0D	Vc m/min	28	52	52	52	46	46	46	41	41	31	15	54	54	54	54	48	48	48	43	32
			fz mm/tooth	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007
			rpm obr/min	29709	41380	41380	41380	36606	36606	36606	32627	32627	24669	11937	34377	34377	34377	34377	30558	30558	30558	27375	20372
			feed posuw mm/min	178	497	497	497	366	366	366	326	326	197	95	688	688	688	688	550	550	550	438	285
			Ap mm	0.003	0.036	0.025	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007
	6-8	1.0D	Vc m/min	28	52	52	52	46	46	46	41	41	31	15	54	54	54	54	48	48	48	43	32
			fz mm/tooth	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007
			rpm obr/min	29709	41380	41380	41380	36606	36606	36606	32627	32627	24669	11937	34377	34377	34377	34377	30558	30558	30558	27375	20372
			feed posuw mm/min	178	497	497	497	366	366	366	326	326	197	95	688	688	688	688	550	550	550	438	285
			Ap mm	0.003	0.036	0.025	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007
	9	1.0D	Vc m/min	28	49	49	49	44	44	44	39	39	29	15	51	51	51	51	46	46	46	41	30
			fz mm/tooth	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.003	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.006
			rpm obr/min	29709	38993	38993	38993	35014	35014	35014	31035	31035	23077	11937	32468	32468	32468	32468	29285	29285	29285	26101	19099
			feed posuw mm/min	178	390	390	390	350	350	350	248	248	185	72	584	584	584	584	469	469	469	365	229
			Ap mm	0.002	0.028	0.02	0.02	0.011	0.011	0.007	0.007	0.004	0.003	0.003	0.035	0.035	0.025	0.025	0.014	0.014	0.009	0.009	0.005
	10-11.1	1.0D	Vc m/min	28	52	52	52	46	46	46	41	41	31	15	54	54	54	54	48	48	48	43	32
			fz mm/tooth	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007
			rpm obr/min	29709	41380	41380	41380	36606	36606	36606	32627	32627	24669	11937	34377	34377	34377	34377	30558	30558	30558	27375	20372
			feed posuw mm/min	178	497	497	497	366	366	366	326	326	197	95	688	688	688	688	550	550	550	438	285
			Ap mm	0.003	0.036	0.025	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007
	11.2	1.0D	Vc m/min	28	49	49	49	44	44	44	39	39	29	15	51	51	51	51	46	46	46	41	30
			fz mm/tooth	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.003	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.006
			rpm obr/min	29709	38993	38993	38993	35014	35014	35014	31035	31035	23077	11937	32468	32468	32468	32468	29285	29285	29285	26101	19099
			feed posuw mm/min	178	390	390	390	350	350	350	248	248	185	72	584	584	584	584	469	469	469	365	229
			Ap mm	0.002	0.028	0.02	0.02	0.011	0.011	0.007	0.007	0.004	0.003	0.003	0.035	0.035	0.025	0.025	0.014	0.014	0.009	0.009	0.005
K	15-20	1.0D	Vc m/min	28	52	52	52	46	46	46	41	41	31	15	54	54	54	54	48	48	48	43	32
			fz mm/tooth	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007
			rpm obr/min	29709	41380	41380	41380	36606	36606	36606	32627	32627	24669	11937	34377	34377	34377	34377	30558	30558	30558	27375	20372
			feed posuw mm/min	178	497	497	497	366	366	366	326	326	197	95	688	688	688	688	550	550	550	438	285
			Ap mm	0.003	0.036	0.025	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007
H	38.1 - 38.2	1.0D	Vc m/min	24	43	43	43	39	39	39	34	34	26	13	45	45	45	45	40	40	40	36	27
			fz mm/tooth	0.003	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.006
			rpm obr/min	25465	34218	34218	34218	31035	31035	31035	27056	27056	20690	10345	28648	28648	28648	28648	25465	25465	25465	22918	17189
			feed posuw mm/min	153	342	342	342	248	248	248	216	216	166	62	516	516	516	516	407	407	407	321	206
			Ap mm	0.002	0.02	0.014	0.014	0.008	0.008	0.005	0.005	0.003	0.002	0.002	0.025	0.025	0.018	0.018	0.01	0.01	0.006	0.006	0.004
	40	1.0D	Vc m/min	28	49	49	49	44	44	44	39	39	29	15	51	51	51	51	46	46	46	41	30
			fz mm/tooth	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.003	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.006
			rpm obr/min	29709	38993	38993	38993	35014	35014	35014	31035	31035	23077	11937	32468	32468	32468	32468	29285	29285	29285	26101	19099
			feed posuw mm/min	178	390	390	390	350	350	350	248	248	185	72	584	584	584	584	469	469	469	365	229
			Ap mm	0.002	0.028	0.02	0.02	0.011	0.011	0.007	0.007	0.004	0.003	0.003	0.035	0.035	0.025	0.025	0.014	0.014	0.009	0.009	0.005
	41	1.0D	Vc m/min	24	43	43	43	39	39	39	34	34	26	13	45	45	45	45	40	40	40	36	27
			fz mm/tooth	0.003	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.006
			rpm obr/min	25465	34218	34218	34218	31035	31035	31035	27056	27056	20690	10345	28648	28648	28648	28648	25465	25465	25465	22918	17189
			feed posuw mm/min	153	342	342	342	248	248	248	216	216	166	62	516	516	516	516	407	407	407	321	206
			Ap mm	0.002	0.02	0.014	0.014	0.008	0.008	0.005	0.005	0.003	0.002	0.002	0.025	0.025	0.018	0.018	0.01	0.01	0.006	0.006	0.004

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
			LBS	10	12	14	16	1	2	3	4	5	6	8	10	12	14	16	2	4
P	1-5	1.0D	Vc m/min	32	16	16	5	64	64	64	58	58	58	52	39	39	19	19	75	68
			fz mm/tooth	0.007	0.006	0.006	0.005	0.015	0.015	0.015	0.013	0.013	0.013	0.012	0.01	0.01	0.009	0.009	0.017	0.015
			rpm obr/min	20372	10186	10186	3183	33953	33953	33953	30770	30770	30770	27587	20690	20690	10080	10080	34105	30922
			feed posuw mm/min	285	122	122	32	1019	1019	1019	800	800	800	662	414	414	181	181	1160	928
			Ap mm	0.005	0.005	0.005	0.005	0.038	0.038	0.038	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025
	6-8	1.0D	Vc m/min	32	16	16	5	64	64	64	58	58	58	52	39	39	19	19	75	68
			fz mm/tooth	0.007	0.006	0.006	0.005	0.015	0.015	0.015	0.013	0.013	0.013	0.012	0.01	0.01	0.009	0.009	0.017	0.015
			rpm obr/min	20372	10186	10186	3183	33953	33953	33953	30770	30770	30770	27587	20690	20690	10080	10080	34105	30922
			feed posuw mm/min	285	122	122	32	1019	1019	1019	800	800	800	662	414	414	181	181	1160	928
			Ap mm	0.005	0.005	0.005	0.005	0.038	0.038	0.038	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025
	9	1.0D	Vc m/min	30	15	15	5	61	61	61	55	55	55	49	37	37	18	18	71	64
			fz mm/tooth	0.006	0.005	0.005	0.005	0.013	0.013	0.013	0.012	0.012	0.012	0.01	0.009	0.009	0.008	0.008	0.014	0.013
			rpm obr/min	19099	9549	9549	3183	32362	32362	32362	29178	29178	29178	25995	19629	19629	9549	9549	32286	29103
			feed posuw mm/min	229	95	95	32	841	841	841	700	700	700	520	353	353	153	153	904	757
			Ap mm	0.004	0.004	0.004	0.004	0.029	0.029	0.029	0.017	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.049	0.02
	10-11.1	1.0D	Vc m/min	32	16	16	5	64	64	64	58	58	58	52	39	39	19	19	75	68
			fz mm/tooth	0.007	0.006	0.006	0.005	0.015	0.015	0.015	0.013	0.013	0.013	0.012	0.01	0.01	0.009	0.009	0.017	0.015
			rpm obr/min	20372	10186	10186	3183	33953	33953	33953	30770	30770	30770	27587	20690	20690	10080	10080	34105	30922
			feed posuw mm/min	285	122	122	32	1019	1019	1019	800	800	800	662	414	414	181	181	1160	928
			Ap mm	0.005	0.005	0.005	0.005	0.038	0.038	0.038	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025
	11.2	1.0D	Vc m/min	30	15	15	5	61	61	61	55	55	55	49	37	37	18	18	71	64
			fz mm/tooth	0.006	0.005	0.005	0.005	0.013	0.013	0.013	0.012	0.012	0.012	0.01	0.009	0.009	0.008	0.008	0.014	0.013
			rpm obr/min	19099	9549	9549	3183	32362	32362	32362	29178	29178	29178	25995	19629	19629	9549	9549	32286	29103
			feed posuw mm/min	229	95	95	32	841	841	841	700	700	700	520	353	353	153	153	904	757
			Ap mm	0.004	0.004	0.004	0.004	0.029	0.029	0.029	0.017	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.049	0.02
K	15-20	1.0D	Vc m/min	32	16	16	5	64	64	64	58	58	58	52	39	39	19	19	75	68
			fz mm/tooth	0.007	0.006	0.006	0.005	0.015	0.015	0.015	0.013	0.013	0.013	0.012	0.01	0.01	0.009	0.009	0.017	0.015
			rpm obr/min	20372	10186	10186	3183	33953	33953	33953	30770	30770	30770	27587	20690	20690	10080	10080	34105	30922
			feed posuw mm/min	285	122	122	32	1019	1019	1019	800	800	800	662	414	414	181	181	1160	928
			Ap mm	0.005	0.005	0.005	0.005	0.038	0.038	0.038	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025
H	38.1 - 38.2	1.0D	Vc m/min	27	13	13	4	54	54	54	48	48	48	43	32	32	16	16	63	56
			fz mm/tooth	0.006	0.006	0.006	0.004	0.012	0.012	0.012	0.011	0.011	0.011	0.01	0.008	0.008	0.007	0.007	0.013	0.012
			rpm obr/min	17189	8276	8276	2546	28648	28648	28648	25465	25465	25465	22812	16977	16977	8488	8488	28648	25465
			feed posuw mm/min	206	99	99	20	688	688	688	560	560	560	456	272	272	119	119	745	611
			Ap mm	0.003	0.003	0.003	0.003	0.021	0.021	0.021	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.003	0.035	0.014
	40	1.0D	Vc m/min	30	15	15	5	61	61	61	55	55	55	49	37	37	18	18	71	64
			fz mm/tooth	0.006	0.005	0.005	0.005	0.013	0.013	0.013	0.012	0.012	0.012	0.01	0.009	0.009	0.008	0.008	0.014	0.013
			rpm obr/min	19099	9549	9549	3183	32362	32362	32362	29178	29178	29178	25995	19629	19629	9549	9549	32286	29103
			feed posuw mm/min	229	95	95	32	841	841	841	700	700	700	520	353	353	153	153	904	757
			Ap mm	0.004	0.004	0.004	0.004	0.029	0.029	0.029	0.017	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.049	0.02
	41	1.0D	Vc m/min	27	13	13	4	54	54	54	48	48	48	43	32	32	16	16	63	56
			fz mm/tooth	0.006	0.006	0.006	0.004	0.012	0.012	0.012	0.011	0.011	0.011	0.01	0.008	0.008	0.007	0.007	0.013	0.012
			rpm obr/min	17189	8276	8276	2546	28648	28648	28648	25465	25465	25465	22812	16977	16977	8488	8488	28648	25465
			feed posuw mm/min	206	99	99	20	688	688	688	560	560	560	456	272	272	119	119	745	611
			Ap mm	0.003	0.003	0.003	0.003	0.021	0.021	0.021	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.003	0.035	0.014

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.0
			LBS	6	8	10	12	2	3	4	5	6	8	10	12	14	16	20	4	6	8	10	2
P	1-5	1.0D	Vc m/min	68	60	60	45	86	86	86	77	77	77	69	69	52	52	26	83	83	83	74	97
			fz mm/tooth	0.015	0.013	0.013	0.012	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.013	0.013	0.011	0.019	0.019	0.019	0.017	0.025
			rpm obr/min	30922	27284	27284	20463	34218	34218	34218	30637	30637	30637	27454	27454	20690	20690	10345	29355	29355	29355	26172	30876
			feed posuw mm/min	928	709	709	491	1232	1232	1232	980	980	980	769	769	538	538	228	1115	1115	1115	890	1544
			Ap mm	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.032	0.02	0.02	0.09
	6-8	1.0D	Vc m/min	68	60	60	45	86	86	86	77	77	77	69	69	52	52	26	83	83	83	74	97
			fz mm/tooth	0.015	0.013	0.013	0.012	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.013	0.013	0.011	0.019	0.019	0.019	0.017	0.025
			rpm obr/min	30922	27284	27284	20463	34218	34218	34218	30637	30637	30637	27454	27454	20690	20690	10345	29355	29355	29355	26172	30876
			feed posuw mm/min	928	709	709	491	1232	1232	1232	980	980	980	769	769	538	538	228	1115	1115	1115	890	1544
			Ap mm	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.032	0.02	0.02	0.09
	9	1.0D	Vc m/min	64	57	57	43	81	81	81	73	73	73	65	65	49	49	24	78	78	78	69	91
			fz mm/tooth	0.013	0.012	0.012	0.01	0.016	0.016	0.016	0.014	0.014	0.014	0.013	0.013	0.011	0.011	0.01	0.017	0.017	0.017	0.015	0.023
			rpm obr/min	29103	25920	25920	19553	32229	32229	32229	29046	29046	29046	25863	25863	19496	19496	9549	27587	27587	27587	24404	28966
			feed posuw mm/min	757	622	622	391	1031	1031	1031	813	813	813	672	672	429	429	191	938	938	938	732	1332
			Ap mm	0.012	0.012	0.007	0.005	0.056	0.039	0.039	0.022	0.022	0.014	0.014	0.008	0.006	0.006	0.006	0.025	0.025	0.016	0.016	0.07
	10 - 11.1	1.0D	Vc m/min	68	60	60	45	86	86	86	77	77	77	69	69	52	52	26	83	83	83	74	97
			fz mm/tooth	0.015	0.013	0.013	0.012	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.013	0.013	0.011	0.019	0.019	0.019	0.017	0.025
			rpm obr/min	30922	27284	27284	20463	34218	34218	34218	30637	30637	30637	27454	27454	20690	20690	10345	29355	29355	29355	26172	30876
			feed posuw mm/min	928	709	709	491	1232	1232	1232	980	980	980	769	769	538	538	228	1115	1115	1115	890	1544
			Ap mm	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.032	0.02	0.02	0.09
	11.2	1.0D	Vc m/min	64	57	57	43	81	81	81	73	73	73	65	65	49	49	24	78	78	78	69	91
			fz mm/tooth	0.013	0.012	0.012	0.01	0.016	0.016	0.016	0.014	0.014	0.014	0.013	0.013	0.011	0.011	0.01	0.017	0.017	0.017	0.015	0.023
			rpm obr/min	29103	25920	25920	19553	32229	32229	32229	29046	29046	29046	25863	25863	19496	19496	9549	27587	27587	27587	24404	28966
			feed posuw mm/min	757	622	622	391	1031	1031	1031	813	813	813	672	672	429	429	191	938	938	938	732	1332
			Ap mm	0.012	0.012	0.007	0.005	0.056	0.039	0.039	0.022	0.022	0.014	0.014	0.008	0.006	0.006	0.006	0.025	0.025	0.016	0.016	0.07
K	15-20	1.0D	Vc m/min	68	60	60	45	86	86	86	77	77	77	69	69	52	52	26	83	83	83	74	97
			fz mm/tooth	0.015	0.013	0.013	0.012	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.013	0.013	0.011	0.019	0.019	0.019	0.017	0.025
			rpm obr/min	30922	27284	27284	20463	34218	34218	34218	30637	30637	30637	27454	27454	20690	20690	10345	29355	29355	29355	26172	30876
			feed posuw mm/min	928	709	709	491	1232	1232	1232	980	980	980	769	769	538	538	228	1115	1115	1115	890	1544
			Ap mm	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.032	0.02	0.02	0.09
H	38.1 - 38.2	1.0D	Vc m/min	56	50	50	38	72	72	72	64	64	64	57	57	43	43	21	69	69	69	61	81
			fz mm/tooth	0.012	0.011	0.011	0.009	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.012	0.011	0.011	0.009	0.016	0.016	0.016	0.014	0.021
			rpm obr/min	25465	22736	22736	17280	28648	28648	28648	25465	25465	25465	22680	22680	17109	17109	8356	24404	24404	24404	21574	25783
			feed posuw mm/min	611	500	500	311	859	859	859	713	713	713	544	544	376	376	150	781	781	781	604	1083
			Ap mm	0.009	0.009	0.005	0.004	0.04	0.028	0.028	0.016	0.016	0.01	0.01	0.006	0.004	0.004	0.004	0.018	0.018	0.011	0.011	0.05
	40	1.0D	Vc m/min	64	57	57	43	81	81	81	73	73	73	65	65	49	49	24	78	78	78	69	91
			fz mm/tooth	0.013	0.012	0.012	0.01	0.016	0.016	0.016	0.014	0.014	0.014	0.013	0.013	0.011	0.011	0.01	0.017	0.017	0.017	0.015	0.023
			rpm obr/min	29103	25920	25920	19553	32229	32229	32229	29046	29046	29046	25863	25863	19496	19496	9549	27587	27587	27587	24404	28966
			feed posuw mm/min	757	622	622	391	1031	1031	1031	813	813	813	672	672	429	429	191	938	938	938	732	1332
			Ap mm	0.012	0.012	0.007	0.005	0.056	0.039	0.039	0.022	0.022	0.014	0.014	0.008	0.006	0.006	0.006	0.025	0.025	0.016	0.016	0.07
	41	1.0D	Vc m/min	56	50	50	38	72	72	72	64	64	64	57	57	43	43	21	69	69	69	61	81
			fz mm/tooth	0.012	0.011	0.011	0.009	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.012	0.011	0.011	0.009	0.016	0.016	0.016	0.014	0.021
			rpm obr/min	25465	22736	22736	17280	28648	28648	28648	25465	25465	25465	22680	22680	17109	17109	8356	24404	24404	24404	21574	25783
			feed posuw mm/min	611	500	500	311	859	859	859	713	713	713	544	544	376	376	150	781	781	781	604	1083
			Ap mm	0.009	0.009	0.005	0.004	0.04	0.028	0.028	0.016	0.016	0.01	0.01	0.006	0.004	0.004	0.004	0.018	0.018	0.011	0.011	0.05

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			LBS	3	4	5	6	7	8	10	12	14	16	18	20	22	26	30	40	50
P	1-5	1.0D	Vc m/min	97	97	97	87	87	87	87	77	77	58	58	58	29	29	29	10	10
			fz mm/tooth	0.025	0.025	0.025	0.022	0.022	0.022	0.022	0.02	0.02	0.017	0.017	0.017	0.015	0.015	0.015	0.012	0.012
			rpm obr/min	30876	30876	30876	27693	27693	27693	27693	24510	24510	18462	18462	18462	9231	9231	9231	3183	3183
			feed posuw mm/min	1544	1544	1544	1218	1218	1218	1218	980	980	628	628	628	277	277	277	76	76
			Ap mm	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009	0.009	0.009	0.009	0.006
	6-8	1.0D	Vc m/min	97	97	97	87	87	87	87	77	77	58	58	58	29	29	29	10	10
			fz mm/tooth	0.025	0.025	0.025	0.022	0.022	0.022	0.022	0.02	0.02	0.017	0.017	0.017	0.015	0.015	0.015	0.012	0.012
			rpm obr/min	30876	30876	30876	27693	27693	27693	27693	24510	24510	18462	18462	18462	9231	9231	9231	3183	3183
			feed posuw mm/min	1544	1544	1544	1218	1218	1218	1218	980	980	628	628	628	277	277	277	76	76
			Ap mm	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009	0.009	0.009	0.009	0.006
	9	1.0D	Vc m/min	91	91	91	82	82	82	82	73	73	55	55	55	27	27	27	9	9
			fz mm/tooth	0.023	0.023	0.023	0.02	0.02	0.02	0.02	0.018	0.018	0.016	0.016	0.016	0.013	0.013	0.013	0.011	0.011
			rpm obr/min	28966	28966	28966	26101	26101	26101	26101	23237	23237	17507	17507	17507	8594	8594	8594	2865	2865
			feed posuw mm/min	1332	1332	1332	1044	1044	1044	1044	837	837	560	560	560	223	223	223	63	63
			Ap mm	0.07	0.049	0.049	0.028	0.028	0.028	0.018	0.018	0.011	0.011	0.007	0.007	0.007	0.007	0.007	0.007	0.005
	10 - 11.1	1.0D	Vc m/min	97	97	97	87	87	87	87	77	77	58	58	58	29	29	29	10	10
			fz mm/tooth	0.025	0.025	0.025	0.022	0.022	0.022	0.022	0.02	0.02	0.017	0.017	0.017	0.015	0.015	0.015	0.012	0.012
			rpm obr/min	30876	30876	30876	27693	27693	27693	27693	24510	24510	18462	18462	18462	9231	9231	9231	3183	3183
			feed posuw mm/min	1544	1544	1544	1218	1218	1218	1218	980	980	628	628	628	277	277	277	76	76
			Ap mm	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009	0.009	0.009	0.009	0.006
	11.2	1.0D	Vc m/min	91	91	91	82	82	82	82	73	73	55	55	55	27	27	27	9	9
			fz mm/tooth	0.023	0.023	0.023	0.02	0.02	0.02	0.02	0.018	0.018	0.016	0.016	0.016	0.013	0.013	0.013	0.011	0.011
			rpm obr/min	28966	28966	28966	26101	26101	26101	26101	23237	23237	17507	17507	17507	8594	8594	8594	2865	2865
			feed posuw mm/min	1332	1332	1332	1044	1044	1044	1044	837	837	560	560	560	223	223	223	63	63
			Ap mm	0.07	0.049	0.049	0.028	0.028	0.028	0.018	0.018	0.011	0.011	0.007	0.007	0.007	0.007	0.007	0.007	0.005
K	15-20	1.0D	Vc m/min	97	97	97	87	87	87	87	77	77	58	58	58	29	29	29	10	10
			fz mm/tooth	0.025	0.025	0.025	0.022	0.022	0.022	0.022	0.02	0.02	0.017	0.017	0.017	0.015	0.015	0.015	0.012	0.012
			rpm obr/min	30876	30876	30876	27693	27693	27693	27693	24510	24510	18462	18462	18462	9231	9231	9231	3183	3183
			feed posuw mm/min	1544	1544	1544	1218	1218	1218	1218	980	980	628	628	628	277	277	277	76	76
			Ap mm	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009	0.009	0.009	0.009	0.006
H	38.1 - 38.2	1.0D	Vc m/min	81	81	81	73	73	73	73	65	65	48	48	48	24	24	24	8	8
			fz mm/tooth	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.015	0.013	0.013	0.013	0.011	0.011
			rpm obr/min	25783	25783	25783	23237	23237	23237	23237	20690	20690	15279	15279	15279	7639	7639	7639	2546	2546
			feed posuw mm/min	1083	1083	1083	883	883	883	883	703	703	458	458	458	199	199	199	56	56
			Ap mm	0.05	0.035	0.035	0.02	0.02	0.02	0.013	0.013	0.008	0.008	0.005	0.005	0.005	0.005	0.005	0.005	0.003
	40	1.0D	Vc m/min	91	91	91	82	82	82	82	73	73	55	55	55	27	27	27	9	9
			fz mm/tooth	0.023	0.023	0.023	0.02	0.02	0.02	0.02	0.018	0.018	0.016	0.016	0.016	0.013	0.013	0.013	0.011	0.011
			rpm obr/min	28966	28966	28966	26101	26101	26101	26101	23237	23237	17507	17507	17507	8594	8594	8594	2865	2865
			feed posuw mm/min	1332	1332	1332	1044	1044	1044	1044	837	837	560	560	560	223	223	223	63	63
			Ap mm	0.07	0.049	0.049	0.028	0.028	0.028	0.018	0.018	0.011	0.011	0.007	0.007	0.007	0.007	0.007	0.007	0.005
	41	1.0D	Vc m/min	81	81	81	73	73	73	73	65	65	48	48	48	24	24	24	8	8
			fz mm/tooth	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.015	0.013	0.013	0.013	0.011	0.011
			rpm obr/min	25783	25783	25783	23237	23237	23237	23237	20690	20690	15279	15279	15279	7639	7639	7639	2546	2546
			feed posuw mm/min	1083	1083	1083	883	883	883	883	703	703	458	458	458	199	199	199	56	56
			Ap mm	0.05	0.035	0.035	0.02	0.02	0.02	0.013	0.013	0.008	0.008	0.005	0.005	0.005	0.005	0.005	0.005	0.003

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.2	1.2	1.2	1.2	1.2	12	1.2	1.2	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
			LBS	4	6	8	10	12	16	20	26	6	8	10	16	4	5	6	7	8	10	12	14
P	1-5	1.0D	Vc m/min	99	99	89	89	89	79	59	30	95	85	85	76	113	113	113	113	101	101	101	101
			fz mm/tooth	0.026	0.026	0.024	0.024	0.024	0.021	0.018	0.016	0.03	0.027	0.027	0.024	0.033	0.033	0.033	0.033	0.03	0.03	0.03	0.03
			rpm obr/min	26261	26261	23608	23608	23608	20955	15650	7958	21600	19326	19326	17280	23979	23979	23979	23979	21433	21433	21433	21433
			feed posuw mm/min	1366	1366	1133	1133	1133	880	563	255	1296	1044	1044	829	1583	1583	1583	1583	1286	1286	1286	1286
			Ap mm	0.076	0.076	0.043	0.027	0.027	0.016	0.011	0.011	0.088	0.05	0.05	0.032	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034
	6-8	1.0D	Vc m/min	99	99	89	89	89	79	59	30	95	85	85	76	113	113	113	113	101	101	101	101
			fz mm/tooth	0.026	0.026	0.024	0.024	0.024	0.021	0.018	0.016	0.03	0.027	0.027	0.024	0.033	0.033	0.033	0.033	0.03	0.03	0.03	0.03
			rpm obr/min	26261	26261	23608	23608	23608	20955	15650	7958	21600	19326	19326	17280	23979	23979	23979	23979	21433	21433	21433	21433
			feed posuw mm/min	1366	1366	1133	1133	1133	880	563	255	1296	1044	1044	829	1583	1583	1583	1583	1286	1286	1286	1286
			Ap mm	0.076	0.076	0.043	0.027	0.027	0.016	0.011	0.011	0.088	0.05	0.05	0.032	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034
	9	1.0D	Vc m/min	93	93	84	84	84	75	56	28	89	80	80	71	106	106	106	106	96	96	96	96
			fz mm/tooth	0.023	0.023	0.021	0.021	0.021	0.019	0.016	0.014	0.027	0.024	0.024	0.022	0.03	0.03	0.03	0.03	0.027	0.027	0.027	0.027
			rpm obr/min	24669	24669	22282	22282	22282	19894	14854	7427	20235	18189	18189	16143	22494	22494	22494	22494	20372	20372	20372	20372
			feed posuw mm/min	1135	1135	936	936	936	756	475	208	1093	873	873	710	1350	1350	1350	1350	1100	1100	1100	1100
			Ap mm	0.059	0.059	0.034	0.021	0.021	0.013	0.008	0.008	0.069	0.039	0.039	0.025	0.105	0.074	0.074	0.074	0.042	0.042	0.042	0.026
	10 - 11.1	1.0D	Vc m/min	99	99	89	89	89	79	59	30	95	85	85	76	113	113	113	113	101	101	101	101
			fz mm/tooth	0.026	0.026	0.024	0.024	0.024	0.021	0.018	0.016	0.03	0.027	0.027	0.024	0.033	0.033	0.033	0.033	0.03	0.03	0.03	0.03
			rpm obr/min	26261	26261	23608	23608	23608	20955	15650	7958	21600	19326	19326	17280	23979	23979	23979	23979	21433	21433	21433	21433
			feed posuw mm/min	1366	1366	1133	1133	1133	880	563	255	1296	1044	1044	829	1583	1583	1583	1583	1286	1286	1286	1286
			Ap mm	0.076	0.076	0.043	0.027	0.027	0.016	0.011	0.011	0.088	0.05	0.05	0.032	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034
	11.2	1.0D	Vc m/min	93	93	84	84	84	75	56	28	89	80	80	71	106	106	106	106	96	96	96	96
			fz mm/tooth	0.023	0.023	0.021	0.021	0.021	0.019	0.016	0.014	0.027	0.024	0.024	0.022	0.03	0.03	0.03	0.03	0.027	0.027	0.027	0.027
			rpm obr/min	24669	24669	22282	22282	22282	19894	14854	7427	20235	18189	18189	16143	22494	22494	22494	22494	20372	20372	20372	20372
			feed posuw mm/min	1135	1135	936	936	936	756	475	208	1093	873	873	710	1350	1350	1350	1350	1100	1100	1100	1100
			Ap mm	0.059	0.059	0.034	0.021	0.021	0.013	0.008	0.008	0.069	0.039	0.039	0.025	0.105	0.074	0.074	0.074	0.042	0.042	0.042	0.026
K	15-20	1.0D	Vc m/min	99	99	89	89	89	79	59	30	95	85	85	76	113	113	113	113	101	101	101	101
			fz mm/tooth	0.026	0.026	0.024	0.024	0.024	0.021	0.018	0.016	0.03	0.027	0.027	0.024	0.033	0.033	0.033	0.033	0.03	0.03	0.03	0.03
			rpm obr/min	26261	26261	23608	23608	23608	20955	15650	7958	21600	19326	19326	17280	23979	23979	23979	23979	21433	21433	21433	21433
			feed posuw mm/min	1366	1366	1133	1133	1133	880	563	255	1296	1044	1044	829	1583	1583	1583	1583	1286	1286	1286	1286
			Ap mm	0.076	0.076	0.043	0.027	0.027	0.016	0.011	0.011	0.088	0.05	0.05	0.032	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034
H	38.1 - 38.2	1.0D	Vc m/min	83	83	74	74	74	66	50	25	79	71	71	63	94	94	94	94	85	85	85	85
			fz mm/tooth	0.022	0.022	0.02	0.02	0.02	0.017	0.015	0.013	0.026	0.023	0.023	0.021	0.027	0.027	0.027	0.027	0.024	0.024	0.024	0.024
			rpm obr/min	22016	22016	19629	19629	19629	17507	13263	6631	17962	16143	16143	14324	19947	19947	19947	19947	18038	18038	18038	18038
			feed posuw mm/min	969	969	785	785	785	595	398	172	934	743	743	602	1077	1077	1077	1077	866	866	866	866
			Ap mm	0.042	0.042	0.024	0.015	0.015	0.009	0.006	0.006	0.049	0.028	0.028	0.018	0.075	0.053	0.053	0.053	0.03	0.03	0.03	0.019
	40	1.0D	Vc m/min	93	93	84	84	84	75	56	28	89	80	80	71	106	106	106	106	96	96	96	96
			fz mm/tooth	0.023	0.023	0.021	0.021	0.021	0.019	0.016	0.014	0.027	0.024	0.024	0.022	0.03	0.03	0.03	0.03	0.027	0.027	0.027	0.027
			rpm obr/min	24669	24669	22282	22282	22282	19894	14854	7427	20235	18189	18189	16143	22494	22494	22494	22494	20372	20372	20372	20372
			feed posuw mm/min	1135	1135	936	936	936	756	475	208	1093	873	873	710	1350	1350	1350	1350	1100	1100	1100	1100
			Ap mm	0.059	0.059	0.034	0.021	0.021	0.013	0.008	0.008	0.069	0.039	0.039	0.025	0.105	0.074	0.074	0.074	0.042	0.042	0.042	0.026
	41	1.0D	Vc m/min	83	83	74	74	74	66	50	25	79	71	71	63	94	94	94	94	85	85	85	85
			fz mm/tooth	0.022	0.022	0.02	0.02	0.02	0.017	0.015	0.013	0.026	0.023	0.023	0.021	0.027	0.027	0.027	0.027	0.024	0.024	0.024	0.024
			rpm obr/min	22016	22016	19629	19629	19629	17507	13263	6631	17962	16143	16143	14324	19947	19947	19947	19947	18038	18038	18038	18038
			feed posuw mm/min	969	969	785	785	785	595	398	172	934	743	743	602	1077	1077	1077	1077	866	866	866	866
			Ap mm	0.042	0.042	0.024	0.015	0.015	0.009	0.006	0.006	0.049	0.028	0.028	0.018	0.075	0.053	0.053	0.053	0.03	0.03	0.03	0.019

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8	1.8
			LBS	16	18	20	22	26	30	35	40	4	6	8	10	12	16	20	4	6
P	1-5	1.0D	Vc m/min	90	90	90	90	68	68	34	34	112	112	112	100	100	100	89	126	126
			fz mm/tooth	0.026	0.026	0.026	0.026	0.023	0.023	0.02	0.02	0.035	0.035	0.035	0.032	0.032	0.032	0.028	0.04	0.04
			rpm obr/min	19099	19099	19099	19099	14430	14430	7215	7215	22282	22282	22282	19894	19894	19894	17706	22282	22282
			feed posuw mm/min	993	993	993	993	664	664	289	289	1560	1560	1560	1273	1273	1273	992	1783	1783
			Ap mm	0.034	0.034	0.02	0.02	0.014	0.014	0.01	0.01	0.101	0.101	0.101	0.058	0.058	0.036	0.036	0.113	0.113
	6-8	1.0D	Vc m/min	90	90	90	90	68	68	34	34	112	112	112	100	100	100	89	126	126
			fz mm/tooth	0.026	0.026	0.026	0.026	0.023	0.023	0.02	0.02	0.035	0.035	0.035	0.032	0.032	0.032	0.028	0.04	0.04
			rpm obr/min	19099	19099	19099	19099	14430	14430	7215	7215	22282	22282	22282	19894	19894	19894	17706	22282	22282
			feed posuw mm/min	993	993	993	993	664	664	289	289	1560	1560	1560	1273	1273	1273	992	1783	1783
			Ap mm	0.034	0.034	0.02	0.02	0.014	0.014	0.01	0.01	0.101	0.101	0.101	0.058	0.058	0.036	0.036	0.113	0.113
	9	1.0D	Vc m/min	85	85	85	85	64	64	32	32	106	106	106	95	95	95	84	119	119
			fz mm/tooth	0.024	0.024	0.024	0.024	0.021	0.021	0.018	0.018	0.031	0.031	0.031	0.028	0.028	0.028	0.025	0.035	0.035
			rpm obr/min	18038	18038	18038	18038	13581	13581	6791	6791	21088	21088	21088	18900	18900	18900	16711	21044	21044
			feed posuw mm/min	866	866	866	866	570	570	244	244	1307	1307	1307	1058	1058	1058	836	1473	1473
			Ap mm	0.026	0.026	0.016	0.016	0.011	0.011	0.008	0.008	0.078	0.078	0.078	0.045	0.045	0.028	0.028	0.088	0.088
	10 - 11.1	1.0D	Vc m/min	90	90	90	90	68	68	34	34	112	112	112	100	100	100	89	126	126
			fz mm/tooth	0.026	0.026	0.026	0.026	0.023	0.023	0.02	0.02	0.035	0.035	0.035	0.032	0.032	0.032	0.028	0.04	0.04
			rpm obr/min	19099	19099	19099	19099	14430	14430	7215	7215	22282	22282	22282	19894	19894	19894	17706	22282	22282
			feed posuw mm/min	993	993	993	993	664	664	289	289	1560	1560	1560	1273	1273	1273	992	1783	1783
			Ap mm	0.034	0.034	0.02	0.02	0.014	0.014	0.01	0.01	0.101	0.101	0.101	0.058	0.058	0.036	0.036	0.113	0.113
	11.2	1.0D	Vc m/min	85	85	85	85	64	64	32	32	106	106	106	95	95	95	84	119	119
			fz mm/tooth	0.024	0.024	0.024	0.024	0.021	0.021	0.018	0.018	0.031	0.031	0.031	0.028	0.028	0.028	0.025	0.035	0.035
			rpm obr/min	18038	18038	18038	18038	13581	13581	6791	6791	21088	21088	21088	18900	18900	18900	16711	21044	21044
			feed posuw mm/min	866	866	866	866	570	570	244	244	1307	1307	1307	1058	1058	1058	836	1473	1473
			Ap mm	0.026	0.026	0.016	0.016	0.011	0.011	0.008	0.008	0.078	0.078	0.078	0.045	0.045	0.028	0.028	0.088	0.088
K	15-20	1.0D	Vc m/min	90	90	90	90	68	68	34	34	112	112	112	100	100	100	89	126	126
			fz mm/tooth	0.026	0.026	0.026	0.026	0.023	0.023	0.02	0.02	0.035	0.035	0.035	0.032	0.032	0.032	0.028	0.04	0.04
			rpm obr/min	19099	19099	19099	19099	14430	14430	7215	7215	22282	22282	22282	19894	19894	19894	17706	22282	22282
			feed posuw mm/min	993	993	993	993	664	664	289	289	1560	1560	1560	1273	1273	1273	992	1783	1783
			Ap mm	0.034	0.034	0.02	0.02	0.014	0.014	0.01	0.01	0.101	0.101	0.101	0.058	0.058	0.036	0.036	0.113	0.113
H	38.1 - 38.2	1.0D	Vc m/min	75	75	75	75	57	57	28	28	93	93	93	84	84	84	74	105	105
			fz mm/tooth	0.022	0.022	0.022	0.022	0.019	0.019	0.016	0.016	0.03	0.03	0.03	0.027	0.027	0.027	0.024	0.033	0.033
			rpm obr/min	15915	15915	15915	15915	12096	12096	5942	5942	18502	18502	18502	16711	16711	16711	14722	18568	18568
			feed posuw mm/min	700	700	700	700	460	460	190	190	1110	1110	1110	902	902	902	707	1225	1225
			Ap mm	0.019	0.019	0.011	0.011	0.008	0.008	0.005	0.005	0.056	0.056	0.056	0.032	0.032	0.02	0.02	0.063	0.063
	40	1.0D	Vc m/min	85	85	85	85	64	64	32	32	106	106	106	95	95	95	84	119	119
			fz mm/tooth	0.024	0.024	0.024	0.024	0.021	0.021	0.018	0.018	0.031	0.031	0.031	0.028	0.028	0.028	0.025	0.035	0.035
			rpm obr/min	18038	18038	18038	18038	13581	13581	6791	6791	21088	21088	21088	18900	18900	18900	16711	21044	21044
			feed posuw mm/min	866	866	866	866	570	570	244	244	1307	1307	1307	1058	1058	1058	836	1473	1473
			Ap mm	0.026	0.026	0.016	0.016	0.011	0.011	0.008	0.008	0.078	0.078	0.078	0.045	0.045	0.028	0.028	0.088	0.088
	41	1.0D	Vc m/min	75	75	75	75	57	57	28	28	93	93	93	84	84	84	74	105	105
			fz mm/tooth	0.022	0.022	0.022	0.022	0.019	0.019	0.016	0.016	0.03	0.03	0.03	0.027	0.027	0.027	0.024	0.033	0.033
			rpm obr/min	15915	15915	15915	15915	12096	12096	5942	5942	18502	18502	18502	16711	16711	16711	14722	18568	18568
			feed posuw mm/min	700	700	700	700	460	460	190	190	1110	1110	1110	902	902	902	707	1225	1225
			Ap mm	0.019	0.019	0.011	0.011	0.008	0.008	0.005	0.005	0.056	0.056	0.056	0.032	0.032	0.02	0.02	0.063	0.063

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.8	1.8	1.8	1.8	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
			LBS	8	10	12	16	20	6	8	10	12	14	16	18	20	22	26	30	35	40	45	50
P	1-5	1.0D	Vc m/min	126	113	113	113	100	113	113	113	102	102	102	102	102	90	90	90	68	68	34	34
			fz mm/tooth	0.04	0.036	0.036	0.036	0.032	0.05	0.05	0.05	0.045	0.045	0.045	0.045	0.045	0.04	0.04	0.04	0.035	0.035	0.03	0.03
			rpm obr/min	22282	19983	19983	19983	17684	17985	17985	17985	16234	16234	16234	16234	16234	14324	14324	14324	10823	10823	5411	5411
			feed posuw mm/min	1783	1439	1439	1439	1132	1798	1798	1798	1461	1461	1461	1461	1461	1146	1146	1146	758	758	325	325
			Ap mm	0.113	0.065	0.065	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018
	6-8	1.0D	Vc m/min	126	113	113	113	100	113	113	113	102	102	102	102	102	90	90	90	68	68	34	34
			fz mm/tooth	0.04	0.036	0.036	0.036	0.032	0.05	0.05	0.05	0.045	0.045	0.045	0.045	0.045	0.04	0.04	0.04	0.035	0.035	0.03	0.03
			rpm obr/min	22282	19983	19983	19983	17684	17985	17985	17985	16234	16234	16234	16234	16234	14324	14324	14324	10823	10823	5411	5411
			feed posuw mm/min	1783	1439	1439	1439	1132	1798	1798	1798	1461	1461	1461	1461	1461	1146	1146	1146	758	758	325	325
			Ap mm	0.113	0.065	0.065	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018
	9	1.0D	Vc m/min	119	107	107	107	95	107	107	107	96	96	96	96	96	85	85	85	64	64	32	32
			fz mm/tooth	0.035	0.031	0.031	0.031	0.028	0.045	0.045	0.045	0.04	0.04	0.04	0.04	0.04	0.036	0.036	0.036	0.031	0.031	0.027	0.027
			rpm obr/min	21044	18922	18922	18922	16800	17030	17030	17030	15279	15279	15279	15279	15279	13528	13528	13528	10186	10186	5093	5093
			feed posuw mm/min	1473	1173	1173	1173	941	1533	1533	1533	1222	1222	1222	1222	1222	974	974	974	632	632	275	275
			Ap mm	0.088	0.05	0.05	0.032	0.032	0.14	0.098	0.098	0.056	0.056	0.056	0.035	0.035	0.035	0.035	0.021	0.014	0.014	0.014	0.014
	10 - 11.1	1.0D	Vc m/min	126	113	113	113	100	113	113	113	102	102	102	102	102	90	90	90	68	68	34	34
			fz mm/tooth	0.04	0.036	0.036	0.036	0.032	0.05	0.05	0.05	0.045	0.045	0.045	0.045	0.045	0.04	0.04	0.04	0.035	0.035	0.03	0.03
			rpm obr/min	22282	19983	19983	19983	17684	17985	17985	17985	16234	16234	16234	16234	16234	14324	14324	14324	10823	10823	5411	5411
			feed posuw mm/min	1783	1439	1439	1439	1132	1798	1798	1798	1461	1461	1461	1461	1461	1146	1146	1146	758	758	325	325
			Ap mm	0.113	0.065	0.065	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018
	11.2	1.0D	Vc m/min	119	107	107	107	95	107	107	107	96	96	96	96	96	85	85	85	64	64	32	32
			fz mm/tooth	0.035	0.031	0.031	0.031	0.028	0.045	0.045	0.045	0.04	0.04	0.04	0.04	0.04	0.036	0.036	0.036	0.031	0.031	0.027	0.027
			rpm obr/min	21044	18922	18922	18922	16800	17030	17030	17030	15279	15279	15279	15279	15279	13528	13528	13528	10186	10186	5093	5093
			feed posuw mm/min	1473	1173	1173	1173	941	1533	1533	1533	1222	1222	1222	1222	1222	974	974	974	632	632	275	275
			Ap mm	0.088	0.05	0.05	0.032	0.032	0.14	0.098	0.098	0.056	0.056	0.056	0.035	0.035	0.035	0.035	0.021	0.014	0.014	0.014	0.014
K	15-20	1.0D	Vc m/min	126	113	113	113	100	113	113	113	102	102	102	102	102	90	90	90	68	68	34	34
			fz mm/tooth	0.04	0.036	0.036	0.036	0.032	0.05	0.05	0.05	0.045	0.045	0.045	0.045	0.045	0.04	0.04	0.04	0.035	0.035	0.03	0.03
			rpm obr/min	22282	19983	19983	19983	17684	17985	17985	17985	16234	16234	16234	16234	16234	14324	14324	14324	10823	10823	5411	5411
			feed posuw mm/min	1783	1439	1439	1439	1132	1798	1798	1798	1461	1461	1461	1461	1461	1146	1146	1146	758	758	325	325
			Ap mm	0.113	0.065	0.065	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018
H	38.1 - 38.2	1.0D	Vc m/min	105	94	94	94	84	94	94	94	85	85	85	85	85	75	75	75	57	57	28	28
			fz mm/tooth	0.033	0.03	0.03	0.03	0.027	0.043	0.043	0.043	0.039	0.039	0.039	0.039	0.039	0.034	0.034	0.034	0.03	0.03	0.026	0.026
			rpm obr/min	18568	16623	16623	16623	14854	14961	14961	14961	13528	13528	13528	13528	13528	11937	11937	11937	9072	9072	4456	4456
			feed posuw mm/min	1225	997	997	997	802	1287	1287	1287	1055	1055	1055	1055	1055	812	812	812	544	544	232	232
			Ap mm	0.063	0.036	0.036	0.023	0.023	0.1	0.07	0.07	0.04	0.04	0.04	0.025	0.025	0.025	0.025	0.015	0.01	0.01	0.01	0.01
	40	1.0D	Vc m/min	119	107	107	107	95	107	107	107	96	96	96	96	96	85	85	85	64	64	32	32
			fz mm/tooth	0.035	0.031	0.031	0.031	0.028	0.045	0.045	0.045	0.04	0.04	0.04	0.04	0.04	0.036	0.036	0.036	0.031	0.031	0.027	0.027
			rpm obr/min	21044	18922	18922	18922	16800	17030	17030	17030	15279	15279	15279	15279	15279	13528	13528	13528	10186	10186	5093	5093
			feed posuw mm/min	1473	1173	1173	1173	941	1533	1533	1533	1222	1222	1222	1222	1222	974	974	974	632	632	275	275
			Ap mm	0.088	0.05	0.05	0.032	0.032	0.14	0.098	0.098	0.056	0.056	0.056	0.035	0.035	0.035	0.035	0.021	0.014	0.014	0.014	0.014
	41	1.0D	Vc m/min	105	94	94	94	84	94	94	94	85	85	85	85	85	75	75	75	57	57	28	28
			fz mm/tooth	0.033	0.03	0.03	0.03	0.027	0.043	0.043	0.043	0.039	0.039	0.039	0.039	0.039	0.034	0.034	0.034	0.03	0.03	0.026	0.026
			rpm obr/min	18568	16623	16623	16623	14854	14961	14961	14961	13528	13528	13528	13528	13528	11937	11937	11937	9072	9072	4456	4456
			feed posuw mm/min	1225	997	997	997	802	1287	1287	1287	1055	1055	1055	1055	1055	812	812	812	544	544	232	232
			Ap mm	0.063	0.036	0.036	0.023	0.023	0.1	0.07	0.07	0.04	0.04	0.04	0.025	0.025	0.025	0.025	0.015	0.01	0.01	0.01	0.01

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	2.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	25	2.5	2.5	3.0	3.0	3.0	3.0
			LBS	60	8	10	12	16	20	22	26	30	35	40	45	50	6	8	10	12
P	1-5	1.0D	Vc m/min	34	124	124	124	112	112	112	99	99	99	74	74	74	129	129	129	129
			fz mm/tooth	0.03	0.061	0.061	0.061	0.055	0.055	0.055	0.049	0.049	0.049	0.043	0.043	0.043	0.075	0.075	0.075	0.075
			rpm obr/min	5411	15788	15788	15788	14260	14260	14260	12605	12605	12605	9422	9422	9422	13687	13687	13687	13687
			feed posuw mm/min	325	1926	1926	1926	1569	1569	1569	1235	1235	1235	810	810	810	2053	2053	2053	2053
			Ap mm	0.018	0.158	0.158	0.158	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189
	6-8	1.0D	Vc m/min	34	124	124	124	112	112	112	99	99	99	74	74	74	129	129	129	129
			fz mm/tooth	0.03	0.061	0.061	0.061	0.055	0.055	0.055	0.049	0.049	0.049	0.043	0.043	0.043	0.075	0.075	0.075	0.075
			rpm obr/min	5411	15788	15788	15788	14260	14260	14260	12605	12605	12605	9422	9422	9422	13687	13687	13687	13687
			feed posuw mm/min	325	1926	1926	1926	1569	1569	1569	1235	1235	1235	810	810	810	2053	2053	2053	2053
			Ap mm	0.018	0.158	0.158	0.158	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189
	9	1.0D	Vc m/min	32	117	117	117	105	105	105	94	94	94	70	70	70	122	122	122	122
			fz mm/tooth	0.027	0.054	0.054	0.054	0.048	0.048	0.048	0.043	0.043	0.043	0.038	0.038	0.038	0.067	0.067	0.067	0.067
			rpm obr/min	5093	14897	14897	14897	13369	13369	13369	11968	11968	11968	8913	8913	8913	12945	12945	12945	12945
			feed posuw mm/min	275	1609	1609	1609	1283	1283	1283	1029	1029	1029	677	677	677	1735	1735	1735	1735
			Ap mm	0.014	0.123	0.123	0.123	0.07	0.07	0.044	0.044	0.044	0.026	0.026	0.018	0.018	0.21	0.21	0.147	0.147
	10 - 11.1	1.0D	Vc m/min	34	124	124	124	112	112	112	99	99	99	74	74	74	129	129	129	129
			fz mm/tooth	0.03	0.061	0.061	0.061	0.055	0.055	0.055	0.049	0.049	0.049	0.043	0.043	0.043	0.075	0.075	0.075	0.075
			rpm obr/min	5411	15788	15788	15788	14260	14260	14260	12605	12605	12605	9422	9422	9422	13687	13687	13687	13687
			feed posuw mm/min	325	1926	1926	1926	1569	1569	1569	1235	1235	1235	810	810	810	2053	2053	2053	2053
			Ap mm	0.018	0.158	0.158	0.158	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189
	11.2	1.0D	Vc m/min	32	117	117	117	105	105	105	94	94	94	70	70	70	122	122	122	122
			fz mm/tooth	0.027	0.054	0.054	0.054	0.048	0.048	0.048	0.043	0.043	0.043	0.038	0.038	0.038	0.067	0.067	0.067	0.067
			rpm obr/min	5093	14897	14897	14897	13369	13369	13369	11968	11968	11968	8913	8913	8913	12945	12945	12945	12945
			feed posuw mm/min	275	1609	1609	1609	1283	1283	1283	1029	1029	1029	677	677	677	1735	1735	1735	1735
			Ap mm	0.014	0.123	0.123	0.123	0.07	0.07	0.044	0.044	0.044	0.026	0.026	0.018	0.018	0.21	0.21	0.147	0.147
K	15-20	1.0D	Vc m/min	34	124	124	124	112	112	112	99	99	99	74	74	74	129	129	129	129
			fz mm/tooth	0.03	0.061	0.061	0.061	0.055	0.055	0.055	0.049	0.049	0.049	0.043	0.043	0.043	0.075	0.075	0.075	0.075
			rpm obr/min	5411	15788	15788	15788	14260	14260	14260	12605	12605	12605	9422	9422	9422	13687	13687	13687	13687
			feed posuw mm/min	325	1926	1926	1926	1569	1569	1569	1235	1235	1235	810	810	810	2053	2053	2053	2053
			Ap mm	0.018	0.158	0.158	0.158	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189
H	38.1 - 38.2	1.0D	Vc m/min	28	104	104	104	93	93	93	83	83	83	62	62	62	107	107	107	107
			fz mm/tooth	0.026	0.049	0.049	0.049	0.044	0.044	0.044	0.04	0.04	0.04	0.035	0.035	0.035	0.063	0.063	0.063	0.063
			rpm obr/min	4456	13242	13242	13242	11841	11841	11841	10568	10568	10568	7894	7894	7894	11353	11353	11353	11353
			feed posuw mm/min	232	1298	1298	1298	1042	1042	1042	845	845	845	553	553	553	1430	1430	1430	1430
			Ap mm	0.01	0.088	0.088	0.088	0.05	0.05	0.031	0.031	0.031	0.019	0.019	0.013	0.013	0.15	0.15	0.105	0.105
	40	1.0D	Vc m/min	32	117	117	117	105	105	105	94	94	94	70	70	70	122	122	122	122
			fz mm/tooth	0.027	0.054	0.054	0.054	0.048	0.048	0.048	0.043	0.043	0.043	0.038	0.038	0.038	0.067	0.067	0.067	0.067
			rpm obr/min	5093	14897	14897	14897	13369	13369	13369	11968	11968	11968	8913	8913	8913	12945	12945	12945	12945
			feed posuw mm/min	275	1609	1609	1609	1283	1283	1283	1029	1029	1029	677	677	677	1735	1735	1735	1735
			Ap mm	0.014	0.123	0.123	0.123	0.07	0.07	0.044	0.044	0.044	0.026	0.026	0.018	0.018	0.21	0.21	0.147	0.147
	41	1.0D	Vc m/min	28	104	104	104	93	93	93	83	83	83	62	62	62	107	107	107	107
			fz mm/tooth	0.026	0.049	0.049	0.049	0.044	0.044	0.044	0.04	0.04	0.04	0.035	0.035	0.035	0.063	0.063	0.063	0.063
			rpm obr/min	4456	13242	13242	13242	11841	11841	11841	10568	10568	10568	7894	7894	7894	11353	11353	11353	11353
			feed posuw mm/min	232	1298	1298	1298	1042	1042	1042	845	845	845	553	553	553	1430	1430	1430	1430
			Ap mm	0.01	0.088	0.088	0.088	0.05	0.05	0.031	0.031	0.031	0.019	0.019	0.013	0.013	0.15	0.15	0.105	0.105

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
			LBS	14	16	18	20	22	26	30	35	40	45	50	60	8	10	12	14	16	18	20	22
P	1-5	1.0D	Vc m/min	129	116	116	116	116	116	116	103	103	103	77	77	123	123	123	123	123	123	123	111
			fz mm/tooth	0.075	0.067	0.067	0.067	0.067	0.067	0.067	0.06	0.06	0.06	0.052	0.052	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.09
			rpm obr/min	13687	12308	12308	12308	12308	12308	12308	10929	10929	10929	8170	8170	9788	9788	9788	9788	9788	9788	9788	8833
			feed posuw mm/min	2053	1649	1649	1649	1649	1649	1649	1311	1311	1311	850	850	1958	1958	1958	1958	1958	1958	1958	1590
			Ap mm	0.189	0.108	0.108	0.108	0.108	0.068	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144
	6-8	1.0D	Vc m/min	129	116	116	116	116	116	116	103	103	103	77	77	123	123	123	123	123	123	123	111
			fz mm/tooth	0.075	0.067	0.067	0.067	0.067	0.067	0.067	0.06	0.06	0.06	0.052	0.052	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.09
			rpm obr/min	13687	12308	12308	12308	12308	12308	12308	10929	10929	10929	8170	8170	9788	9788	9788	9788	9788	9788	9788	8833
			feed posuw mm/min	2053	1649	1649	1649	1649	1649	1649	1311	1311	1311	850	850	1958	1958	1958	1958	1958	1958	1958	1590
			Ap mm	0.189	0.108	0.108	0.108	0.108	0.068	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144
	9	1.0D	Vc m/min	122	109	109	109	109	109	109	97	97	97	73	73	117	117	117	117	117	117	117	105
			fz mm/tooth	0.067	0.06	0.06	0.06	0.06	0.06	0.06	0.054	0.054	0.054	0.047	0.047	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.081
			rpm obr/min	12945	11565	11565	11565	11565	11565	11565	10292	10292	10292	7746	7746	9311	9311	9311	9311	9311	9311	9311	8356
			feed posuw mm/min	1735	1388	1388	1388	1388	1388	1388	1112	1112	1112	728	728	1676	1676	1676	1676	1676	1676	1676	1354
			Ap mm	0.147	0.084	0.084	0.084	0.084	0.053	0.053	0.053	0.032	0.032	0.021	0.021	0.28	0.28	0.28	0.196	0.196	0.196	0.196	0.112
	10 - 11.1	1.0D	Vc m/min	129	116	116	116	116	116	116	103	103	103	77	77	123	123	123	123	123	123	123	111
			fz mm/tooth	0.075	0.067	0.067	0.067	0.067	0.067	0.067	0.06	0.06	0.06	0.052	0.052	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.09
			rpm obr/min	13687	12308	12308	12308	12308	12308	12308	10929	10929	10929	8170	8170	9788	9788	9788	9788	9788	9788	9788	8833
			feed posuw mm/min	2053	1649	1649	1649	1649	1649	1649	1311	1311	1311	850	850	1958	1958	1958	1958	1958	1958	1958	1590
			Ap mm	0.189	0.108	0.108	0.108	0.108	0.068	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144
	11.2	1.0D	Vc m/min	122	109	109	109	109	109	109	97	97	97	73	73	117	117	117	117	117	117	117	105
			fz mm/tooth	0.067	0.06	0.06	0.06	0.06	0.06	0.06	0.054	0.054	0.054	0.047	0.047	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.081
			rpm obr/min	12945	11565	11565	11565	11565	11565	11565	10292	10292	10292	7746	7746	9311	9311	9311	9311	9311	9311	9311	8356
			feed posuw mm/min	1735	1388	1388	1388	1388	1388	1388	1112	1112	1112	728	728	1676	1676	1676	1676	1676	1676	1676	1354
			Ap mm	0.147	0.084	0.084	0.084	0.084	0.053	0.053	0.053	0.032	0.032	0.021	0.021	0.28	0.28	0.28	0.196	0.196	0.196	0.196	0.112
K	15-20	1.0D	Vc m/min	129	116	116	116	116	116	116	103	103	103	77	77	123	123	123	123	123	123	123	111
			fz mm/tooth	0.075	0.067	0.067	0.067	0.067	0.067	0.067	0.06	0.06	0.06	0.052	0.052	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.09
			rpm obr/min	13687	12308	12308	12308	12308	12308	12308	10929	10929	10929	8170	8170	9788	9788	9788	9788	9788	9788	9788	8833
			feed posuw mm/min	2053	1649	1649	1649	1649	1649	1649	1311	1311	1311	850	850	1958	1958	1958	1958	1958	1958	1958	1590
			Ap mm	0.189	0.108	0.108	0.108	0.108	0.068	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144
H	38.1 - 38.2	1.0D	Vc m/min	107	97	97	97	97	97	97	86	86	86	64	64	103	103	103	103	103	103	103	93
			fz mm/tooth	0.063	0.057	0.057	0.057	0.057	0.057	0.057	0.05	0.05	0.05	0.044	0.044	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.077
			rpm obr/min	11353	10292	10292	10292	10292	10292	10292	9125	9125	9125	6791	6791	8196	8196	8196	8196	8196	8196	8196	7401
			feed posuw mm/min	1430	1173	1173	1173	1173	1173	1173	912	912	912	598	598	1393	1393	1393	1393	1393	1393	1393	1140
			Ap mm	0.105	0.06	0.06	0.06	0.06	0.038	0.038	0.038	0.023	0.023	0.015	0.015	0.2	0.2	0.2	0.14	0.14	0.14	0.14	0.08
	40	1.0D	Vc m/min	122	109	109	109	109	109	109	97	97	97	73	73	117	117	117	117	117	117	117	105
			fz mm/tooth	0.067	0.06	0.06	0.06	0.06	0.06	0.06	0.054	0.054	0.054	0.047	0.047	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.081
			rpm obr/min	12945	11565	11565	11565	11565	11565	11565	10292	10292	10292	7746	7746	9311	9311	9311	9311	9311	9311	9311	8356
			feed posuw mm/min	1735	1388	1388	1388	1388	1388	1388	1112	1112	1112	728	728	1676	1676	1676	1676	1676	1676	1676	1354
			Ap mm	0.147	0.084	0.084	0.084	0.084	0.053	0.053	0.053	0.032	0.032	0.021	0.021	0.28	0.28	0.28	0.196	0.196	0.196	0.196	0.112
	41	1.0D	Vc m/min	107	97	97	97	97	97	97	86	86	86	64	64	103	103	103	103	103	103	103	93
			fz mm/tooth	0.063	0.057	0.057	0.057	0.057	0.057	0.057	0.05	0.05	0.05	0.044	0.044	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.077
			rpm obr/min	11353	10292	10292	10292	10292	10292	10292	9125	9125	9125	6791	6791	8196	8196	8196	8196	8196	8196	8196	7401
			feed posuw mm/min	1430	1173	1173	1173	1173	1173	1173	912	912	912	598	598	1393	1393	1393	1393	1393	1393	1393	1140
			Ap mm	0.105	0.06	0.06	0.06	0.06	0.038	0.038	0.038	0.023	0.023	0.015	0.015	0.2	0.2	0.2	0.14	0.14	0.14	0.14	0.08

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	4.0	4.0	4.0	4.0	I 4.0	4.0	4.0	5.0	5.0	5.0	5.0
			LBS	26	30	35	40	45	50	60	15	20	26	30
P	1-5	1.0D	Vc m/min	111	111	111	111	99	99	99	121	121	109	109
			fz mm/tooth	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.12	0.12	0.108	0.108
			rpm obr/min	8833	8833	8833	8833	7878	7878	7878	7703	7703	6939	6939
			feed posuw mm/min	1590	1590	1590	1590	1261	1261	1261	1849	1849	1499	1499
			Ap mm	0.144	0.144	0.09	0.09	0.09	0.09	0.054	0.315	0.315	0.18	0.18
	6-8	1.0D	Vc m/min	111	111	111	111	99	99	99	121	121	109	109
			fz mm/tooth	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.12	0.12	0.108	0.108
			rpm obr/min	8833	8833	8833	8833	7878	7878	7878	7703	7703	6939	6939
			feed posuw mm/min	1590	1590	1590	1590	1261	1261	1261	1849	1849	1499	1499
			Ap mm	0.144	0.144	0.09	0.09	0.09	0.09	0.054	0.315	0.315	0.18	0.18
	9	1.0D	Vc m/min	105	105	105	105	93	93	93	115	115	103	103
			fz mm/tooth	0.081	0.081	0.081	0.081	0.072	0.072	0.072	0.1	0.1	0.09	0.09
			rpm obr/min	8356	8356	8356	8356	7401	7401	7401	7321	7321	6557	6557
			feed posuw mm/min	1354	1354	1354	1354	1066	1066	1066	1464	1464	1180	1180
			Ap mm	0.112	0.112	0.07	0.07	0.07	0.07	0.042	0.245	0.245	0.14	0.14
	10 - 11.1	1.0D	Vc m/min	111	111	111	111	99	99	99	121	121	109	109
			fz mm/tooth	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.12	0.12	0.108	0.108
			rpm obr/min	8833	8833	8833	8833	7878	7878	7878	7703	7703	6939	6939
			feed posuw mm/min	1590	1590	1590	1590	1261	1261	1261	1849	1849	1499	1499
			Ap mm	0.144	0.144	0.09	0.09	0.09	0.09	0.054	0.315	0.315	0.18	0.18
	11.2	1.0D	Vc m/min	105	105	105	105	93	93	93	115	115	103	103
			fz mm/tooth	0.081	0.081	0.081	0.081	0.072	0.072	0.072	0.1	0.1	0.09	0.09
			rpm obr/min	8356	8356	8356	8356	7401	7401	7401	7321	7321	6557	6557
			feed posuw mm/min	1354	1354	1354	1354	1066	1066	1066	1464	1464	1180	1180
			Ap mm	0.112	0.112	0.07	0.07	0.07	0.07	0.042	0.245	0.245	0.14	0.14
K	15-20	1.0D	Vc m/min	111	111	111	111	99	99	99	121	121	109	109
			fz mm/tooth	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.12	0.12	0.108	0.108
			rpm obr/min	8833	8833	8833	8833	7878	7878	7878	7703	7703	6939	6939
			feed posuw mm/min	1590	1590	1590	1590	1261	1261	1261	1849	1849	1499	1499
			Ap mm	0.144	0.144	0.09	0.09	0.09	0.09	0.054	0.315	0.315	0.18	0.18
H	38.1 - 38.2	1.0D	Vc m/min	93	93	93	93	82	82	82	101	101	90	90
			fz mm/tooth	0.077	0.077	0.077	0.077	0.068	0.068	0.068	0.1	0.1	0.09	0.09
			rpm obr/min	7401	7401	7401	7401	6525	6525	6525	6430	6430	5730	5730
			feed posuw mm/min	1140	1140	1140	1140	887	887	887	1286	1286	1031	1031
			Ap mm	0.08	0.08	0.05	0.05	0.05	0.05	0.03	0.175	0.175	0.1	0.1
	40	1.0D	Vc m/min	105	105	105	105	93	93	93	115	115	103	103
			fz mm/tooth	0.081	0.081	0.081	0.081	0.072	0.072	0.072	0.1	0.1	0.09	0.09
			rpm obr/min	8356	8356	8356	8356	7401	7401	7401	7321	7321	6557	6557
			feed posuw mm/min	1354	1354	1354	1354	1066	1066	1066	1464	1464	1180	1180
			Ap mm	0.112	0.112	0.07	0.07	0.07	0.07	0.042	0.245	0.245	0.14	0.14
	41	1.0D	Vc m/min	93	93	93	93	82	82	82	101	101	90	90
			fz mm/tooth	0.077	0.077	0.077	0.077	0.068	0.068	0.068	0.1	0.1	0.09	0.09
			rpm obr/min	7401	7401	7401	7401	6525	6525	6525	6430	6430	5730	5730
			feed posuw mm/min	1140	1140	1140	1140	887	887	887	1286	1286	1031	1031
			Ap mm	0.08	0.08	0.05	0.05	0.05	0.05	0.03	0.175	0.175	0.1	0.1

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE SLOTTING / FREZ KULOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	5.0	5.0	5.0	5.0	6.0	6.0	8.0	8.0	10.0	10.0	12.0	12.0	12.0
			LBS	35	40	50	60	20	30	25	30	30	40	32	45	50
P	1-5	1.0D	Vc m/min	109	109	109	97	123	123	122	122	121	121	121	121	100
			fz mm/tooth	0.108	0.108	0.108	0.096	0.146	0.146	0.186	0.186	0.214	0.214	0.238	0.238	0.151
			rpm obr/min	6939	6939	6939	6175	6525	6525	4854	4854	3852	3852	3210	3210	2653
			feed posuw mm/min	1499	1499	1499	1186	1905	1905	1806	1806	1648	1648	1528	1528	801
			Ap mm	0.18	0.18	0.113	0.113	0.378	0.378	0.504	0.504	0.9	0.63	1.08	0.756	0.756
	6-8	1.0D	Vc m/min	109	109	109	97	123	123	122	122	121	121	121	121	100
			fz mm/tooth	0.108	0.108	0.108	0.096	0.146	0.146	0.186	0.186	0.214	0.214	0.238	0.238	0.151
			rpm obr/min	6939	6939	6939	6175	6525	6525	4854	4854	3852	3852	3210	3210	2653
			feed posuw mm/min	1499	1499	1499	1186	1905	1905	1806	1806	1648	1648	1528	1528	801
			Ap mm	0.18	0.18	0.113	0.113	0.378	0.378	0.504	0.504	0.9	0.63	1.08	0.756	0.756
	9	1.0D	Vc m/min	103	103	103	92	117	117	116	116	116	116	115	115	95
			fz mm/tooth	0.09	0.09	0.09	0.08	0.129	0.129	0.163	0.163	0.19	0.19	0.213	0.213	0.119
			rpm obr/min	6557	6557	6557	5857	6207	6207	4615	4615	3692	3692	3050	3050	2520
			feed posuw mm/min	1180	1180	1180	937	1601	1601	1505	1505	1403	1403	1300	1300	600
			Ap mm	0.14	0.14	0.088	0.088	0.294	0.294	0.392	0.392	0.7	0.49	0.84	0.588	0.588
	10 - 11.1	1.0D	Vc m/min	109	109	109	97	123	123	122	122	121	121	121	121	100
			fz mm/tooth	0.108	0.108	0.108	0.096	0.146	0.146	0.186	0.186	0.214	0.214	0.238	0.238	0.151
			rpm obr/min	6939	6939	6939	6175	6525	6525	4854	4854	3852	3852	3210	3210	2653
			feed posuw mm/min	1499	1499	1499	1186	1905	1905	1806	1806	1648	1648	1528	1528	801
			Ap mm	0.18	0.18	0.113	0.113	0.378	0.378	0.504	0.504	0.9	0.63	1.08	0.756	0.756
	11.2	1.0D	Vc m/min	103	103	103	92	117	117	116	116	116	116	115	115	95
			fz mm/tooth	0.09	0.09	0.09	0.08	0.129	0.129	0.163	0.163	0.19	0.19	0.213	0.213	0.119
			rpm obr/min	6557	6557	6557	5857	6207	6207	4615	4615	3692	3692	3050	3050	2520
			feed posuw mm/min	1180	1180	1180	937	1601	1601	1505	1505	1403	1403	1300	1300	600
			Ap mm	0.14	0.14	0.088	0.088	0.294	0.294	0.392	0.392	0.7	0.49	0.84	0.588	0.588
K	15-20	1.0D	Vc m/min	109	109	109	97	123	123	122	122	121	121	121	121	100
			fz mm/tooth	0.108	0.108	0.108	0.096	0.146	0.146	0.186	0.186	0.214	0.214	0.238	0.238	0.151
			rpm obr/min	6939	6939	6939	6175	6525	6525	4854	4854	3852	3852	3210	3210	2653
			feed posuw mm/min	1499	1499	1499	1186	1905	1905	1806	1806	1648	1648	1528	1528	801
			Ap mm	0.18	0.18	0.113	0.113	0.378	0.378	0.504	0.504	0.9	0.63	1.08	0.756	0.756
H	38.1 - 38.2	1.0D	Vc m/min	90	90	90	80	104	104	101	101	101	101	100	100	82
			fz mm/tooth	0.09	0.09	0.09	0.08	0.121	0.121	0.16	0.16	0.188	0.188	0.208	0.208	0.08
			rpm obr/min	5730	5730	5730	5093	5517	5517	4019	4019	3215	3215	2653	2653	2175
			feed posuw mm/min	1031	1031	1031	815	1335	1335	1286	1286	1209	1209	1103	1103	348
			Ap mm	0.1	0.1	0.063	0.063	0.21	0.21	0.28	0.28	0.5	0.35	0.6	0.42	0.42
	40	1.0D	Vc m/min	103	103	103	92	117	117	116	116	116	116	115	115	95
			fz mm/tooth	0.09	0.09	0.09	0.08	0.129	0.129	0.163	0.163	0.19	0.19	0.213	0.213	0.119
			rpm obr/min	6557	6557	6557	5857	6207	6207	4615	4615	3692	3692	3050	3050	2520
			feed posuw mm/min	1180	1180	1180	937	1601	1601	1505	1505	1403	1403	1300	1300	600
			Ap mm	0.14	0.14	0.088	0.088	0.294	0.294	0.392	0.392	0.7	0.49	0.84	0.588	0.588
	41	1.0D	Vc m/min	90	90	90	80	104	104	101	101	101	101	100	100	82
			fz mm/tooth	0.09	0.09	0.09	0.08	0.121	0.121	0.16	0.16	0.188	0.188	0.208	0.208	0.08
			rpm obr/min	5730	5730	5730	5093	5517	5517	4019	4019	3215	3215	2653	2653	2175
			feed posuw mm/min	1031	1031	1031	815	1335	1335	1286	1286	1209	1209	1103	1103	348
			Ap mm	0.1	0.1	0.063	0.063	0.21	0.21	0.28	0.28	0.5	0.35	0.6	0.42	0.42

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX54

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5400204Y20A004040	0,02	0,2	4	0,4	40
UFX5400204Y50A004040	0,05	0,2	4	0,4	40
UFX5400304Y20A006040	0,02	0,3	4	0,6	40
UFX5400304Y50A006040	0,05	0,3	4	0,6	40
UFX5400404Y50A008040	0,05	0,4	4	0,8	40
UFX5400404001A008040	0,1	0,4	4	0,8	40
UFX5400504Y50A010040	0,05	0,5	4	1	40
UFX5400504001A010040	0,1	0,5	4	1	40
UFX5400604Y50A012040	0,05	0,6	4	1,2	40
UFX5400604001A012040	0,1	0,6	4	1,2	40
UFX5400604002A012040	0,2	0,6	4	1,2	40
UFX5400704Y50A014040	0,05	0,7	4	1,4	40
UFX5400704001A014040	0,1	0,7	4	1,4	40
UFX5400704002A014040	0,2	0,7	4	1,4	40
UFX5400804Y50A016040	0,05	0,8	4	1,6	40
UFX5400804001A016040	0,1	0,8	4	1,6	40
UFX5400804002A016040	0,2	0,8	4	1,6	40
UFX5400904Y50A018040	0,05	0,9	4	1,8	40
UFX5400904001A018040	0,1	0,9	4	1,8	40
UFX5401004Y50A025050	0,05	1	4	2,5	50
UFX5401004001A025050	0,1	1	4	2,5	50
UFX5401004002A025050	0,2	1	4	2,5	50
UFX5401004003A025050	0,3	1	4	2,5	50
UFX5401006Y50A025050	0,05	1	6	2,5	50
UFX5401006001A025050	0,1	1	6	2,5	50
UFX5401006002A025050	0,2	1	6	2,5	50
UFX5401006003A025050	0,3	1	6	2,5	50
UFX5401204Y50A030050	0,05	1,2	4	3	50
UFX5401204001A030050	0,1	1,2	4	3	50
UFX5401204002A030050	0,2	1,2	4	3	50
UFX5401204003A030050	0,3	1,2	4	3	50
UFX5401206Y50A030050	0,05	1,2	6	3	50
UFX5401206001A030050	0,1	1,2	6	3	50
UFX5401206002A030050	0,2	1,2	6	3	50
UFX5401206003A030050	0,3	1,2	6	3	50
UFX5401504Y50A040050	0,05	1,5	4	4	50

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFX54

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5401504001A040050	0,1	1,5	4	4	50
UFX5401504002A040050	0,2	1,5	4	4	50
UFX5401504003A040050	0,3	1,5	4	4	50
UFX5401504005A040050	0,5	1,5	4	4	50
UFX5401506Y50A040050	0,05	1,5	6	4	50
UFX5401506001A040050	0,1	1,5	6	4	50
UFX5401506002A040050	0,2	1,5	6	4	50
UFX5401506003A040050	0,3	1,5	6	4	50
UFX5401506005A040050	0,5	1,5	6	4	50
UFX5402004001A060050	0,1	2	4	6	50
UFX5402004002A060050	0,2	2	4	6	50
UFX5402004003A060050	0,3	2	4	6	50

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.5
P	1-5	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
	6-8	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
	9	1.0D	0.2D	Vc m/min	18	25	34	37	37	44	50	53	57	59	64
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	28648	26526	27056	23555	19629	20008	19894	18745	18144	15650	13581
				feed posuw mm/min	57	53	54	94	79	80	80	75	109	94	109
	10-11.1	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
	11.2	1.0D	0.2D	Vc m/min	18	25	34	37	37	44	50	53	57	59	64
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	28648	26526	27056	23555	19629	20008	19894	18745	18144	15650	13581
				feed posuw mm/min	57	53	54	94	79	80	80	75	109	94	109
K	15-20	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
H	38.1-38.2	1.0D	0.2D	Vc m/min	11	16	21	22	23	27	30	33	35	37	40
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	17507	16977	16711	14006	12202	12278	11937	11671	11141	9815	8488
				feed posuw mm/min	35	34	33	56	49	49	48	47	67	59	68
	40	1.0D	0.2D	Vc m/min	18	25	34	37	37	44	50	53	57	59	64
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	28648	26526	27056	23555	19629	20008	19894	18745	18144	15650	13581
				feed posuw mm/min	57	53	54	94	79	80	80	75	109	94	109
	41	1.0D	0.2D	Vc m/min	11	16	21	22	23	27	30	33	35	37	40
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	17507	16977	16711	14006	12202	12278	11937	11671	11141	9815	8488
				feed posuw mm/min	35	34	33	56	49	49	48	47	67	59	68

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	10.0	11.0	12.0	14.0	16.0	20.0
P	1-5	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
	6-8	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
	9	1.0D	0.2D	Vc m/min	73	75	81	85	86	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.005	0.007	0.008	0.01	0.012	0.015	0.017	0.021	0.025	0.028	0.033	0.038	0.04	0.041	0.041	0.04	0.037
				rpm obr/min	11618	9549	8594	7730	6844	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	116	134	138	155	164	189	197	228	252	247	252	249	243	228	199	169	121
	10-11.1	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
	11.2	1.0D	0.2D	Vc m/min	73	75	81	85	86	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.005	0.007	0.008	0.01	0.012	0.015	0.017	0.021	0.025	0.028	0.033	0.038	0.04	0.041	0.041	0.04	0.037
				rpm obr/min	11618	9549	8594	7730	6844	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	116	134	138	155	164	189	197	228	252	247	252	249	243	228	199	169	121
K	15-20	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
H	38.1-38.2	1.0D	0.2D	Vc m/min	45	48	50	53	54	61	60	61	62	64	63	63	64	63	65	64	63
				fz mm/tooth	0.005	0.006	0.007	0.008	0.009	0.01	0.013	0.016	0.018	0.021	0.024	0.03	0.03	0.03	0.03	0.031	0.03
				rpm obr/min	7162	6112	5305	4820	4297	4315	3820	3530	3289	2910	2507	2005	1852	1671	1478	1273	1003
				feed posuw mm/min	72	73	74	77	77	86	99	113	118	122	120	120	111	100	89	79	60
	40	1.0D	0.2D	Vc m/min	73	75	81	85	86	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.005	0.007	0.008	0.01	0.012	0.015	0.017	0.021	0.025	0.028	0.033	0.038	0.04	0.041	0.041	0.04	0.037
				rpm obr/min	11618	9549	8594	7730	6844	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	116	134	138	155	164	189	197	228	252	247	252	249	243	228	199	169	121
	41	1.0D	0.2D	Vc m/min	45	48	50	53	54	61	60	61	62	64	63	63	64	63	65	64	63
				fz mm/tooth	0.005	0.006	0.007	0.008	0.009	0.01	0.013	0.016	0.018	0.021	0.024	0.03	0.03	0.03	0.03	0.031	0.03
				rpm obr/min	7162	6112	5305	4820	4297	4315	3820	3530	3289	2910	2507	2005	1852	1671	1478	1273	1003
				feed posuw mm/min	72	73	74	77	77	86	99	113	118	122	120	120	111	100	89	79	60

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX54

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○

ISO	N												S							H			
HRc													15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100					200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30			31	32	33	34	35	36	37	38	39	40	41
																				○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5402004005A060050	0,5	2	4	6	50
UFX5402006001A060050	0,1	2	6	6	50
UFX5402006002A060050	0,2	2	6	6	50
UFX5402006003A060050	0,3	2	6	6	50
UFX5402006005A060050	0,5	2	6	6	50
UFX5402504001A070060	0,1	2,5	4	7	60
UFX5402504002A070060	0,2	2,5	4	7	60
UFX5402504003A070060	0,3	2,5	4	7	60
UFX5402504005A070060	0,5	2,5	4	7	60
UFX5402506001A070060	0,1	2,5	6	7	60
UFX5402506002A070060	0,2	2,5	6	7	60
UFX5402506003A070060	0,3	2,5	6	7	60
UFX5402506005A070060	0,5	2,5	6	7	60
UFX5403006001A080060	0,1	3	6	8	60
UFX5403006002A080060	0,2	3	6	8	60
UFX5403006003A080060	0,3	3	6	8	60
UFX5403006005A080060	0,5	3	6	8	60
UFX5403006010A080060	1	3	6	8	60
UFX5403506001A100070	0,1	3,5	6	10	70
UFX5403506002A100070	0,2	3,5	6	10	70
UFX5403506003A100070	0,3	3,5	6	10	70
UFX5403506005A100070	0,5	3,5	6	10	70
UFX5404004001A100070	0,1	4	4	10	70
UFX5404004002A100070	0,2	4	4	10	70
UFX5404004003A100070	0,3	4	4	10	70
UFX5404004005A100070	0,5	4	4	10	70
UFX5404004010A100070	1	4	4	10	70
UFX5404004001A100100	0,1	4	4	10	100
UFX5404004002A100100	0,2	4	4	10	100
UFX5404004003A100100	0,3	4	4	10	100
UFX5404004005A100100	0,5	4	4	10	100
UFX5404004010A100100	1	4	4	10	100
UFX5404006001A100070	0,1	4	6	10	70
UFX5404006002A100070	0,2	4	6	10	70
UFX5404006003A100070	0,3	4	6	10	70
UFX5404006005A100070	0,5	4	6	10	70
UFX5404006010A100070	1	4	6	10	70

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFX54

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5404506001A110080	0,1	4,5	6	11	80
UFX5404506002A110080	0,2	4,5	6	11	80
UFX5404506003A110080	0,3	4,5	6	11	80
UFX5404506005A110080	0,5	4,5	6	11	80
UFX5405006001A130090	0,1	5	6	13	90
UFX5405006002A130090	0,2	5	6	13	90
UFX5405006003A130090	0,3	5	6	13	90
UFX5405006005A130090	0,5	5	6	13	90
UFX5405006010A130090	1	5	6	13	90
UFX5405506001A130090	0,1	5,5	6	13	90
UFX5405506002A130090	0,2	5,5	6	13	90
UFX5405506003A130090	0,3	5,5	6	13	90
UFX5405506005A130090	0,5	5,5	6	13	90
UFX5405506010A130090	1	5,5	6	13	90
UFX5406006002A150060	0,2	6	6	15	60
UFX5406006003A150060	0,3	6	6	15	60
UFX5406006005A150060	0,5	6	6	15	60
UFX5406006010A150060	1	6	6	15	60
UFX5406006001A150090	0,1	6	6	15	90
UFX5406006002A150090	0,2	6	6	15	90
UFX5406006003A150090	0,3	6	6	15	90
UFX5406006005A150090	0,5	6	6	15	90
UFX5406006010A150090	1	6	6	15	90
UFX5406006015A150090	1,5	6	6	15	90
UFX5406006020A150090	2	6	6	15	90
UFX5406006005A150110	0,5	6	6	15	110
UFX5406006010A150110	1	6	6	15	110
UFX5406006005A150130	0,5	6	6	15	130
UFX5406006010A150130	1	6	6	15	130
UFX5407008001A160090	0,1	7	8	16	90
UFX5407008002A160090	0,2	7	8	16	90
UFX5407008003A160090	0,3	7	8	16	90
UFX5407008005A160090	0,5	7	8	16	90
UFX5407008010A160090	1	7	8	16	90
UFX5407008020A160090	2	7	8	16	90
UFX5408008003A200070	0,3	8	8	20	70
UFX5408008005A200070	0,5	8	8	20	70

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX54

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5408008010A200070	1	8	8	20	70
UFX5408008001A200100	0,1	8	8	20	100
UFX5408008002A200100	0,2	8	8	20	100
UFX5408008003A200100	0,3	8	8	20	100
UFX5408008005A200100	0,5	8	8	20	100
UFX5408008010A200100	1	8	8	20	100
UFX5408008015A200100	1,5	8	8	20	100
UFX5408008020A200100	2	8	8	20	100
UFX5408008025A200100	2,5	8	8	20	100
UFX5408008030A200100	3	8	8	20	100
UFX5408008005A200120	0,5	8	8	20	120
UFX5408008010A200120	1	8	8	20	120
UFX5408008005A200150	0,5	8	8	20	150
UFX5408008010A200150	1	8	8	20	150
UFX5410010003A250075	0,3	10	10	25	75
UFX5410010005A250075	0,5	10	10	25	75
UFX5410010010A250075	1	10	10	25	75
UFX5410010001A250100	0,1	10	10	25	100
UFX5410010002A250100	0,2	10	10	25	100
UFX5410010003A250100	0,3	10	10	25	100
UFX5410010005A250100	0,5	10	10	25	100
UFX5410010010A250100	1	10	10	25	100
UFX5410010015A250100	1,5	10	10	25	100
UFX5410010020A250100	2	10	10	25	100
UFX5410010025A250100	2,5	10	10	25	100
UFX5410010030A250100	3	10	10	25	100
UFX5410010040A250100	4	10	10	25	100
UFX5410010005A250130	0,5	10	10	25	130
UFX5410010010A250130	1	10	10	25	130
UFX5410010005A250150	0,5	10	10	25	150
UFX5410010010A250150	1	10	10	25	150
UFX5411012002A250110	0,2	11	12	25	110
UFX5411012003A250110	0,3	11	12	25	110
UFX5411012005A250110	0,5	11	12	25	110
UFX5411012010A250110	1	11	12	25	110
UFX5411012020A250110	2	11	12	25	110
UFX5412012003A300080	0,3	12	12	30	80

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX54

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX5412012005A300080	0,5	12	12	30	80
UFX5412012010A300080	1	12	12	30	80
UFX5412012001A300110	0,1	12	12	30	110
UFX5412012002A300110	0,2	12	12	30	110
UFX5412012003A300110	0,3	12	12	30	110
UFX5412012005A300110	0,5	12	12	30	110
UFX5412012010A300110	1	12	12	30	110
UFX5412012015A300110	1,5	12	12	30	110
UFX5412012020A300110	2	12	12	30	110
UFX5412012025A300110	2,5	12	12	30	110
UFX5412012030A300110	3	12	12	30	110
UFX5412012040A300110	4	12	12	30	110
UFX5412012050A300110	5	12	12	30	110
UFX5412012005A300130	0,5	12	12	30	130
UFX5412012010A300130	1	12	12	30	130
UFX5412012005A300150	0,5	12	12	30	150
UFX5412012010A300150	1	12	12	30	150
UFX5414016005A350150	0,5	14	16	35	150
UFX5414016010A350150	1	14	16	35	150
UFX5414016020A350150	2	14	16	35	150
UFX5416016005A320150	0,5	16	16	32	150
UFX5416016010A320150	1	16	16	32	150
UFX5416016015A320150	1,5	16	16	32	150
UFX5416016020A320150	2	16	16	32	150
UFX5420020005A380150	0,5	20	20	38	150
UFX5420020010A380150	1	20	20	38	150
UFX5420020015A380150	1,5	20	20	38	150
UFX5420020020A380150	2	20	20	38	150

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.5
P	1-5	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
	6-8	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
	9	1.0D	0.2D	Vc m/min	18	25	34	37	37	44	50	53	57	59	64
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	28648	26526	27056	23555	19629	20008	19894	18745	18144	15650	13581
				feed posuw mm/min	57	53	54	94	79	80	80	75	109	94	109
	10-11.1	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
	11.2	1.0D	0.2D	Vc m/min	18	25	34	37	37	44	50	53	57	59	64
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	28648	26526	27056	23555	19629	20008	19894	18745	18144	15650	13581
				feed posuw mm/min	57	53	54	94	79	80	80	75	109	94	109
K	15-20	1.0D	0.2D	Vc m/min	28	39	52	57	57	66	75	85	87	93	104
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.006
				rpm obr/min	44563	41380	41380	36287	30239	30012	29842	30063	27693	24669	22069
				feed posuw mm/min	178	166	166	218	242	240	239	241	222	247	265
H	38.1-38.2	1.0D	0.2D	Vc m/min	11	16	21	22	23	27	30	33	35	37	40
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	17507	16977	16711	14006	12202	12278	11937	11671	11141	9815	8488
				feed posuw mm/min	35	34	33	56	49	49	48	47	67	59	68
	40	1.0D	0.2D	Vc m/min	18	25	34	37	37	44	50	53	57	59	64
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	28648	26526	27056	23555	19629	20008	19894	18745	18144	15650	13581
				feed posuw mm/min	57	53	54	94	79	80	80	75	109	94	109
	41	1.0D	0.2D	Vc m/min	11	16	21	22	23	27	30	33	35	37	40
				fz mm/tooth	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	17507	16977	16711	14006	12202	12278	11937	11671	11141	9815	8488
				feed posuw mm/min	35	34	33	56	49	49	48	47	67	59	68

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	10.0	11.0	12.0	14.0	16.0	20.0
P	1-5	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
	6-8	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
	9	1.0D	0.2D	Vc m/min	73	75	81	85	86	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.005	0.007	0.008	0.01	0.012	0.015	0.017	0.021	0.025	0.028	0.033	0.038	0.04	0.041	0.041	0.04	0.037
				rpm obr/min	11618	9549	8594	7730	6844	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	116	134	138	155	164	189	197	228	252	247	252	249	243	228	199	169	121
	10-11.1	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
	11.2	1.0D	0.2D	Vc m/min	73	75	81	85	86	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.005	0.007	0.008	0.01	0.012	0.015	0.017	0.021	0.025	0.028	0.033	0.038	0.04	0.041	0.041	0.04	0.037
				rpm obr/min	11618	9549	8594	7730	6844	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	116	134	138	155	164	189	197	228	252	247	252	249	243	228	199	169	121
K	15-20	1.0D	0.2D	Vc m/min	113	118	125	132	135	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.007	0.009	0.011	0.013	0.016	0.019	0.023	0.027	0.032	0.037	0.045	0.054	0.052	0.051	0.054	0.058	0.056
				rpm obr/min	17985	15024	13263	12005	10743	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	252	270	292	312	344	379	422	459	506	515	541	543	475	419	390	360	282
H	38.1-38.2	1.0D	0.2D	Vc m/min	45	48	50	53	54	61	60	61	62	64	63	63	64	63	65	64	63
				fz mm/tooth	0.005	0.006	0.007	0.008	0.009	0.01	0.013	0.016	0.018	0.021	0.024	0.03	0.03	0.03	0.03	0.031	0.03
				rpm obr/min	7162	6112	5305	4820	4297	4315	3820	3530	3289	2910	2507	2005	1852	1671	1478	1273	1003
				feed posuw mm/min	72	73	74	77	77	86	99	113	118	122	120	120	111	100	89	79	60
	40	1.0D	0.2D	Vc m/min	73	75	81	85	86	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.005	0.007	0.008	0.01	0.012	0.015	0.017	0.021	0.025	0.028	0.033	0.038	0.04	0.041	0.041	0.04	0.037
				rpm obr/min	11618	9549	8594	7730	6844	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	116	134	138	155	164	189	197	228	252	247	252	249	243	228	199	169	121
	41	1.0D	0.2D	Vc m/min	45	48	50	53	54	61	60	61	62	64	63	63	64	63	65	64	63
				fz mm/tooth	0.005	0.006	0.007	0.008	0.009	0.01	0.013	0.016	0.018	0.021	0.024	0.03	0.03	0.03	0.03	0.031	0.03
				rpm obr/min	7162	6112	5305	4820	4297	4315	3820	3530	3289	2910	2507	2005	1852	1671	1478	1273	1003
				feed posuw mm/min	72	73	74	77	77	86	99	113	118	122	120	120	111	100	89	79	60

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5800204Y20A003005	0,02	0,2	4	0,3	0,5	40	0,17
UFX5800204Y20A003010	0,02	0,2	4	0,3	1	40	0,17
UFX5800204Y20A003015	0,02	0,2	4	0,3	1,5	40	0,17
UFX5800204Y20A003020	0,02	0,2	4	0,3	2	40	0,17
UFX5800204Y50A003005	0,05	0,2	4	0,3	0,5	40	0,17
UFX5800204Y50A003010	0,05	0,2	4	0,3	1	40	0,17
UFX5800204Y50A003015	0,05	0,2	4	0,3	1,5	40	0,17
UFX5800204Y50A003020	0,05	0,2	4	0,3	2	40	0,17
UFX5800304Y50A002010	0,05	0,3	4	0,25	1,5	40	0,27
UFX5800304Y20A005010	0,02	0,3	4	0,5	1	40	0,27
UFX5800304Y20A005020	0,02	0,3	4	0,5	2	40	0,27
UFX5800304Y20A005030	0,02	0,3	4	0,5	3	40	0,27
UFX5800304Y50A005010	0,05	0,3	4	0,5	1	40	0,27
UFX5800304Y50A005020	0,05	0,3	4	0,5	2	40	0,27
UFX5800304Y50A005030	0,05	0,3	4	0,5	3	40	0,27
UFX5800306Y50A002020	0,05	0,3	6	0,25	2	40	0,27
UFX5800404Y50A006010	0,05	0,4	4	0,6	1	40	0,37
UFX5800404Y50A006015	0,05	0,4	4	0,6	1,5	40	0,37
UFX5800404Y50A006020	0,05	0,4	4	0,6	2	40	0,37
UFX5800404Y50A006025	0,05	0,4	4	0,6	2,5	40	0,37
UFX5800404Y50A006030	0,05	0,4	4	0,6	3	40	0,37
UFX5800404Y50A006040	0,05	0,4	4	0,6	4	40	0,37
UFX5800404001A006010	0,1	0,4	4	0,6	1	40	0,37
UFX5800404001A006015	0,1	0,4	4	0,6	1,5	40	0,37
UFX5800404001A006020	0,1	0,4	4	0,6	2	40	0,37
UFX5800404001A006025	0,1	0,4	4	0,6	2,5	40	0,37
UFX5800404001A006030	0,1	0,4	4	0,6	3	40	0,37
UFX5800404001A006040	0,1	0,4	4	0,6	4	40	0,37
UFX5800504Y50A007010	0,05	0,5	4	0,7	1	45	0,45
UFX5800504Y50A007015	0,05	0,5	4	0,7	1,5	45	0,45
UFX5800504Y50A007020	0,05	0,5	4	0,7	2	45	0,45
UFX5800504Y50A007025	0,05	0,5	4	0,7	2,5	45	0,45
UFX5800504Y50A007030	0,05	0,5	4	0,7	3	45	0,45
UFX5800504Y50A007040	0,05	0,5	4	0,7	4	45	0,45
UFX5800504Y50A007050	0,05	0,5	4	0,7	5	45	0,45
UFX5800504Y50A007060	0,05	0,5	4	0,7	6	45	0,45
UFX5800506Y50A004040	0,05	0,5	6	0,4	4	45	0,45

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	± 0.010	h5
OVER TO R6	0 –-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5800504001A007010	0,1	0,5	4	0,7	1	45	0,45
UFX5800504001A007015	0,1	0,5	4	0,7	1,5	45	0,45
UFX5800504001A007020	0,1	0,5	4	0,7	2	45	0,45
UFX5800504001A007025	0,1	0,5	4	0,7	2,5	45	0,45
UFX5800504001A007030	0,1	0,5	4	0,7	3	45	0,45
UFX5800504001A007040	0,1	0,5	4	0,7	4	45	0,45
UFX5800504001A007050	0,1	0,5	4	0,7	5	45	0,45
UFX5800504001A007060	0,1	0,5	4	0,7	6	45	0,45
UFX5800506001A004060	0,1	0,5	6	0,4	2	45	0,45
UFX5800506001A0X4060	0,1	0,5	6	0,4	4	45	0,45
UFX5800604Y50A009020	0,05	0,6	4	0,9	2	45	0,55
UFX5800604Y50A009030	0,05	0,6	4	0,9	3	45	0,55
UFX5800604Y50A009040	0,05	0,6	4	0,9	4	45	0,55
UFX5800604Y50A009060	0,05	0,6	4	0,9	6	45	0,55
UFX5800604Y50A009080	0,05	0,6	4	0,9	8	45	0,55
UFX5800604Y50A009100	0,05	0,6	4	0,9	10	45	0,55
UFX5800604001A009020	0,1	0,6	4	0,9	2	45	0,55
UFX5800604001A009030	0,1	0,6	4	0,9	3	45	0,55
UFX5800604001A009040	0,1	0,6	4	0,9	4	45	0,55
UFX5800604001A009060	0,1	0,6	4	0,9	6	45	0,55
UFX5800604001A009080	0,1	0,6	4	0,9	8	45	0,55
UFX5800604001A009100	0,1	0,6	4	0,9	10	45	0,55
UFX5800604002A009020	0,2	0,6	4	0,9	2	45	0,55
UFX5800604002A009030	0,2	0,6	4	0,9	3	45	0,55
UFX5800604002A009040	0,2	0,6	4	0,9	4	45	0,55
UFX5800604002A009060	0,2	0,6	4	0,9	6	45	0,55
UFX5800604002A009080	0,2	0,6	4	0,9	8	45	0,55
UFX5800604002A009100	0,2	0,6	4	0,9	10	45	0,55
UFX5800704Y50A012020	0,05	0,7	4	1,2	2	45	0,65
UFX5800704Y50A012040	0,05	0,7	4	1,2	4	45	0,65
UFX5800704Y50A012060	0,05	0,7	4	1,2	6	45	0,65
UFX5800704Y50A012080	0,05	0,7	4	1,2	8	45	0,65
UFX5800704Y50A012100	0,05	0,7	4	1,2	10	45	0,65
UFX5800704001A012020	0,1	0,7	4	1,2	2	45	0,65
UFX5800704001A012040	0,1	0,7	4	1,2	4	45	0,65
UFX5800704001A012060	0,1	0,7	4	1,2	6	45	0,65
UFX5800704001A012080	0,1	0,7	4	1,2	8	45	0,65

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5800704001A012100	0,1	0,7	4	1,2	10	45	0,65
UFX5800704002A012020	0,2	0,7	4	1,2	2	45	0,65
UFX5800704002A012040	0,2	0,7	4	1,2	4	45	0,65
UFX5800704002A012060	0,2	0,7	4	1,2	6	45	0,65
UFX5800704002A012080	0,2	0,7	4	1,2	8	45	0,65
UFX5800704002A012100	0,2	0,7	4	1,2	10	45	0,65
UFX5800804Y50A012020	0,05	0,8	4	1,2	2	45	0,75
UFX5800804Y50A012030	0,05	0,8	4	1,2	3	45	0,75
UFX5800804Y50A012040	0,05	0,8	4	1,2	4	45	0,75
UFX5800804Y50A012060	0,05	0,8	4	1,2	6	45	0,75
UFX5800804Y50A012080	0,05	0,8	4	1,2	8	45	0,75
UFX5800804Y50A012100	0,05	0,8	4	1,2	10	45	0,75
UFX5800804001A012020	0,1	0,8	4	1,2	2	45	0,75
UFX5800804001A012030	0,1	0,8	4	1,2	3	45	0,75
UFX5800804001A012040	0,1	0,8	4	1,2	4	45	0,75
UFX5800804001A012060	0,1	0,8	4	1,2	6	45	0,75
UFX5800804001A012080	0,1	0,8	4	1,2	8	45	0,75
UFX5800804001A012100	0,1	0,8	4	1,2	10	45	0,75
UFX5800804002A012020	0,2	0,8	4	1,2	2	45	0,75
UFX5800804002A012030	0,2	0,8	4	1,2	3	45	0,75
UFX5800804002A012040	0,2	0,8	4	1,2	4	45	0,75
UFX5800804002A012060	0,2	0,8	4	1,2	6	45	0,75

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5801504Y50A023060	0,05	1,5	4	2,3	6	50	1,45
UFX5801504Y50A023080	0,05	1,5	4	2,3	8	50	1,45
UFX5801504Y50A023100	0,05	1,5	4	2,3	10	50	1,45
UFX5801504Y50A023120	0,05	1,5	4	2,3	12	50	1,45
UFX5801504Y50A023140	0,05	1,5	4	2,3	14	50	1,45
UFX5801504Y50A023160	0,05	1,5	4	2,3	16	50	1,45
UFX5801504Y50A023200	0,05	1,5	4	2,3	20	50	1,45
UFX5801504Y50A023220	0,05	1,5	4	2,3	22	60	1,45
UFX5801504Y50A023260	0,05	1,5	4	2,3	26	60	1,45
UFX5801504001A023040	0,1	1,5	4	2,3	4	50	1,45
UFX5801504001A023060	0,1	1,5	4	2,3	6	50	1,45
UFX5801504001A023080	0,1	1,5	4	2,3	8	50	1,45
UFX5801504001A023100	0,1	1,5	4	2,3	10	50	1,45
UFX5801504001A023120	0,1	1,5	4	2,3	12	50	1,45
UFX5801504001A023140	0,1	1,5	4	2,3	14	50	1,45
UFX5801504001A023160	0,1	1,5	4	2,3	16	50	1,45
UFX5801504001A023200	0,1	1,5	4	2,3	20	50	1,45
UFX5801504001A023220	0,1	1,5	4	2,3	22	60	1,45
UFX5801504001A023260	0,1	1,5	4	2,3	26	60	1,45
UFX5801504002A023040	0,2	1,5	4	2,3	4	50	1,45
UFX5801504002A023060	0,2	1,5	4	2,3	6	50	1,45
UFX5801504002A023080	0,2	1,5	4	2,3	8	50	1,45
UFX5801504002A023100	0,2	1,5	4	2,3	10	50	1,45
UFX5801504002A023120	0,2	1,5	4	2,3	12	50	1,45
UFX5801504002A023140	0,2	1,5	4	2,3	14	50	1,45
UFX5801504002A023160	0,2	1,5	4	2,3	16	50	1,45
UFX5801504002A023200	0,2	1,5	4	2,3	20	50	1,45
UFX5801504002A023220	0,2	1,5	4	2,3	22	60	1,45
UFX5801504002A023260	0,2	1,5	4	2,3	26	60	1,45
UFX5801504003A023040	0,3	1,5	4	2,3	4	50	1,45
UFX5801504003A023060	0,3	1,5	4	2,3	6	50	1,45
UFX5801504003A023080	0,3	1,5	4	2,3	8	50	1,45
UFX5801504003A023100	0,3	1,5	4	2,3	10	50	1,45
UFX5801504003A023120	0,3	1,5	4	2,3	12	50	1,45
UFX5801504003A023140	0,3	1,5	4	2,3	14	50	1,45
UFX5801504003A023160	0,3	1,5	4	2,3	16	50	1,45
UFX5801504003A023200	0,3	1,5	4	2,3	20	50	1,45

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5801504003A023220	0,3	1,5	4	2,3	22	60	1,45
UFX5801504003A023260	0,3	1,5	4	2,3	26	60	1,45
UFX5801504005A023040	0,5	1,5	4	2,3	4	50	1,45
UFX5801504005A023060	0,5	1,5	4	2,3	6	50	1,45
UFX5801504005A023080	0,5	1,5	4	2,3	8	50	1,45
UFX5801504005A023100	0,5	1,5	4	2,3	10	50	1,45
UFX5801504005A023120	0,5	1,5	4	2,3	12	50	1,45
UFX5801504005A023140	0,5	1,5	4	2,3	14	50	1,45
UFX5801504005A023160	0,5	1,5	4	2,3	16	50	1,45
UFX5801504005A023200	0,5	1,5	4	2,3	20	50	1,45
UFX5801504005A023220	0,5	1,5	4	2,3	22	60	1,45
UFX5801504005A023260	0,5	1,5	4	2,3	26	60	1,45
UFX5802004001A030060	0,1	2	4	3	6	50	1,95
UFX5802004001A030080	0,1	2	4	3	8	50	1,95
UFX5802004001A030100	0,1	2	4	3	10	50	1,95
UFX5802004001A030120	0,1	2	4	3	12	50	1,95
UFX5802004001A030140	0,1	2	4	3	14	50	1,95
UFX5802004001A030160	0,1	2	4	3	16	50	1,95
UFX5802004001A030200	0,1	2	4	3	20	50	1,95
UFX5802004001A030220	0,1	2	4	3	22	60	1,95
UFX5802004001A030260	0,1	2	4	3	26	60	1,95
UFX5802004001A030300	0,1	2	4	3	30	70	1,95
UFX5802004002A030060	0,2	2	4	3	6	50	1,95
UFX5802004002A030080	0,2	2	4	3	8	50	1,95
UFX5802004002A030100	0,2	2	4	3	10	50	1,95
UFX5802004002A030120	0,2	2	4	3	12	50	1,95
UFX5802004002A030140	0,2	2	4	3	14	50	1,95
UFX5802004002A030160	0,2	2	4	3	16	50	1,95
UFX5802004002A030200	0,2	2	4	3	20	50	1,95
UFX5802004002A030220	0,2	2	4	3	22	60	1,95
UFX5802004002A030260	0,2	2	4	3	26	60	1,95
UFX5802004002A030300	0,2	2	4	3	30	70	1,95
UFX5802004003A030060	0,3	2	4	3	6	50	1,95
UFX5802004003A030080	0,3	2	4	3	8	50	1,95
UFX5802004003A030100	0,3	2	4	3	10	50	1,95
UFX5802004003A030120	0,3	2	4	3	12	50	1,95
UFX5802004003A030140	0,3	2	4	3	14	50	1,95

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5802004003A030160	0,3	2	4	3	16	50	1,95
UFX5802004003A030200	0,3	2	4	3	20	50	1,95
UFX5802004003A030220	0,3	2	4	3	22	60	1,95
UFX5802004003A030260	0,3	2	4	3	26	60	1,95
UFX5802004003A030300	0,3	2	4	3	30	70	1,95
UFX5802004005A030060	0,5	2	4	3	6	50	1,95
UFX5802004005A030080	0,5	2	4	3	8	50	1,95
UFX5802004005A030100	0,5	2	4	3	10	50	1,95
UFX5802004005A030120	0,5	2	4	3	12	50	1,95
UFX5802004005A030140	0,5	2	4	3	14	50	1,95
UFX5802004005A030160	0,5	2	4	3	16	50	1,95
UFX5802004005A030200	0,5	2	4	3	20	50	1,95
UFX5802004005A030220	0,5	2	4	3	22	60	1,95
UFX5802004005A030260	0,5	2	4	3	26	60	1,95
UFX5802004005A030300	0,5	2	4	3	30	70	1,95
UFX5802006005A030080	0,5	2	6	3	8	50	1,95
UFX5802504001A040080	0,1	2,5	4	4	8	50	2,4
UFX5802504001A040100	0,1	2,5	4	4	10	50	2,4
UFX5802504001A040120	0,1	2,5	4	4	12	50	2,4
UFX5802504001A040140	0,1	2,5	4	4	14	50	2,4
UFX5802504001A040160	0,1	2,5	4	4	16	50	2,4
UFX5802504001A040200	0,1	2,5	4	4	20	50	2,4
UFX5802504001A040260	0,1	2,5	4	4	26	60	2,4
UFX5802504001A040300	0,1	2,5	4	4	30	70	2,4
UFX5802504002A040080	0,2	2,5	4	4	8	50	2,4
UFX5802504002A040100	0,2	2,5	4	4	10	50	2,4
UFX5802504002A040120	0,2	2,5	4	4	12	50	2,4
UFX5802504002A040140	0,2	2,5	4	4	14	50	2,4
UFX5802504002A040160	0,2	2,5	4	4	16	50	2,4
UFX5802504002A040200	0,2	2,5	4	4	20	50	2,4
UFX5802504002A040260	0,2	2,5	4	4	26	60	2,4
UFX5802504002A040300	0,2	2,5	4	4	30	70	2,4
UFX5802504003A040080	0,3	2,5	4	4	8	50	2,4
UFX5802504003A040100	0,3	2,5	4	4	10	50	2,4
UFX5802504003A040120	0,3	2,5	4	4	12	50	2,4
UFX5802504003A040140	0,3	2,5	4	4	14	50	2,4
UFX5802504003A040160	0,3	2,5	4	4	16	50	2,4

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5802504003A040200	0,3	2,5	4	4	20	50	2,4
UFX5802504003A040260	0,3	2,5	4	4	26	60	2,4
UFX5802504003A040300	0,3	2,5	4	4	30	70	2,4
UFX5802506005A040080	0,5	2,5	4	4	8	50	2,4
UFX5802506005A040100	0,5	2,5	4	4	10	50	2,4
UFX5802506005A040120	0,5	2,5	4	4	12	50	2,4
UFX5802506005A040140	0,5	2,5	4	4	14	50	2,4
UFX5802506005A040160	0,5	2,5	4	4	16	50	2,4
UFX5802506005A040200	0,5	2,5	4	4	20	50	2,4
UFX5802506005A040260	0,5	2,5	4	4	26	60	2,4
UFX5802506005A040300	0,5	2,5	4	4	30	70	2,4
UFX5803006001A045080	0,1	3	6	4,5	8	50	2,85
UFX5803006001A045100	0,1	3	6	4,5	10	50	2,85
UFX5803006001A045120	0,1	3	6	4,5	12	50	2,85
UFX5803006001A045140	0,1	3	6	4,5	14	60	2,85
UFX5803006001A045160	0,1	3	6	4,5	16	60	2,85
UFX5803006001A045200	0,1	3	6	4,5	20	60	2,85
UFX5803006001A045260	0,1	3	6	4,5	26	65	2,85
UFX5803006001A045300	0,1	3	6	4,5	30	70	2,85
UFX5803006001A045350	0,1	3	6	4,5	35	70	2,85
UFX5803006001A045400	0,1	3	6	4,5	40	80	2,85
UFX5803006002A045080	0,2	3	6	4,5	8	50	2,85
UFX5803006002A045100	0,2	3	6	4,5	10	50	2,85
UFX5803006002A045120	0,2	3	6	4,5	12	50	2,85
UFX5803006002A045140	0,2	3	6	4,5	14	60	2,85
UFX5803006002A045160	0,2	3	6	4,5	16	60	2,85
UFX5803006002A045200	0,2	3	6	4,5	20	60	2,85
UFX5803006002A045260	0,2	3	6	4,5	26	65	2,85
UFX5803006002A045300	0,2	3	6	4,5	30	70	2,85
UFX5803006002A045350	0,2	3	6	4,5	35	70	2,85
UFX5803006002A045400	0,2	3	6	4,5	40	80	2,85
UFX5803006003A045080	0,3	3	6	4,5	8	50	2,85
UFX5803006003A045100	0,3	3	6	4,5	10	50	2,85
UFX5803006003A045120	0,3	3	6	4,5	12	50	2,85
UFX5803006003A045140	0,3	3	6	4,5	14	60	2,85
UFX5803006003A045160	0,3	3	6	4,5	16	60	2,85

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5803006003A045200	0,3	3	6	4,5	20	60	2,85
UFX5803006003A045260	0,3	3	6	4,5	26	65	2,85
UFX5803006003A045300	0,3	3	6	4,5	30	70	2,85
UFX5803006003A045350	0,3	3	6	4,5	35	70	2,85
UFX5803006003A045400	0,3	3	6	4,5	40	80	2,85
UFX5803006005A045080	0,5	3	6	4,5	8	50	2,85
UFX5803006005A045100	0,5	3	6	4,5	10	50	2,85
UFX5803006005A045120	0,5	3	6	4,5	12	50	2,85
UFX5803006005A045140	0,5	3	6	4,5	14	60	2,85
UFX5803006005A045160	0,5	3	6	4,5	16	60	2,85
UFX5803006005A045200	0,5	3	6	4,5	20	60	2,85
UFX5803006005A045260	0,5	3	6	4,5	26	65	2,85
UFX5803006005A045300	0,5	3	6	4,5	30	70	2,85
UFX5803006005A045350	0,5	3	6	4,5	35	70	2,85
UFX5803006005A045400	0,5	3	6	4,5	40	80	2,85
UFX5803006010A045080	1	3	6	4,5	8	50	2,85
UFX5803006010A045100	1	3	6	4,5	10	50	2,85
UFX5803006010A045120	1	3	6	4,5	12	50	2,85
UFX5803006010A045140	1	3	6	4,5	14	60	2,85
UFX5803006010A045160	1	3	6	4,5	16	60	2,85
UFX5803006010A045200	1	3	6	4,5	20	60	2,85
UFX5803006010A045260	1	3	6	4,5	26	65	2,85
UFX5803006010A045300	1	3	6	4,5	30	70	2,85
UFX5803006010A045350	1	3	6	4,5	35	70	2,85
UFX5803006010A045400	1	3	6	4,5	40	80	2,85
UFX5804006001A060100	0,1	4	6	6	10	50	3,85
UFX5804006001A060120	0,1	4	6	6	12	50	3,85
UFX5804006001A060140	0,1	4	6	6	14	60	3,85
UFX5804006001A060160	0,1	4	6	6	16	60	3,85
UFX5804006001A060200	0,1	4	6	6	20	60	3,85
UFX5804006001A060260	0,1	4	6	6	26	65	3,85
UFX5804006001A060300	0,1	4	6	6	30	70	3,85
UFX5804006001A060350	0,1	4	6	6	35	70	3,85
UFX5804006001A060400	0,1	4	6	6	40	80	3,85
UFX5804006001A060450	0,1	4	6	6	45	90	3,85
UFX5804006001A060500	0,1	4	6	6	50	100	3,85

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5804006002A060100	0,2	4	6	6	10	50	3,85
UFX5804006002A060120	0,2	4	6	6	12	50	3,85
UFX5804006002A060140	0,2	4	6	6	14	60	3,85
UFX5804006002A060160	0,2	4	6	6	16	60	3,85
UFX5804006002A060200	0,2	4	6	6	20	60	3,85
UFX5804006002A060260	0,2	4	6	6	26	65	3,85
UFX5804006002A060300	0,2	4	6	6	30	70	3,85
UFX5804006002A060350	0,2	4	6	6	35	70	3,85
UFX5804006002A060400	0,2	4	6	6	40	80	3,85
UFX5804006002A060450	0,2	4	6	6	45	90	3,85
UFX5804006002A060500	0,2	4	6	6	50	100	3,85
UFX5804006003A060100	0,3	4	6	6	10	50	3,85
UFX5804006003A060120	0,3	4	6	6	12	50	3,85
UFX5804006003A060140	0,3	4	6	6	14	50	3,85
UFX5804006003A060160	0,3	4	6	6	16	50	3,85
UFX5804006003A060200	0,3	4	6	6	20	50	3,85
UFX5804006003A060260	0,3	4	6	6	26	65	3,85
UFX5804006003A060300	0,3	4	6	6	30	70	3,85
UFX5804006003A060350	0,3	4	6	6	35	70	3,85
UFX5804006003A060400	0,3	4	6	6	40	80	3,85
UFX5804006003A060450	0,3	4	6	6	45	90	3,85
UFX5804006003A060500	0,3	4	6	6	50	100	3,85
UFX5804006005A060100	0,5	4	6	6	10	50	3,85
UFX5804006005A060120	0,5	4	6	6	12	50	3,85
UFX5804006005A060140	0,5	4	6	6	14	60	3,85
UFX5804006005A060160	0,5	4	6	6	16	60	3,85
UFX5804006005A060200	0,5	4	6	6	20	60	3,85
UFX5804006005A060260	0,5	4	6	6	26	65	3,85
UFX5804006005A060300	0,5	4	6	6	30	70	3,85
UFX5804006005A060350	0,5	4	6	6	35	70	3,85
UFX5804006005A060400	0,5	4	6	6	40	80	3,85

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5804006005A060450	0,5	4	6	6	45	90	3,85
UFX5804006005A060500	0,5	4	6	6	50	100	3,85
UFX5804006010A060100	1	4	6	6	10	50	3,85
UFX5804006010A060120	1	4	6	6	12	50	3,85
UFX5804006010A060140	1	4	6	6	14	60	3,85
UFX5804006010A060160	1	4	6	6	16	60	3,85
UFX5804006010A060200	1	4	6	6	20	60	3,85
UFX5804006010A060260	1	4	6	6	26	65	3,85
UFX5804006010A060300	1	4	6	6	30	70	3,85
UFX5804006010A060350	1	4	6	6	35	70	3,85
UFX5804006010A060400	1	4	6	6	40	80	3,85
UFX5804006010A060450	1	4	6	6	45	90	3,85
UFX5804006010A060500	1	4	6	6	50	100	3,85
UFX5805006001A080150	0,1	5	6	8	15	60	4,85
UFX5805006002A080150	0,2	5	6	8	15	60	4,85
UFX5805006003A080150	0,3	5	6	8	15	60	4,85
UFX5805006005A080150	0,5	5	6	8	15	60	4,85
UFX5805006010A080150	1	5	6	8	15	60	4,85
UFX5805006015A080150	1,5	5	6	8	15	60	4,85
UFX5805006020A080150	2	5	6	8	15	60	4,85
UFX5806006001A090200	0,1	6	6	9	20	60	5,85
UFX5806006002A090200	0,2	6	6	9	20	60	5,85
UFX5806006003A090200	0,3	6	6	9	20	60	5,85
UFX5806006005A090200	0,5	6	6	9	20	60	5,85
UFX5806006010A090200	1	6	6	9	20	60	5,85
UFX5806006015A090200	1,5	6	6	9	20	60	5,85
UFX5806006020A090200	2	6	6	9	20	60	5,85
UFX5806006003A150300	0,3	6	6	15	30	90	5,85
UFX5806006005A090240	0,5	6	6	9	24	90	5,85
UFX5806006005A150300	0,5	6	6	15	30	90	5,85
UFX5806006010A150300	1	6	6	15	30	90	5,85
UFX5808008001A120250	0,1	8	8	12	25	70	7,7
UFX5808008002A120250	0,2	8	8	12	25	70	7,7
UFX5808008003A120250	0,3	8	8	12	25	70	7,7
UFX5808008005A120250	0,5	8	8	12	25	70	7,7
UFX5808008010A120250	1	8	8	12	25	70	7,7
UFX5808008015A120250	1,5	8	8	12	25	70	7,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX5808008020A120250	2	8	8	12	25	70	7,7
UFX5808008003A200350	0,3	8	8	20	35	100	7,7
UFX5808008005A200350	0,5	8	8	20	35	100	7,7
UFX5808008010A200350	1	8	8	20	35	100	7,7
UFX5810010001A150300	0,1	10	10	15	30	75	9,7
UFX5810010002A150300	0,2	10	10	15	30	75	9,7
UFX5810010003A150300	0,3	10	10	15	30	75	9,7
UFX5810010005A150300	0,5	10	10	15	30	75	9,7
UFX5810010010A150300	1	10	10	15	30	75	9,7
UFX5810010015A150300	1,5	10	10	15	30	75	9,7
UFX5810010020A150300	2	10	10	15	30	75	9,7
UFX5810010003A250400	0,3	10	10	25	40	100	9,7
UFX5810010005A250400	0,5	10	10	25	40	100	9,7
UFX5810010010A250400	1	10	10	25	40	100	9,7
UFX5812012002A180320	0,2	12	12	18	32	80	11,7
UFX5812012003A180320	0,3	12	12	18	32	80	11,7
UFX5812012005A180320	0,5	12	12	18	32	80	11,7
UFX5812012010A180320	1	12	12	18	32	80	11,7
UFX5812012015A180320	1,5	12	12	18	32	80	11,7
UFX5812012020A180320	2	12	12	18	32	80	11,7
UFX5812012003A300450	0,3	12	12	30	50	110	11,7
UFX5812012005A300450	0,5	12	12	30	50	110	11,7
UFX5812012010A300450	1	12	12	30	50	110	11,7
UFX5816016005A200350	0,5	16	16	20	35	100	15,7
UFX5816016010A200350	1	16	16	20	35	100	15,7
UFX5816016005A350500	0,5	16	16	35	50	150	15,7
UFX5816016010A350500	1	16	16	35	50	150	15,7
UFX5820020005A250400	0,5	20	20	25	40	100	19,7
UFX5820020010A250400	1	20	20	25	40	100	19,7
UFX5820020005A400550	0,5	20	20	40	55	150	19,7
UFX5820020010A400550	1	20	20	40	55	150	19,7

SIZE	MILL DIA TOLERANCE mm	CORNER RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	± 0.010	h5
OVER TO R6	0 ~-0.015	± 0.015	h5

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.2	02	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
			LBS	0.5	1	15	2	1	2	3	1	15	2	2.5	3
P	1-5	1.0D	Vc m/min	31	31	28	28	47	42	42	63	63	63	57	57
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	49338	49338	44563	44563	49869	44563	44563	50134	50134	50134	45359	45359
			feed posuw mm/min	197	197	178	178	199	178	178	201	201	201	181	181
			Ap mm	0.04	0.028	0.016	0.01	0.042	0.024	0.015	0.08	0.056	0.056	0.032	0.032
	6-8	1.0D	Vc m/min	31	31	28	28	47	42	42	63	63	63	57	57
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	49338	49338	44563	44563	49869	44563	44563	50134	50134	50134	45359	45359
			feed posuw mm/min	197	197	178	178	199	178	178	201	201	201	181	181
			Ap mm	0.04	0.028	0.016	0.01	0.042	0.024	0.015	0.08	0.056	0.056	0.032	0.032
	9	1.0D	Vc m/min	22	22	20	20	30	27	27	40	40	40	36	36
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
			rpm obr/min	35014	35014	31831	31831	31831	28648	28648	31831	31831	31831	28648	28648
			feed posuw mm/min	70	70	64	64	64	57	57	64	64	64	57	57
			Ap mm	0.03	0.021	0.012	0.008	0.032	0.018	0.011	0.06	0.042	0.042	0.024	0.024
	10-11.1	1.0D	Vc m/min	31	31	28	28	47	42	42	63	63	63	57	57
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	49338	49338	44563	44563	49869	44563	44563	50134	50134	50134	45359	45359
			feed posuw mm/min	197	197	178	178	199	178	178	201	201	201	181	181
			Ap mm	0.04	0.028	0.016	0.01	0.042	0.024	0.015	0.08	0.056	0.056	0.032	0.032
	11.2	1.0D	Vc m/min	22	22	20	20	30	27	27	40	40	40	36	36
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
			rpm obr/min	35014	35014	31831	31831	31831	28648	28648	31831	31831	31831	28648	28648
			feed posuw mm/min	70	70	64	64	64	57	57	64	64	64	57	57
			Ap mm	0.03	0.021	0.012	0.008	0.032	0.018	0.011	0.06	0.042	0.042	0.024	0.024
K	15-20	1.0D	Vc m/min	31	31	28	28	47	42	42	63	63	63	57	57
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	49338	49338	44563	44563	49869	44563	44563	50134	50134	50134	45359	45359
			feed posuw mm/min	197	197	178	178	199	178	178	201	201	201	181	181
			Ap mm	0.04	0.028	0.016	0.01	0.042	0.024	0.015	0.08	0.056	0.056	0.032	0.032
H	38.1 - 38.2	1.0D	Vc m/min	13	13	12	12	19	17	17	25	25	25	23	23
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
			rpm obr/min	20690	20690	19099	19099	20160	18038	18038	19894	19894	19894	18303	18303
			feed posuw mm/min	41	41	38	38	40	36	36	40	40	40	37	37
			Ap mm	0.024	0.017	0.01	0.006	0.025	0.014	0.009	0.048	0.034	0.034	0.019	0.019
	40	1.0D	Vc m/min	22	22	20	20	30	27	27	40	40	40	36	36
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
			rpm obr/min	35014	35014	31831	31831	31831	28648	28648	31831	31831	31831	28648	28648
			feed posuw mm/min	70	70	64	64	64	57	57	64	64	64	57	57
			Ap mm	0.03	0.021	0.012	0.008	0.032	0.018	0.011	0.06	0.042	0.042	0.024	0.024
	41	1.0D	Vc m/min	13	13	12	12	19	17	17	25	25	25	23	23
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
			rpm obr/min	20690	20690	19099	19099	20160	18038	18038	19894	19894	19894	18303	18303
			feed posuw mm/min	41	41	38	38	40	36	36	40	40	40	37	37
			Ap mm	0.024	0.017	0.01	0.006	0.025	0.014	0.009	0.048	0.034	0.034	0.019	0.019

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.4	0.5	0.5	05	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7
			LBS	4	1	1.5	2	2.5	3	4	5	6	2	3	4	6	8	10	2
P	1-5	1.0D	Vc m/min	57	68	68	68	68	61	61	61	54	69	69	62	62	55	41	80
			fz mm/tooth	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.003
			rpm obr/min	45359	43290	43290	43290	43290	38834	38834	38834	34377	36606	36606	32892	32892	29178	21751	36378
			feed posuw mm/min	181	260	260	260	260	155	155	155	138	220	220	197	197	175	87	218
			Ap mm	0.02	0.1	0.1	0.07	0.07	0.04	0.04	0.025	0.025	0.084	0.084	0.048	0.03	0.018	0.012	0.14
	6-8	1.0D	Vc m/min	57	68	68	68	68	61	61	61	54	69	69	62	62	55	41	80
			fz mm/tooth	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.003
			rpm obr/min	45359	43290	43290	43290	43290	38834	38834	38834	34377	36606	36606	32892	32892	29178	21751	36378
			feed posuw mm/min	181	260	260	260	260	155	155	155	138	220	220	197	197	175	87	218
			Ap mm	0.02	0.1	0.1	0.07	0.07	0.04	0.04	0.025	0.025	0.084	0.084	0.048	0.03	0.018	0.012	0.14
	9	1.0D	Vc m/min	36	44	44	44	44	40	40	40	35	45	45	41	41	36	27	53
			fz mm/tooth	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	28648	28011	28011	28011	28011	25465	25465	25465	22282	23873	23873	21751	21751	19099	14324	24101
			feed posuw mm/min	57	112	112	112	112	51	51	51	45	95	95	87	87	76	57	96
			Ap mm	0.015	0.075	0.075	0.053	0.053	0.03	0.03	0.019	0.019	0.063	0.063	0.036	0.023	0.014	0.009	0.105
	10-11.1	1.0D	Vc m/min	57	68	68	68	68	61	61	61	54	69	69	62	62	55	41	80
			fz mm/tooth	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.003
			rpm obr/min	45359	43290	43290	43290	43290	38834	38834	38834	34377	36606	36606	32892	32892	29178	21751	36378
			feed posuw mm/min	181	260	260	260	260	155	155	155	138	220	220	197	197	175	87	218
			Ap mm	0.02	0.1	0.1	0.07	0.07	0.04	0.04	0.025	0.025	0.084	0.084	0.048	0.03	0.018	0.012	0.14
	11.2	1.0D	Vc m/min	36	44	44	44	44	40	40	40	35	45	45	41	41	36	27	53
			fz mm/tooth	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	28648	28011	28011	28011	28011	25465	25465	25465	22282	23873	23873	21751	21751	19099	14324	24101
			feed posuw mm/min	57	112	112	112	112	51	51	51	45	95	95	87	87	76	57	96
			Ap mm	0.015	0.075	0.075	0.053	0.053	0.03	0.03	0.019	0.019	0.063	0.063	0.036	0.023	0.014	0.009	0.105
K	15-20	1.0D	Vc m/min	57	68	68	68	68	61	61	61	54	69	69	62	62	55	41	80
			fz mm/tooth	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.003
			rpm obr/min	45359	43290	43290	43290	43290	38834	38834	38834	34377	36606	36606	32892	32892	29178	21751	36378
			feed posuw mm/min	181	260	260	260	260	155	155	155	138	220	220	197	197	175	87	218
			Ap mm	0.02	0.1	0.1	0.07	0.07	0.04	0.04	0.025	0.025	0.084	0.084	0.048	0.03	0.018	0.012	0.14
H	38.1 - 38.2	1.0D	Vc m/min	23	27	27	27	27	24	24	24	21	27	27	25	25	22	16	32
			fz mm/tooth	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.002
			rpm obr/min	18303	17189	17189	17189	17189	15279	15279	15279	13369	14324	14324	13263	13263	11671	8488	14551
			feed posuw mm/min	37	69	69	69	69	61	61	61	27	57	57	53	53	47	17	58
			Ap mm	0.012	0.06	0.06	0.042	0.042	0.024	0.024	0.015	0.015	0.05	0.05	0.029	0.018	0.011	0.007	0.084
	40	1.0D	Vc m/min	36	44	44	44	44	40	40	40	35	45	45	41	41	36	27	53
			fz mm/tooth	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	28648	28011	28011	28011	28011	25465	25465	25465	22282	23873	23873	21751	21751	19099	14324	24101
			feed posuw mm/min	57	112	112	112	112	51	51	51	45	95	95	87	87	76	57	96
			Ap mm	0.015	0.075	0.075	0.053	0.053	0.03	0.03	0.019	0.019	0.063	0.063	0.036	0.023	0.014	0.009	0.105
	41	1.0D	Vc m/min	23	27	27	27	27	24	24	24	21	27	27	25	25	22	16	32
			fz mm/tooth	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.002
			rpm obr/min	18303	17189	17189	17189	17189	15279	15279	15279	13369	14324	14324	13263	13263	11671	8488	14551
			feed posuw mm/min	37	69	69	69	69	61	61	61	27	57	57	53	53	47	17	58
			Ap mm	0.012	0.06	0.06	0.042	0.042	0.024	0.024	0.015	0.015	0.05	0.05	0.029	0.018	0.011	0.007	0.084

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0
			LBS	4	6	8	10	2	3	4	6	8	10	3	4	6	8	10
P	1-5	1.0D	Vc m/min	72	72	64	64	91	91	91	82	82	73	104	104	94	94	94
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	32740	32740	29103	29103	36208	36208	36208	32627	32627	29046	33104	33104	29921	29921	29921
			feed posuw mm/min	196	196	175	175	217	217	217	196	196	174	265	265	239	239	239
			Ap mm	0.056	0.035	0.035	0.021	0.16	0.112	0.112	0.064	0.04	0.04	0.2	0.14	0.08	0.08	0.05
	6-8	1.0D	Vc m/min	72	72	64	64	91	91	91	82	82	73	104	104	94	94	94
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	32740	32740	29103	29103	36208	36208	36208	32627	32627	29046	33104	33104	29921	29921	29921
			feed posuw mm/min	196	196	175	175	217	217	217	196	196	174	265	265	239	239	239
			Ap mm	0.056	0.035	0.035	0.021	0.16	0.112	0.112	0.064	0.04	0.04	0.2	0.14	0.08	0.08	0.05
	9	1.0D	Vc m/min	48	48	42	42	60	60	60	54	54	48	68	68	61	61	61
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002
			rpm obr/min	21827	21827	19099	19099	23873	23873	23873	21486	21486	19099	21645	21645	19417	19417	19417
			feed posuw mm/min	87	87	76	76	95	95	95	86	86	76	130	130	78	78	78
			Ap mm	0.042	0.026	0.026	0.016	0.12	0.084	0.084	0.048	0.03	0.03	0.15	0.105	0.06	0.06	0.038
	10-11.1	1.0D	Vc m/min	72	72	64	64	91	91	91	82	82	73	104	104	94	94	94
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	32740	32740	29103	29103	36208	36208	36208	32627	32627	29046	33104	33104	29921	29921	29921
			feed posuw mm/min	196	196	175	175	217	217	217	196	196	174	265	265	239	239	239
			Ap mm	0.056	0.035	0.035	0.021	0.16	0.112	0.112	0.064	0.04	0.04	0.2	0.14	0.08	0.08	0.05
	11.2	1.0D	Vc m/min	48	48	42	42	60	60	60	54	54	48	68	68	61	61	61
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002
			rpm obr/min	21827	21827	19099	19099	23873	23873	23873	21486	21486	19099	21645	21645	19417	19417	19417
			feed posuw mm/min	87	87	76	76	95	95	95	86	86	76	130	130	78	78	78
			Ap mm	0.042	0.026	0.026	0.016	0.12	0.084	0.084	0.048	0.03	0.03	0.15	0.105	0.06	0.06	0.038
K	15-20	1.0D	Vc m/min	72	72	64	64	91	91	91	82	82	73	104	104	94	94	94
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	32740	32740	29103	29103	36208	36208	36208	32627	32627	29046	33104	33104	29921	29921	29921
			feed posuw mm/min	196	196	175	175	217	217	217	196	196	174	265	265	239	239	239
			Ap mm	0.056	0.035	0.035	0.021	0.16	0.112	0.112	0.064	0.04	0.04	0.2	0.14	0.08	0.08	0.05
H	38.1 - 38.2	1.0D	Vc m/min	29	29	26	26	36	36	36	33	33	29	41	41	37	37	37
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002
			rpm obr/min	13187	13187	11823	11823	14324	14324	14324	13130	13130	11539	13051	13051	11777	11777	11777
			feed posuw mm/min	53	53	47	47	57	57	57	53	53	46	78	78	47	47	47
			Ap mm	0.034	0.021	0.021	0.013	0.096	0.067	0.067	0.038	0.024	0.024	0.12	0.084	0.048	0.048	0.03
	40	1.0D	Vc m/min	48	48	42	42	60	60	60	54	54	48	68	68	61	61	61
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002
			rpm obr/min	21827	21827	19099	19099	23873	23873	23873	21486	21486	19099	21645	21645	19417	19417	19417
			feed posuw mm/min	87	87	76	76	95	95	95	86	86	76	130	130	78	78	78
			Ap mm	0.042	0.026	0.026	0.016	0.12	0.084	0.084	0.048	0.03	0.03	0.15	0.105	0.06	0.06	0.038
	41	1.0D	Vc m/min	29	29	26	26	36	36	36	33	33	29	41	41	37	37	37
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002
			rpm obr/min	13187	13187	11823	11823	14324	14324	14324	13130	13130	11539	13051	13051	11777	11777	11777
			feed posuw mm/min	53	53	47	47	57	57	57	53	53	46	78	78	47	47	47
			Ap mm	0.034	0.021	0.021	0.013	0.096	0.067	0.067	0.038	0.024	0.024	0.12	0.084	0.048	0.048	0.03

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.5	1.5	1.5	15
			LBS	12	14	16	20	3	4	6	8	10	12	16	20	4	6	8	10
P	1-5	1.0D	Vc m/min	83	83	62	62	112	112	112	101	101	101	90	67	124	124	112	112
			fz mm/tooth	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.003	0.006	0.006	0.005	0.005
			rpm obr/min	26420	26420	19735	19735	29709	29709	29709	26791	26791	26791	23873	17772	26314	26314	23767	23767
			feed posuw mm/min	159	159	118	118	297	297	297	214	214	214	191	107	316	316	238	238
			Ap mm	0.05	0.03	0.03	0.02	0.24	0.168	0.168	0.096	0.06	0.06	0.036	0.024	0.3	0.21	0.12	0.12
	6-8	1.0D	Vc m/min	83	83	62	62	112	112	112	101	101	101	90	67	124	124	112	112
			fz mm/tooth	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.003	0.006	0.006	0.005	0.005
			rpm obr/min	26420	26420	19735	19735	29709	29709	29709	26791	26791	26791	23873	17772	26314	26314	23767	23767
			feed posuw mm/min	159	159	118	118	297	297	297	214	214	214	191	107	316	316	238	238
			Ap mm	0.05	0.03	0.03	0.02	0.24	0.168	0.168	0.096	0.06	0.06	0.036	0.024	0.3	0.21	0.12	0.12
	9	1.0D	Vc m/min	54	54	41	41	71	71	71	64	64	64	57	43	76	76	69	69
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004
			rpm obr/min	17189	17189	13051	13051	18833	18833	18833	16977	16977	16977	15120	11406	16128	16128	14642	14642
			feed posuw mm/min	69	69	52	52	113	113	113	102	102	102	91	46	129	129	117	117
			Ap mm	0.038	0.023	0.023	0.015	0.18	0.126	0.126	0.072	0.045	0.045	0.027	0.018	0.225	0.158	0.09	0.09
	10-11.1	1.0D	Vc m/min	83	83	62	62	112	112	112	101	101	101	90	67	124	124	112	112
			fz mm/tooth	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.003	0.006	0.006	0.005	0.005
			rpm obr/min	26420	26420	19735	19735	29709	29709	29709	26791	26791	26791	23873	17772	26314	26314	23767	23767
			feed posuw mm/min	159	159	118	118	297	297	297	214	214	214	191	107	316	316	238	238
			Ap mm	0.05	0.03	0.03	0.02	0.24	0.168	0.168	0.096	0.06	0.06	0.036	0.024	0.3	0.21	0.12	0.12
	11.2	1.0D	Vc m/min	54	54	41	41	71	71	71	64	64	64	57	43	76	76	69	69
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004
			rpm obr/min	17189	17189	13051	13051	18833	18833	18833	16977	16977	16977	15120	11406	16128	16128	14642	14642
			feed posuw mm/min	69	69	52	52	113	113	113	102	102	102	91	46	129	129	117	117
			Ap mm	0.038	0.023	0.023	0.015	0.18	0.126	0.126	0.072	0.045	0.045	0.027	0.018	0.225	0.158	0.09	0.09
K	15-20	1.0D	Vc m/min	83	83	62	62	112	112	112	101	101	101	90	67	124	124	112	112
			fz mm/tooth	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.003	0.006	0.006	0.005	0.005
			rpm obr/min	26420	26420	19735	19735	29709	29709	29709	26791	26791	26791	23873	17772	26314	26314	23767	23767
			feed posuw mm/min	159	159	118	118	297	297	297	214	214	214	191	107	316	316	238	238
			Ap mm	0.05	0.03	0.03	0.02	0.24	0.168	0.168	0.096	0.06	0.06	0.036	0.024	0.3	0.21	0.12	0.12
H	38.1 - 38.2	1.0D	Vc m/min	33	33	25	25	44	44	44	40	40	40	35	26	48	48	43	43
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.003
			rpm obr/min	10504	10504	7958	7958	11671	11671	11671	10610	10610	10610	9284	6897	10186	10186	9125	9125
			feed posuw mm/min	42	42	32	32	70	70	70	64	64	64	37	28	61	61	55	55
			Ap mm	0.03	0.018	0.018	0.012	0.144	0.101	0.101	0.058	0.036	0.036	0.022	0.014	0.18	0.126	0.072	0.072
	40	1.0D	Vc m/min	54	54	41	41	71	71	71	64	64	64	57	43	76	76	69	69
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004
			rpm obr/min	17189	17189	13051	13051	18833	18833	18833	16977	16977	16977	15120	11406	16128	16128	14642	14642
			feed posuw mm/min	69	69	52	52	113	113	113	102	102	102	91	46	129	129	117	117
			Ap mm	0.038	0.023	0.023	0.015	0.18	0.126	0.126	0.072	0.045	0.045	0.027	0.018	0.225	0.158	0.09	0.09
	41	1.0D	Vc m/min	33	33	25	25	44	44	44	40	40	40	35	26	48	48	43	43
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.003
			rpm obr/min	10504	10504	7958	7958	11671	11671	11671	10610	10610	10610	9284	6897	10186	10186	9125	9125
			feed posuw mm/min	42	42	32	32	70	70	70	64	64	64	37	28	61	61	55	55
			Ap mm	0.03	0.018	0.018	0.012	0.144	0.101	0.101	0.058	0.036	0.036	0.022	0.014	0.18	0.126	0.072	0.072

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.5	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
			LBS	12	14	16	20	22	26	6	8	10	12	14	16	20	22	26
P	1-5	1.0D	Vc m/min	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109
			fz mm/tooth	0.005	0.005	0.004	0.004	0.004	0.004	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006
			rpm obr/min	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348
			feed posuw mm/min	238	238	170	170	170	127	303	303	303	233	233	233	233	208	208
			Ap mm	0.12	0.075	0.075	0.045	0.045	0.03	0.4	0.28	0.28	0.16	0.16	0.16	0.1	0.1	0.1
	6-8	1.0D	Vc m/min	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109
			fz mm/tooth	0.005	0.005	0.004	0.004	0.004	0.004	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006
			rpm obr/min	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348
			feed posuw mm/min	238	238	170	170	170	127	303	303	303	233	233	233	233	208	208
			Ap mm	0.12	0.075	0.075	0.045	0.045	0.03	0.4	0.28	0.28	0.16	0.16	0.16	0.1	0.1	0.1
	9	1.0D	Vc m/min	69	69	61	61	61	46	87	87	87	78	78	78	78	69	69
			fz mm/tooth	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004
			rpm obr/min	14642	14642	12945	12945	12945	9762	13846	13846	13846	12414	12414	12414	12414	10982	10982
			feed posuw mm/min	117	117	78	78	78	59	138	138	138	124	124	124	124	88	88
			Ap mm	0.09	0.056	0.056	0.034	0.034	0.023	0.3	0.21	0.21	0.12	0.12	0.12	0.075	0.075	0.075
	10-11.1	1.0D	Vc m/min	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109
			fz mm/tooth	0.005	0.005	0.004	0.004	0.004	0.004	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006
			rpm obr/min	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348
			feed posuw mm/min	238	238	170	170	170	127	303	303	303	233	233	233	233	208	208
			Ap mm	0.12	0.075	0.075	0.045	0.045	0.03	0.4	0.28	0.28	0.16	0.16	0.16	0.1	0.1	0.1
	11.2	1.0D	Vc m/min	69	69	61	61	61	46	87	87	87	78	78	78	78	69	69
			fz mm/tooth	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004
			rpm obr/min	14642	14642	12945	12945	12945	9762	13846	13846	13846	12414	12414	12414	12414	10982	10982
			feed posuw mm/min	117	117	78	78	78	59	138	138	138	124	124	124	124	88	88
			Ap mm	0.09	0.056	0.056	0.034	0.034	0.023	0.3	0.21	0.21	0.12	0.12	0.12	0.075	0.075	0.075
K	15-20	1.0D	Vc m/min	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109
			fz mm/tooth	0.005	0.005	0.004	0.004	0.004	0.004	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006
			rpm obr/min	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348
			feed posuw mm/min	238	238	170	170	170	127	303	303	303	233	233	233	233	208	208
			Ap mm	0.12	0.075	0.075	0.045	0.045	0.03	0.4	0.28	0.28	0.16	0.16	0.16	0.1	0.1	0.1
H	38.1 - 38.2	1.0D	Vc m/min	43	43	38	38	38	29	54	54	54	49	49	49	49	43	43
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.002	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	9125	9125	8064	8064	8064	6154	8594	8594	8594	7799	7799	7799	7799	6844	6844
			feed posuw mm/min	55	55	48	48	48	25	86	86	86	62	62	62	62	55	55
			Ap mm	0.072	0.045	0.045	0.027	0.027	0.018	0.24	0.168	0.168	0.096	0.096	0.096	0.06	0.06	0.06
	40	1.0D	Vc m/min	69	69	61	61	61	46	87	87	87	78	78	78	78	69	69
			fz mm/tooth	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004
			rpm obr/min	14642	14642	12945	12945	12945	9762	13846	13846	13846	12414	12414	12414	12414	10982	10982
			feed posuw mm/min	117	117	78	78	78	59	138	138	138	124	124	124	124	88	88
			Ap mm	0.09	0.056	0.056	0.034	0.034	0.023	0.3	0.21	0.21	0.12	0.12	0.12	0.075	0.075	0.075
	41	1.0D	Vc m/min	43	43	38	38	38	29	54	54	54	49	49	49	49	43	43
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.002	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	9125	9125	8064	8064	8064	6154	8594	8594	8594	7799	7799	7799	7799	6844	6844
			feed posuw mm/min	55	55	48	48	48	25	86	86	86	62	62	62	62	55	55
			Ap mm	0.072	0.045	0.045	0.027	0.027	0.018	0.24	0.168	0.168	0.096	0.096	0.096	0.06	0.06	0.06

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	2.0	2.5	2.5	25	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
			LBS	30	8	10	12	14	16	20	26	30	8	10	12	14	16	20	26
P	1-5	1.0D	Vc m/min	109	141	141	141	127	127	127	113	113	150	150	150	150	135	135	135
			fz mm/tooth	0.006	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.01	0.01	0.01	0.01	0.009	0.009	0.009
			rpm obr/min	17348	17953	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324
			feed posuw mm/min	208	323	323	323	259	259	259	201	201	318	318	318	318	258	258	258
			Ap mm	0.06	0.35	0.35	0.35	0.2	0.2	0.2	0.125	0.125	0.6	0.42	0.42	0.42	0.24	0.24	0.15
	6-8	1.0D	Vc m/min	109	141	141	141	127	127	127	113	113	150	150	150	150	135	135	135
			fz mm/tooth	0.006	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.01	0.01	0.01	0.01	0.009	0.009	0.009
			rpm obr/min	17348	17953	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324
			feed posuw mm/min	208	323	323	323	259	259	259	201	201	318	318	318	318	258	258	258
			Ap mm	0.06	0.35	0.35	0.35	0.2	0.2	0.2	0.125	0.125	0.6	0.42	0.42	0.42	0.24	0.24	0.15
	9	1.0D	Vc m/min	69	90	90	90	81	81	81	72	72	97	97	97	97	87	87	87
			fz mm/tooth	0.004	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007
			rpm obr/min	10982	11459	11459	11459	10313	10313	10313	9167	9167	10292	10292	10292	10292	9231	9231	9231
			feed posuw mm/min	88	160	160	160	124	124	124	92	92	165	165	165	165	129	129	129
			Ap mm	0.045	0.263	0.263	0.263	0.15	0.15	0.15	0.094	0.094	0.45	0.315	0.315	0.315	0.18	0.18	0.113
	10-11.1	1.0D	Vc m/min	109	141	141	141	127	127	127	113	113	150	150	150	150	135	135	135
			fz mm/tooth	0.006	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.01	0.01	0.01	0.01	0.009	0.009	0.009
			rpm obr/min	17348	17953	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324
			feed posuw mm/min	208	323	323	323	259	259	259	201	201	318	318	318	318	258	258	258
			Ap mm	0.06	0.35	0.35	0.35	0.2	0.2	0.2	0.125	0.125	0.6	0.42	0.42	0.42	0.24	0.24	0.15
	11.2	1.0D	Vc m/min	69	90	90	90	81	81	81	72	72	97	97	97	97	87	87	87
			fz mm/tooth	0.004	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007
			rpm obr/min	10982	11459	11459	11459	10313	10313	10313	9167	9167	10292	10292	10292	10292	9231	9231	9231
			feed posuw mm/min	88	160	160	160	124	124	124	92	92	165	165	165	165	129	129	129
			Ap mm	0.045	0.263	0.263	0.263	0.15	0.15	0.15	0.094	0.094	0.45	0.315	0.315	0.315	0.18	0.18	0.113
K	15-20	1.0D	Vc m/min	109	141	141	141	127	127	127	113	113	150	150	150	150	135	135	135
			fz mm/tooth	0.006	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.01	0.01	0.01	0.01	0.009	0.009	0.009
			rpm obr/min	17348	17953	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324
			feed posuw mm/min	208	323	323	323	259	259	259	201	201	318	318	318	318	258	258	258
			Ap mm	0.06	0.35	0.35	0.35	0.2	0.2	0.2	0.125	0.125	0.6	0.42	0.42	0.42	0.24	0.24	0.15
H	38.1 - 38.2	1.0D	Vc m/min	43	57	57	57	52	52	52	46	46	59	59	59	59	53	53	53
			fz mm/tooth	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006
			rpm obr/min	6844	7257	7257	7257	6621	6621	6621	5857	5857	6260	6260	6260	6260	5623	5623	5623
			feed posuw mm/min	55	73	73	73	66	66	66	47	47	75	75	75	75	67	67	67
			Ap mm	0.036	0.21	0.21	0.21	0.12	0.12	0.12	0.075	0.075	0.36	0.252	0.252	0.252	0.144	0.144	0.09
	40	1.0D	Vc m/min	69	90	90	90	81	81	81	72	72	97	97	97	97	87	87	87
			fz mm/tooth	0.004	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007
			rpm obr/min	10982	11459	11459	11459	10313	10313	10313	9167	9167	10292	10292	10292	10292	9231	9231	9231
			feed posuw mm/min	88	160	160	160	124	124	124	92	92	165	165	165	165	129	129	129
			Ap mm	0.045	0.263	0.263	0.263	0.15	0.15	0.15	0.094	0.094	0.45	0.315	0.315	0.315	0.18	0.18	0.113
	41	1.0D	Vc m/min	43	57	57	57	52	52	52	46	46	59	59	59	59	53	53	53
			fz mm/tooth	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006
			rpm obr/min	6844	7257	7257	7257	6621	6621	6621	5857	5857	6260	6260	6260	6260	5623	5623	5623
			feed posuw mm/min	55	73	73	73	66	66	66	47	47	75	75	75	75	67	67	67
			Ap mm	0.036	0.21	0.21	0.21	0.12	0.12	0.12	0.075	0.075	0.36	0.252	0.252	0.252	0.144	0.144	0.09

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
			LBS	30	35	40	10	12	14	16	20	26	30	35	40	45
P	1-5	1.0D	Vc m/min	135	120	120	161	161	161	161	161	145	145	145	145	129
			fz mm/tooth	0.009	0.008	0.008	0.016	0.016	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.012
			rpm obr/min	14324	12732	12732	12812	12812	12812	12812	12812	11539	11539	11539	11539	10265
			feed posuw mm/min	258	204	204	410	410	410	410	410	323	323	323	323	246
			Ap mm	0.15	0.15	0.09	0.8	0.8	0.56	0.56	0.56	0.32	0.32	0.2	0.2	0.2
	6-8	1.0D	Vc m/min	135	120	120	161	161	161	161	161	145	145	145	145	129
			fz mm/tooth	0.009	0.008	0.008	0.016	0.016	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.012
			rpm obr/min	14324	12732	12732	12812	12812	12812	12812	12812	11539	11539	11539	11539	10265
			feed posuw mm/min	258	204	204	410	410	410	410	410	323	323	323	323	246
			Ap mm	0.15	0.15	0.09	0.8	0.8	0.56	0.56	0.56	0.32	0.32	0.2	0.2	0.2
	9	1.0D	Vc m/min	87	78	78	103	103	103	103	103	93	93	93	93	82
			fz mm/tooth	0.007	0.006	0.006	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.01
			rpm obr/min	9231	8276	8276	8196	8196	8196	8196	8196	7401	7401	7401	7401	6525
			feed posuw mm/min	129	99	99	197	197	197	197	197	163	163	163	163	131
			Ap mm	0.113	0.113	0.068	0.6	0.6	0.42	0.42	0.42	0.24	0.24	0.15	0.15	0.15
	10-11.1	1.0D	Vc m/min	135	120	120	161	161	161	161	161	145	145	145	145	129
			fz mm/tooth	0.009	0.008	0.008	0.016	0.016	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.012
			rpm obr/min	14324	12732	12732	12812	12812	12812	12812	12812	11539	11539	11539	11539	10265
			feed posuw mm/min	258	204	204	410	410	410	410	410	323	323	323	323	246
			Ap mm	0.15	0.15	0.09	0.8	0.8	0.56	0.56	0.56	0.32	0.32	0.2	0.2	0.2
	11.2	1.0D	Vc m/min	87	78	78	103	103	103	103	103	93	93	93	93	82
			fz mm/tooth	0.007	0.006	0.006	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.01
			rpm obr/min	9231	8276	8276	8196	8196	8196	8196	8196	7401	7401	7401	7401	6525
			feed posuw mm/min	129	99	99	197	197	197	197	197	163	163	163	163	131
			Ap mm	0.113	0.113	0.068	0.6	0.6	0.42	0.42	0.42	0.24	0.24	0.15	0.15	0.15
K	15-20	1.0D	Vc m/min	135	120	120	161	161	161	161	161	145	145	145	145	129
			fz mm/tooth	0.009	0.008	0.008	0.016	0.016	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.012
			rpm obr/min	14324	12732	12732	12812	12812	12812	12812	12812	11539	11539	11539	11539	10265
			feed posuw mm/min	258	204	204	410	410	410	410	410	323	323	323	323	246
			Ap mm	0.15	0.15	0.09	0.8	0.8	0.56	0.56	0.56	0.32	0.32	0.2	0.2	0.2
H	38.1 - 38.2	1.0D	Vc m/min	53	48	48	65	65	65	65	65	58	58	58	58	52
			fz mm/tooth	0.006	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.007
			rpm obr/min	5623	5093	5093	5173	5173	5173	5173	5173	4615	4615	4615	4615	4138
			feed posuw mm/min	67	51	51	93	93	93	93	93	74	74	74	74	58
			Ap mm	0.09	0.09	0.054	0.48	0.48	0.336	0.336	0.336	0.192	0.192	0.12	0.12	0.12
	40	1.0D	Vc m/min	87	78	78	103	103	103	103	103	93	93	93	93	82
			fz mm/tooth	0.007	0.006	0.006	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.01
			rpm obr/min	9231	8276	8276	8196	8196	8196	8196	8196	7401	7401	7401	7401	6525
			feed posuw mm/min	129	99	99	197	197	197	197	197	163	163	163	163	131
			Ap mm	0.113	0.113	0.068	0.6	0.6	0.42	0.42	0.42	0.24	0.24	0.15	0.15	0.15
	41	1.0D	Vc m/min	53	48	48	65	65	65	65	65	58	58	58	58	52
			fz mm/tooth	0.006	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.007
			rpm obr/min	5623	5093	5093	5173	5173	5173	5173	5173	4615	4615	4615	4615	4138
			feed posuw mm/min	67	51	51	93	93	93	93	93	74	74	74	74	58
			Ap mm	0.09	0.09	0.054	0.48	0.48	0.336	0.336	0.336	0.192	0.192	0.12	0.12	0.12

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	4.0	5.0	6.0	6.0	8.0	8.0	10.0	10.0	12.0	12.0	16.0	16.0	20.0	20.0
			LBS	50	15	20	30	25	35	30	40	32	45	35	50	40	55
P	1-5	1.0D	Vc m/min	129	173	179	179	181	181	188	188	188	188	187	187	188	188
			fz mm/tooth	0.012	0.023	0.032	0.032	0.044	0.044	0.053	0.053	0.05	0.05	0.06	0.06	0.055	0.055
			rpm obr/min	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
			feed posuw mm/min	246	507	608	608	634	634	634	634	499	499	446	446	329	329
			Ap mm	0.2	1	0.84	0.84	1.12	1.12	2	1.4	2.4	1.68	3.2	2.24	4	4
	6-8	1.0D	Vc m/min	129	173	179	179	181	181	188	188	188	188	187	187	188	188
			fz mm/tooth	0.012	0.023	0.032	0.032	0.044	0.044	0.053	0.053	0.05	0.05	0.06	0.06	0.055	0.055
			rpm obr/min	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
			feed posuw mm/min	246	507	608	608	634	634	634	634	499	499	446	446	329	329
			Ap mm	0.2	1	0.84	0.84	1.12	1.12	2	1.4	2.4	1.68	3.2	2.24	4	4
	9	1.0D	Vc m/min	82	110	113	113	114	114	126	126	126	126	127	127	123	123
			fz mm/tooth	0.01	0.017	0.025	0.025	0.033	0.033	0.038	0.038	0.04	0.04	0.042	0.042	0.036	0.036
			rpm obr/min	6525	7003	5995	5995	4536	4536	4011	4011	3342	3342	2527	2527	1958	1958
			feed posuw mm/min	131	238	300	300	299	299	305	305	267	267	212	212	141	141
			Ap mm	0.15	0.75	0.63	0.63	0.84	0.84	1.5	1.05	1.8	1.26	2.4	1.68	3	3
	10-11.1	1.0D	Vc m/min	129	173	179	179	181	181	188	188	188	188	187	187	188	188
			fz mm/tooth	0.012	0.023	0.032	0.032	0.044	0.044	0.053	0.053	0.05	0.05	0.06	0.06	0.055	0.055
			rpm obr/min	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
			feed posuw mm/min	246	507	608	608	634	634	634	634	499	499	446	446	329	329
			Ap mm	0.2	1	0.84	0.84	1.12	1.12	2	1.4	2.4	1.68	3.2	2.24	4	4
	11.2	1.0D	Vc m/min	82	110	113	113	114	114	126	126	126	126	127	127	123	123
			fz mm/tooth	0.01	0.017	0.025	0.025	0.033	0.033	0.038	0.038	0.04	0.04	0.042	0.042	0.036	0.036
			rpm obr/min	6525	7003	5995	5995	4536	4536	4011	4011	3342	3342	2527	2527	1958	1958
			feed posuw mm/min	131	238	300	300	299	299	305	305	267	267	212	212	141	141
			Ap mm	0.15	0.75	0.63	0.63	0.84	0.84	1.5	1.05	1.8	1.26	2.4	1.68	3	3
K	15-20	1.0D	Vc m/min	129	173	179	179	181	181	188	188	188	188	187	187	188	188
			fz mm/tooth	0.012	0.023	0.032	0.032	0.044	0.044	0.053	0.053	0.05	0.05	0.06	0.06	0.055	0.055
			rpm obr/min	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
			feed posuw mm/min	246	507	608	608	634	634	634	634	499	499	446	446	329	329
			Ap mm	0.2	1	0.84	0.84	1.12	1.12	2	1.4	2.4	1.68	3.2	2.24	4	4
H	38.1 - 38.2	1.0D	Vc m/min	52	72	74	74	76	76	76	76	75	75	77	77	75	75
			fz mm/tooth	0.007	0.013	0.018	0.018	0.023	0.023	0.029	0.029	0.03	0.03	0.031	0.031	0.029	0.029
			rpm obr/min	4138	4584	3926	3926	3024	3024	2419	2419	1989	1989	1532	1532	1194	1194
			feed posuw mm/min	58	119	141	141	139	139	140	140	119	119	95	95	69	69
			Ap mm	0.12	0.6	0.504	0.504	0.672	0.672	1.2	0.84	1.44	1.008	1.92	1.344	2.4	2.4
	40	1.0D	Vc m/min	82	110	113	113	114	114	126	126	126	126	127	127	123	123
			fz mm/tooth	0.01	0.017	0.025	0.025	0.033	0.033	0.038	0.038	0.04	0.04	0.042	0.042	0.036	0.036
			rpm obr/min	6525	7003	5995	5995	4536	4536	4011	4011	3342	3342	2527	2527	1958	1958
			feed posuw mm/min	131	238	300	300	299	299	305	305	267	267	212	212	141	141
			Ap mm	0.15	0.75	0.63	0.63	0.84	0.84	1.5	1.05	1.8	1.26	2.4	1.68	3	3
	41	1.0D	Vc m/min	52	72	74	74	76	76	76	76	75	75	77	77	75	75
			fz mm/tooth	0.007	0.013	0.018	0.018	0.023	0.023	0.029	0.029	0.03	0.03	0.031	0.031	0.029	0.029
			rpm obr/min	4138	4584	3926	3926	3024	3024	2419	2419	1989	1989	1532	1532	1194	1194
			feed posuw mm/min	58	119	141	141	139	139	140	140	119	119	95	95	69	69
			Ap mm	0.12	0.6	0.504	0.504	0.672	0.672	1.2	0.84	1.44	1.008	1.92	1.344	2.4	2.4

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX61

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX6101004Y50A025050	0,05	1	4	2,5	50
UFX6101004001A025050	0,1	1	4	2,5	50
UFX6101004002A025050	0,2	1	4	2,5	50
UFX6101004003A025050	0,3	1	4	2,5	50
UFX6101006Y50A025050	0,05	1	6	2,5	50
UFX6101006001A025050	0,1	1	6	2,5	50
UFX6101006002A025050	0,2	1	6	2,5	50
UFX6101006003A025050	0,3	1	6	2,5	50
UFX6101204Y50A030050	0,05	1,2	4	3	50
UFX6101204001A030050	0,1	1,2	4	3	50
UFX6101204002A030050	0,2	1,2	4	3	50
UFX6101204003A030050	0,3	1,2	4	3	50
UFX6101206Y50A030050	0,05	1,2	6	3	50
UFX6101206001A030050	0,1	1,2	6	3	50
UFX6101206002A030050	0,2	1,2	6	3	50
UFX6101206003A030050	0,3	1,2	6	3	50
UFX6101504Y50A040050	0,05	1,5	4	4	50
UFX6101504001A040050	0,1	1,5	4	4	50
UFX6101504002A040050	0,2	1,5	4	4	50
UFX6101504003A040050	0,3	1,5	4	4	50
UFX6101504005A040050	0,5	1,5	4	4	50
UFX6101506Y50A040050	0,05	1,5	6	4	50
UFX6101506001A040050	0,1	1,5	6	4	50
UFX6101506002A040050	0,2	1,5	6	4	50
UFX6101506003A040050	0,3	1,5	6	4	50
UFX6101506005A040050	0,5	1,5	6	4	50
UFX6102004001A060050	0,1	2	4	6	50
UFX6102004002A060050	0,2	2	4	6	50
UFX6102004003A060050	0,3	2	4	6	50
UFX6102004005A060050	0,5	2	4	6	50
UFX6102006001A060050	0,1	2	6	6	50
UFX6102006002A060050	0,2	2	6	6	50
UFX6102006003A060050	0,3	2	6	6	50
UFX6102006005A060050	0,5	2	6	6	50
UFX6102504001A070060	0,1	2,5	4	7	60
UFX6102504002A070060	0,2	2,5	4	7	60
UFX6102504003A070060	0,3	2,5	4	7	60

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX61

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX6102504005A070060	0,5	2,5	4	7	60
UFX6102506001A070060	0,1	2,5	6	7	60
UFX6102506002A070060	0,2	2,5	6	7	60
UFX6102506003A070060	0,3	2,5	6	7	60
UFX6102506005A070060	0,5	2,5	6	7	60
UFX6103006001A080060	0,1	3	6	8	60
UFX6103006002A080060	0,2	3	6	8	60
UFX6103006003A080060	0,3	3	6	8	60
UFX6103006005A080060	0,5	3	6	8	60
UFX6103006010A080060	1	3	6	8	60
UFX6103506001A100070	0,1	3,5	6	10	70
UFX6103506002A100070	0,2	3,5	6	10	70
UFX6103506003A100070	0,3	3,5	6	10	70
UFX6103506005A100070	0,5	3,5	6	10	70
UFX6104004001A100070	0,1	4	4	10	70
UFX6104004002A100070	0,2	4	4	10	70
UFX6104004003A100070	0,3	4	4	10	70
UFX6104004005A100070	0,5	4	4	10	70
UFX6104004010A100070	1	4	4	10	70
UFX6104004001A100100	0,1	4	4	10	100
UFX6104004002A100100	0,2	4	4	10	100
UFX6104004003A100100	0,3	4	4	10	100
UFX6104004005A100100	0,5	4	4	10	100
UFX6104004010A100100	1	4	4	10	100
UFX6104006001A100070	0,1	4	6	10	70
UFX6104006002A100070	0,2	4	6	10	70
UFX6104006003A100070	0,3	4	6	10	70
UFX6104006005A100070	0,5	4	6	10	70
UFX6104006010A100070	1	4	6	10	70
UFX6104506001A110080	0,1	4,5	6	11	80
UFX6104506002A110080	0,2	4,5	6	11	80
UFX6104506003A110080	0,3	4,5	6	11	80
UFX6104506005A110080	0,5	4,5	6	11	80
UFX6105006001A130090	0,1	5	6	13	90
UFX6105006002A130090	0,2	5	6	13	90

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX61

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX6105006003A130090	0,3	5	6	13	90
UFX6105006005A130090	0,5	5	6	13	90
UFX6105006010A130090	1	5	6	13	90
UFX6105506001A130090	0,1	5,5	6	13	90
UFX6105506002A130090	0,2	5,5	6	13	90
UFX6105506003A130090	0,3	5,5	6	13	90
UFX6105506005A130090	0,5	5,5	6	13	90
UFX6105506010A130090	1	5,5	6	13	90
UFX6106006001A150060	0,1	6	6	15	60
UFX6106006002A150060	0,2	6	6	15	60
UFX6106006001A150090	0,1	6	6	15	90
UFX6106006002A150090	0,2	6	6	15	90
UFX6106006003A150090	0,3	6	6	15	90
UFX6106006005A150090	0,5	6	6	15	90
UFX6106006010A150090	1	6	6	15	90
UFX6106006015A150090	1,5	6	6	15	90
UFX6106006020A150090	2	6	6	15	90
UFX6106006005A150110	0,5	6	6	15	110
UFX6106006010A150110	1	6	6	15	110
UFX6106006005A150130	0,5	6	6	15	130
UFX6106006010A150130	1	6	6	15	130
UFX6107008001A160090	0,1	7	8	16	90
UFX6107008002A160090	0,2	7	8	16	90
UFX6107008003A160090	0,3	7	8	16	90
UFX6107008005A160090	0,5	7	8	16	90
UFX6107008010A160090	1	7	8	16	90
UFX6107008020A160090	2	7	8	16	90
UFX6108008003A200070	0,3	8	8	20	70
UFX6108008005A200070	0,5	8	8	20	70
UFX6108008010A200070	1	8	8	20	70
UFX6108008001A200100	0,1	8	8	20	100
UFX6108008002A200100	0,2	8	8	20	100
UFX6108008003A200100	0,3	8	8	20	100
UFX6108008005A200100	0,5	8	8	20	100
UFX6108008010A200100	1	8	8	20	100
UFX6108008015A200100	1,5	8	8	20	100
UFX6108008020A200100	2	8	8	20	100

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX61

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX6108008025A200100	2,5	8	8	20	100
UFX6108008030A200100	3	8	8	20	100
UFX6108008005A200120	0,5	8	8	20	120
UFX6108008010A200120	1	8	8	20	120
UFX6108008005A200150	0,5	8	8	20	150
UFX6108008010A200150	1	8	8	20	150
UFX6110010003A250075	0,3	10	10	25	75
UFX6110010005A250075	0,5	10	10	25	75
UFX6110010010A250075	1	10	10	25	75
UFX6110010001A250100	0,1	10	10	25	100
UFX6110010002A250100	0,2	10	10	25	100
UFX6110010003A250100	0,3	10	10	25	100
UFX6110010005A250100	0,5	10	10	25	100
UFX6110010010A250100	1	10	10	25	100
UFX6110010015A250100	1,5	10	10	25	100
UFX6110010020A250100	2	10	10	25	100
UFX6110010025A250100	2,5	10	10	25	100
UFX6110010030A250100	3	10	10	25	100
UFX6110010040A250100	4	10	10	25	100
UFX6110010005A220130	0,5	10	10	22	130
UFX6110010010A220130	1	10	10	22	130
UFX6110010005A220150	0,5	10	10	22	150
UFX6110010010A220150	1	10	10	22	150
UFX6111012002A250110	0,2	11	12	25	110
UFX6111012003A250110	0,3	11	12	25	110
UFX6111012005A250110	0,5	11	12	25	110
UFX6111012010A250110	1	11	12	25	110
UFX6111012020A250110	2	11	12	25	110
UFX6112012003A300080	0,3	12	12	30	80
UFX6112012005A300080	0,5	12	12	30	80
UFX6112012010A300080	1	12	12	30	80
UFX6112012001A300110	0,1	12	12	30	110
UFX6112012002A300110	0,2	12	12	30	110
UFX6112012003A300110	0,3	12	12	30	110
UFX6112012005A300110	0,5	12	12	30	110
UFX6112012010A300110	1	12	12	30	110

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX61

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX6112012015A300110	1,5	12	12	30	110
UFX6112012020A300110	2	12	12	30	110
UFX6112012025A300110	2,5	12	12	30	110
UFX6112012030A300110	3	12	12	30	110
UFX6112012040A300110	4	12	12	30	110
UFX6112012050A300110	5	12	12	30	110
UFX6112012005A300130	0,5	12	12	30	130
UFX6112012010A300130	1	12	12	30	130
UFX6112012005A300150	0,5	12	12	30	130
UFX6112012010A300150	1	12	12	30	130
UFX6114016005A350150	0,5	14	16	35	150
UFX6114016010A350150	1	14	16	35	150
UFX6114016020A350150	2	14	16	35	150
UFX6116016005A320150	0,5	16	16	32	150
UFX6116016010A320150	1	16	16	32	150
UFX6116016015A320150	1,5	16	16	32	150
UFX6116016020A320150	2	16	16	32	150
UFX6120020005A380150	0,5	20	20	38	150
UFX6120020010A380150	1	20	20	38	150
UFX6120020015A380150	1,5	20	20	38	150
UFX6120020020A380150	2	20	20	38	150

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX61

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.2	1.5	2.0	2.5	3.0	3.5	4.0
P	1-5	0.08D	0.05D	Vc m/min	87	93	104	113	118	125	132	135
				fz mm/tooth	0.003	0.003	0.004	0.004	0.006	0.006	0.008	0.01
				rpm obr/min	27693	24669	22069	17985	15024	13263	12005	10743
				feed posuw mm/min	332	296	353	288	361	318	384	430
	6-8	0.08D	0.05D	Vc m/min	87	93	104	113	118	125	132	135
				fz mm/tooth	0.003	0.003	0.004	0.004	0.006	0.006	0.008	0.01
				rpm obr/min	27693	24669	22069	17985	15024	13263	12005	10743
				feed posuw mm/min	332	296	353	288	361	318	384	430
	9	0.08D	0.05D	Vc m/min	57	59	64	73	75	81	85	86
				fz mm/tooth	0.003	0.004	0.004	0.005	0.007	0.008	0.009	0.011
				rpm obr/min	18144	15650	13581	11618	9549	8594	7730	6844
				feed posuw mm/min	218	250	217	232	267	275	278	301
	10-11.1	0.08D	0.05D	Vc m/min	87	93	104	113	118	125	132	135
				fz mm/tooth	0.003	0.003	0.004	0.004	0.006	0.006	0.008	0.01
				rpm obr/min	27693	24669	22069	17985	15024	13263	12005	10743
				feed posuw mm/min	332	296	353	288	361	318	384	430
	11.2	0.08D	0.05D	Vc m/min	57	59	64	73	75	81	85	86
				fz mm/tooth	0.003	0.004	0.004	0.005	0.007	0.008	0.009	0.011
				rpm obr/min	18144	15650	13581	11618	9549	8594	7730	6844
				feed posuw mm/min	218	250	217	232	267	275	278	301
K	15-20	0.08D	0.05D	Vc m/min	87	93	104	113	118	125	132	135
				fz mm/tooth	0.003	0.003	0.004	0.004	0.006	0.006	0.008	0.01
				rpm obr/min	27693	24669	22069	17985	15024	13263	12005	10743
				feed posuw mm/min	332	296	353	288	361	318	384	430
H	38.1-38.2	0.08D	0.05D	Vc m/min	35	37	40	45	48	50	53	54
				fz mm/tooth	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.008
				rpm obr/min	11141	9815	8488	7162	6112	5305	4820	4297
				feed posuw mm/min	134	118	136	143	122	127	135	138
	40	0.08D	0.05D	Vc m/min	57	59	64	73	75	81	85	86
				fz mm/tooth	0.003	0.004	0.004	0.005	0.007	0.008	0.009	0.011
				rpm obr/min	18144	15650	13581	11618	9549	8594	7730	6844
				feed posuw mm/min	218	250	217	232	267	275	278	301
	41	0.08D	0.05D	Vc m/min	35	37	40	45	48	50	53	54
				fz mm/tooth	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.008
				rpm obr/min	11141	9815	8488	7162	6112	5305	4820	4297
				feed posuw mm/min	134	118	136	143	122	127	135	138

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX61

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	4.5	5.0	5.5	6.0	7.0	8.0	10.0	11.0	12.0	14.0	16.0	20.0
P	1-5	0.08D	0.05D	Vc m/min	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.011	0.012	0.013	0.014	0.016	0.019	0.023	0.022	0.022	0.022	0.023	0.023
				rpm obr/min	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	439	440	442	443	445	457	463	402	362	318	286	231
	6-8	0.08D	0.05D	Vc m/min	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.011	0.012	0.013	0.014	0.016	0.019	0.023	0.022	0.022	0.022	0.023	0.023
				rpm obr/min	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	439	440	442	443	445	457	463	402	362	318	286	231
	9	0.08D	0.05D	Vc m/min	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.013	0.016	0.017	0.018	0.02	0.024	0.027	0.028	0.029	0.028	0.027	0.027
				rpm obr/min	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	327	371	370	363	353	367	354	340	323	272	228	177
	10-11.1	0.08D	0.05D	Vc m/min	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.011	0.012	0.013	0.014	0.016	0.019	0.023	0.022	0.022	0.022	0.023	0.023
				rpm obr/min	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	439	440	442	443	445	457	463	402	362	318	286	231
	11.2	0.08D	0.05D	Vc m/min	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.013	0.016	0.017	0.018	0.02	0.024	0.027	0.028	0.029	0.028	0.027	0.027
				rpm obr/min	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	327	371	370	363	353	367	354	340	323	272	228	177
K	15-20	0.08D	0.05D	Vc m/min	141	144	147	149	153	151	158	158	155	159	156	158
				fz mm/tooth	0.011	0.012	0.013	0.014	0.016	0.019	0.023	0.022	0.022	0.022	0.023	0.023
				rpm obr/min	9974	9167	8508	7905	6957	6008	5029	4572	4112	3615	3104	2515
				feed posuw mm/min	439	440	442	443	445	457	463	402	362	318	286	231
H	38.1-38.2	0.08D	0.05D	Vc m/min	57	60	61	62	64	63	63	64	63	65	64	63
				fz mm/tooth	0.01	0.011	0.012	0.013	0.015	0.017	0.021	0.021	0.021	0.021	0.022	0.023
				rpm obr/min	4032	3820	3530	3289	2910	2507	2005	1852	1671	1478	1273	1003
				feed posuw mm/min	161	168	169	171	175	170	168	156	140	124	112	92
	40	0.08D	0.05D	Vc m/min	89	91	94	95	97	96	103	105	105	107	106	103
				fz mm/tooth	0.013	0.016	0.017	0.018	0.02	0.024	0.027	0.028	0.029	0.028	0.027	0.027
				rpm obr/min	6295	5793	5440	5040	4411	3820	3279	3038	2785	2433	2109	1639
				feed posuw mm/min	327	371	370	363	353	367	354	340	323	272	228	177
	41	0.08D	0.05D	Vc m/min	57	60	61	62	64	63	63	64	63	65	64	63
				fz mm/tooth	0.01	0.011	0.012	0.013	0.015	0.017	0.021	0.021	0.021	0.021	0.022	0.023
				rpm obr/min	4032	3820	3530	3289	2910	2507	2005	1852	1671	1478	1273	1003
				feed posuw mm/min	161	168	169	171	175	170	168	156	140	124	112	92

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX62

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	●	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX6201004Y50A015030	0,05	1	4	1,5	3	50	0,95
UFX6201004Y50A015040	0,05	1	4	1,5	4	50	0,95
UFX6201004Y50A015060	0,05	1	4	1,5	6	50	0,95
UFX6201004Y50A015080	0,05	1	4	1,5	8	50	0,95
UFX6201004Y50A015100	0,05	1	4	1,5	10	50	0,95
UFX6201004Y50A015120	0,05	1	4	1,5	12	50	0,95
UFX6201004Y50A015140	0,05	1	4	1,5	14	50	0,95
UFX6201004Y50A015160	0,05	1	4	1,5	16	50	0,95
UFX6201004Y50A015200	0,05	1	4	1,5	20	50	0,95
UFX6201004001A015030	0,1	1	4	1,5	3	50	0,95
UFX6201004001A015040	0,1	1	4	1,5	4	50	0,95
UFX6201004001A015060	0,1	1	4	1,5	6	50	0,95
UFX6201004001A015080	0,1	1	4	1,5	8	50	0,95
UFX6201004001A015100	0,1	1	4	1,5	10	50	0,95
UFX6201004001A015120	0,1	1	4	1,5	12	50	0,95
UFX6201004001A015140	0,1	1	4	1,5	14	50	0,95
UFX6201004001A015160	0,1	1	4	1,5	16	50	0,95
UFX6201004001A015200	0,1	1	4	1,5	20	50	0,95
UFX6201004002A015030	0,2	1	4	1,5	3	50	0,95
UFX6201004002A015040	0,2	1	4	1,5	4	50	0,95
UFX6201004002A015060	0,2	1	4	1,5	6	50	0,95
UFX6201004002A015080	0,2	1	4	1,5	8	50	0,95
UFX6201004002A015100	0,2	1	4	1,5	10	50	0,95
UFX6201004002A015120	0,2	1	4	1,5	12	50	0,95
UFX6201004002A015140	0,2	1	4	1,5	14	50	0,95
UFX6201004002A015160	0,2	1	4	1,5	16	50	0,95
UFX6201004002A015200	0,2	1	4	1,5	20	50	0,95
UFX6201004003A015030	0,3	1	4	1,5	3	50	0,95
UFX6201004003A015040	0,3	1	4	1,5	4	50	0,95
UFX6201004003A015060	0,3	1	4	1,5	6	50	0,95
UFX6201004003A015080	0,3	1	4	1,5	8	50	0,95
UFX6201004003A015100	0,3	1	4	1,5	10	50	0,95
UFX6201004003A015120	0,3	1	4	1,5	12	50	0,95
UFX6201004003A015140	0,3	1	4	1,5	14	50	0,95
UFX6201004003A015160	0,3	1	4	1,5	16	50	0,95
UFX6201004003A015200	0,3	1	4	1,5	20	50	0,95

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 –-0.03	h5

UFX62

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX6201204Y50A018030	0,05	1,2	4	1,8	3	50	1,15
UFX6201204Y50A018040	0,05	1,2	4	1,8	4	50	1,15
UFX6201204Y50A018060	0,05	1,2	4	1,8	6	50	1,15
UFX6201204Y50A018080	0,05	1,2	4	1,8	8	50	1,15
UFX6201204Y50A018100	0,05	1,2	4	1,8	10	50	1,15
UFX6201204Y50A018120	0,05	1,2	4	1,8	12	50	1,15
UFX6201204Y50A018160	0,05	1,2	4	1,8	16	50	1,15
UFX6201204Y50A018200	0,05	1,2	4	1,8	20	50	1,15
UFX6201204001A018030	0,1	1,2	4	1,8	3	50	1,15
UFX6201204001A018040	0,1	1,2	4	1,8	4	50	1,15
UFX6201204001A018060	0,1	1,2	4	1,8	6	50	1,15
UFX6201204001A018080	0,1	1,2	4	1,8	8	50	1,15
UFX6201204001A018100	0,1	1,2	4	1,8	10	50	1,15
UFX6201204001A018120	0,1	1,2	4	1,8	12	50	1,15
UFX6201204001A018160	0,1	1,2	4	1,8	16	50	1,15
UFX6201204001A018200	0,1	1,2	4	1,8	20	50	1,15
UFX6201204002A018030	0,2	1,2	4	1,8	3	50	1,15
UFX6201204002A018040	0,2	1,2	4	1,8	4	50	1,15
UFX6201204002A018060	0,2	1,2	4	1,8	6	50	1,15
UFX6201204002A018080	0,2	1,2	4	1,8	8	50	1,15
UFX6201204002A018100	0,2	1,2	4	1,8	10	50	1,15
UFX6201204002A018120	0,2	1,2	4	1,8	12	50	1,15
UFX6201204002A018160	0,2	1,2	4	1,8	16	50	1,15
UFX6201204002A018200	0,2	1,2	4	1,8	20	50	1,15
UFX6201204003A018030	0,3	1,2	4	1,8	3	50	1,15
UFX6201204003A018040	0,3	1,2	4	1,8	4	50	1,15
UFX6201204003A018060	0,3	1,2	4	1,8	6	50	1,15
UFX6201204003A018080	0,3	1,2	4	1,8	8	50	1,15
UFX6201204003A018100	0,3	1,2	4	1,8	10	50	1,15
UFX6201204003A018120	0,3	1,2	4	1,8	12	50	1,15
UFX6201204003A018160	0,3	1,2	4	1,8	16	50	1,15
UFX6201204003A018200	0,3	1,2	4	1,8	20	50	1,15
UFX6201504Y50A023040	0,05	1,5	4	2,3	4	50	1,45
UFX6201504Y50A023060	0,05	1,5	4	2,3	6	50	1,45
UFX6201504Y50A023080	0,05	1,5	4	2,3	8	50	1,45
UFX6201504Y50A023100	0,05	1,5	4	2,3	10	50	1,45

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX62

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	●	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX6201504Y50A023120	0,05	1,5	4	2,3	12	50	1,45
UFX6201504Y50A023140	0,05	1,5	4	2,3	14	50	1,45
UFX6201504Y50A023160	0,05	1,5	4	2,3	16	50	1,45
UFX6201504Y50A023200	0,05	1,5	4	2,3	20	50	1,45
UFX6201504Y50A023220	0,05	1,5	4	2,3	22	60	1,45
UFX6201504Y50A023260	0,05	1,5	4	2,3	26	60	1,45
UFX6201504001A023040	0,1	1,5	4	2,3	4	50	1,45
UFX6201504001A023060	0,1	1,5	4	2,3	6	50	1,45
UFX6201504001A023080	0,1	1,5	4	2,3	8	50	1,45
UFX6201504001A023100	0,1	1,5	4	2,3	10	50	1,45
UFX6201504001A023120	0,1	1,5	4	2,3	12	50	1,45
UFX6201504001A023140	0,1	1,5	4	2,3	14	50	1,45
UFX6201504001A023160	0,1	1,5	4	2,3	16	50	1,45
UFX6201504001A023180	0,1	1,5	4	2,3	18	50	1,45
UFX6201504001A023200	0,1	1,5	4	2,3	20	50	1,45
UFX6201504001A023220	0,1	1,5	4	2,3	22	60	1,45
UFX6201504001A023260	0,1	1,5	4	2,3	26	60	1,45
UFX6201504002A023040	0,2	1,5	4	2,3	4	50	1,45
UFX6201504002A023060	0,2	1,5	4	2,3	6	50	1,45
UFX6201504002A023080	0,2	1,5	4	2,3	8	50	1,45
UFX6201504002A023100	0,2	1,5	4	2,3	10	50	1,45
UFX6201504002A023120	0,2	1,5	4	2,3	12	50	1,45
UFX6201504002A023140	0,2	1,5	4	2,3	14	50	1,45
UFX6201504002A023160	0,2	1,5	4	2,3	16	50	1,45
UFX6201504002A023200	0,2	1,5	4	2,3	20	50	1,45
UFX6201504002A023220	0,2	1,5	4	2,3	22	60	1,45
UFX6201504002A023260	0,2	1,5	4	2,3	26	60	1,45
UFX6201504003A023040	0,3	1,5	4	2,3	4	50	1,45
UFX6201504003A023060	0,3	1,5	4	2,3	6	50	1,45
UFX6201504003A023080	0,3	1,5	4	2,3	8	50	1,45
UFX6201504003A023100	0,3	1,5	4	2,3	10	50	1,45
UFX6201504003A023120	0,3	1,5	4	2,3	12	50	1,45
UFX6201504003A023140	0,3	1,5	4	2,3	14	50	1,45
UFX6201504003A023160	0,3	1,5	4	2,3	16	50	1,45
UFX6201504003A023200	0,3	1,5	4	2,3	20	50	1,45
UFX6201504003A023220	0,3	1,5	4	2,3	22	60	1,45
UFX6201504003A023260	0,3	1,5	4	2,3	26	60	1,45

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX62

R 4 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFX62

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	○	●	●	●	●	○	●	●	●	○	●				○	○	○	○	○

ISO	K		N											S								H			
HRc		21												15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100						200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38	39	40	41		
	○																			○		●	○		

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX6202504005A040080	0,5	2,5	4	4	8	50	2,4
UFX6202504005A040100	0,5	2,5	4	4	10	50	2,4
UFX6202504005A040120	0,5	2,5	4	4	12	50	2,4
UFX6202504005A040140	0,5	2,5	4	4	14	50	2,4
UFX6202504005A040160	0,5	2,5	4	4	16	50	2,4
UFX6202504005A040200	0,5	2,5	4	4	20	50	2,4
UFX6202504005A040260	0,5	2,5	4	4	26	60	2,4
UFX6202504005A040300	0,5	2,5	4	4	30	70	2,4
UFX6203006001A045080	0,1	3	6	4,5	8	50	2,85
UFX6203006001A045100	0,1	3	6	4,5	10	50	2,85
UFX6203006001A045120	0,1	3	6	4,5	12	50	2,85
UFX6203006001A045140	0,1	3	6	4,5	14	60	2,85
UFX6203006001A045160	0,1	3	6	4,5	16	60	2,85
UFX6203006001A045200	0,1	3	6	4,5	20	60	2,85
UFX6203006001A045260	0,1	3	6	4,5	26	65	2,85
UFX6203006001A045300	0,1	3	6	4,5	30	70	2,85
UFX6203006001A045350	0,1	3	6	4,5	35	70	2,85
UFX6203006001A045400	0,1	3	6	4,5	40	80	2,85
UFX6203006002A045080	0,2	3	6	4,5	8	50	2,85
UFX6203006002A045100	0,2	3	6	4,5	10	50	2,85
UFX6203006002A045120	0,2	3	6	4,5	12	50	2,85
UFX6203006002A045140	0,2	3	6	4,5	14	60	2,85
UFX6203006002A045160	0,2	3	6	4,5	16	60	2,85
UFX6203006002A045180	0,2	3	6	4,5	18	60	2,85
UFX6203006002A045200	0,2	3	6	4,5	20	60	2,85
UFX6203006002A045260	0,2	3	6	4,5	26	65	2,85
UFX6203006002A045300	0,2	3	6	4,5	30	70	2,85
UFX6203006002A045350	0,2	3	6	4,5	35	70	2,85
UFX6203006002A045400	0,2	3	6	4,5	40	80	2,85
UFX6203006003A045080	0,3	3	6	4,5	8	50	2,85
UFX6203006003A045100	0,3	3	6	4,5	10	50	2,85
UFX6203006003A045120	0,3	3	6	4,5	12	50	2,85
UFX6203006003A045140	0,3	3	6	4,5	14	60	2,85
UFX6203006003A045160	0,3	3	6	4,5	16	60	2,85
UFX6203006003A045200	0,3	3	6	4,5	20	60	2,85
UFX6203006003A045260	0,3	3	6	4,5	26	65	2,85
UFX6203006003A045300	0,3	3	6	4,5	30	70	2,85

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX62

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	○	●	●	●	●	○	●	●	●	○	●				○	○	○	○	○

ISO	K		N											S								H			
HRc		21												15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100						200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38	39	40	41		
	○																			○		●	○		

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX6203006003A045350	0,3	3	6	4,5	35	70	2,85
UFX6203006003A045400	0,3	3	6	4,5	40	80	2,85
UFX6203006005A045080	0,5	3	6	4,5	8	50	2,85
UFX6203006005A045100	0,5	3	6	4,5	10	50	2,85
UFX6203006005A045120	0,5	3	6	4,5	12	50	2,85
UFX6203006005A045140	0,5	3	6	4,5	14	60	2,85
UFX6203006005A045160	0,5	3	6	4,5	16	60	2,85
UFX6203006005A045200	0,5	3	6	4,5	20	60	2,85
UFX6203006005A045260	0,5	3	6	4,5	26	65	2,85
UFX6203006005A045300	0,5	3	6	4,5	30	70	2,85
UFX6203006005A045350	0,5	3	6	4,5	35	70	2,85
UFX6203006005A045400	0,5	3	6	4,5	40	80	2,85
UFX6203006010A045080	1	3	6	4,5	8	50	2,85
UFX6203006010A045100	1	3	6	4,5	10	50	2,85
UFX6203006010A045120	1	3	6	4,5	12	50	2,85
UFX6203006010A045140	1	3	6	4,5	14	60	2,85
UFX6203006010A045160	1	3	6	4,5	16	60	2,85
UFX6203006010A045200	1	3	6	4,5	20	60	2,85
UFX6203006010A045260	1	3	6	4,5	26	65	2,85
UFX6203006010A045300	1	3	6	4,5	30	70	2,85
UFX6203006010A045350	1	3	6	4,5	35	70	2,85
UFX6203006010A045400	1	3	6	4,5	40	80	2,85
UFX6204006001A060100	0,1	4	6	6	10	50	3,85
UFX6204006001A060120	0,1	4	6	6	12	50	3,85
UFX6204006001A060140	0,1	4	6	6	14	60	3,85
UFX6204006001A060160	0,1	4	6	6	16	60	3,85
UFX6204006001A060200	0,1	4	6	6	20	60	3,85
UFX6204006001A060260	0,1	4	6	6	26	65	3,85
UFX6204006001A060300	0,1	4	6	6	30	70	3,85
UFX6204006001A060350	0,1	4	6	6	35	70	3,85
UFX6204006001A060400	0,1	4	6	6	40	80	3,85
UFX6204006001A060450	0,1	4	6	6	45	90	3,85
UFX6204006001A060500	0,1	4	6	6	50	100	3,85
UFX6204006002A060100	0,2	4	6	6	10	50	3,85
UFX6204006002A060120	0,2	4	6	6	12	50	3,85
UFX6204006002A060140	0,2	4	6	6	14	60	3,85

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX62

R 4 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFX62

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	●	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFX6208008010A200350	1	8	8	20	35	100	7,7
UFX6210010001A150300	0,1	10	10	15	30	75	9,7
UFX6210010002A150300	0,2	10	10	15	30	75	9,7
UFX6210010003A150300	0,3	10	10	15	30	75	9,7
UFX6210010005A150300	0,5	10	10	15	30	75	9,7
UFX6210010010A150300	1	10	10	15	30	75	9,7
UFX6210010015A150300	1,5	10	10	15	30	75	9,7
UFX6210010020A150300	2	10	10	15	30	75	9,7
UFX6210010003A250400	0,3	10	10	25	40	100	9,7
UFX6210010005A250400	0,5	10	10	25	40	100	9,7
UFX6210010010A250400	1	10	10	25	40	100	9,7
UFX6212012002A180320	0,2	12	12	18	32	80	11,7
UFX6212012003A180320	0,3	12	12	18	32	80	11,7
UFX6212012005A180320	0,5	12	12	18	32	80	11,7
UFX6212012010A180320	1	12	12	18	32	80	11,7
UFX6212012015A180320	1,5	12	12	18	32	80	11,7
UFX6212012020A180320	2	12	12	18	32	80	11,7
UFX6212012003A300450	0,3	12	12	30	50	110	11,7
UFX6212012005A300450	0,5	12	12	30	50	110	11,7
UFX6212012010A300450	1	12	12	30	50	110	11,7
UFX6216016005A200350	0,5	16	16	20	35	100	15,7
UFX6216016010A200350	1	16	16	20	35	100	15,7
UFX6216020005A350500	0,5	16	16	35	50	150	15,7
UFX6216020010A350500	1	16	16	35	50	150	15,7
UFX6220020005A250400	0,5	20	20	35	40	100	19,7
UFX6220020010A250400	1	20	20	35	40	100	19,7
UFX6220020005A400550	0,5	20	20	35	55	150	19,7
UFX6220020010A400550	1	20	20	35	55	150	19,7

CORNER RADIUS TOLERANCE mm	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	0 ~-0.03	h5

UFX62

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE BOKIEM

ISO	VDI 3323	DC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2	12
		LBS	4	6	8	10	12	16	20	22	26	3	4	6	8	10	12	16
P	1-5	Vc m/min	104	94	94	94	83	62	62	31	31	112	112	112	101	101	101	90
		fz mm/tooth	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002
		rpm obr/min	33104	29921	29921	29921	26420	19735	19735	9868	9868	29709	29709	29709	26791	26791	26791	23873
		feed posuw mm/min	397	239	239	239	211	158	158	79	79	357	357	357	321	321	321	191
		Ae mm	0.021	0.012	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.036	0.025	0.025	0.014	0.009	0.009	0.005
	6-8	Vc m/min	104	94	94	94	83	62	62	31	31	112	112	112	101	101	101	90
		fz mm/tooth	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002
		rpm obr/min	33104	29921	29921	29921	26420	19735	19735	9868	9868	29709	29709	29709	26791	26791	26791	23873
		feed posuw mm/min	397	239	239	239	211	158	158	79	79	357	357	357	321	321	321	191
		Ae mm	0.021	0.012	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.036	0.025	0.025	0.014	0.009	0.009	0.005
	9	Vc m/min	68	61	61	61	54	41	41	20	20	71	71	71	64	64	64	57
		fz mm/tooth	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.003	0.003	0.003	0.003
		rpm obr/min	21645	19417	19417	19417	17189	13051	13051	6366	6366	18833	18833	18833	16977	16977	16977	15120
		feed posuw mm/min	260	233	233	233	138	104	104	51	51	301	301	301	204	204	204	181
		Ae mm	0.016	0.009	0.009	0.006	0.006	0.003	0.002	0.002	0.002	0.027	0.01	0.019	0.011	0.007	0.007	0.004
	10-11.1	Vc m/min	104	94	94	94	83	62	62	31	31	112	112	112	101	101	101	90
		fz mm/tooth	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002
		rpm obr/min	33104	29921	29921	29921	26420	19735	19735	9868	9868	29709	29709	29709	26791	26791	26791	23873
		feed posuw mm/min	397	239	239	239	211	158	158	79	79	357	357	357	321	321	321	191
		Ae mm	0.021	0.012	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.036	0.025	0.025	0.014	0.009	0.009	0.005
	11.2	Vc m/min	68	61	61	61	54	41	41	20	20	71	71	71	64	64	64	57
		fz mm/tooth	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.003	0.003	0.003	0.003
		rpm obr/min	21645	19417	19417	19417	17189	13051	13051	6366	6366	18833	18833	18833	16977	16977	16977	15120
		feed posuw mm/min	260	233	233	233	138	104	104	51	51	301	301	301	204	204	204	181
		Ae mm	0.016	0.009	0.009	0.006	0.006	0.003	0.002	0.002	0.002	0.027	0.01	0.019	0.011	0.007	0.007	0.004
K	15-20	Vc m/min	104	94	94	94	83	62	62	31	31	112	112	112	101	101	101	90
		fz mm/tooth	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002
		rpm obr/min	33104	29921	29921	29921	26420	19735	19735	9868	9868	29709	29709	29709	26791	26791	26791	23873
		feed posuw mm/min	397	239	239	239	211	158	158	79	79	357	357	357	321	321	321	191
		Ae mm	0.021	0.012	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.036	0.025	0.025	0.014	0.009	0.009	0.005
H	38.1 - 38.2	Vc m/min	41	37	37	37	33	25	25	12	12	44	44	44	40	40	40	35
		fz mm/tooth	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002
		rpm obr/min	13051	11777	11777	11777	10504	7958	7958	3820	3820	11671	11671	11671	10610	10610	10610	9284
		feed posuw mm/min	157	94	94	94	84	64	64	31	31	140	140	140	127	127	127	74
		Ae mm	0.013	0.007	0.007	0.005	0.005	0.003	0.002	0.002	0.002	0.022	0.015	0.015	0.009	0.005	0.005	0.003
	40	Vc m/min	68	61	61	61	54	41	41	20	20	71	71	71	64	64	64	57
		fz mm/tooth	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.003	0.003	0.003	0.003
		rpm obr/min	21645	19417	19417	19417	17189	13051	13051	6366	6366	18833	18833	18833	16977	16977	16977	15120
		feed posuw mm/min	260	233	233	233	138	104	104	51	51	301	301	301	204	204	204	181
		Ae mm	0.016	0.009	0.009	0.006	0.006	0.003	0.002	0.002	0.002	0.027	0.01	0.019	0.011	0.007	0.007	0.004
	41	Vc m/min	41	37	37	37	33	25	25	12	12	44	44	44	40	40	40	35
		fz mm/tooth	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002
		rpm obr/min	13051	11777	11777	11777	10504	7958	7958	3820	3820	11671	11671	11671	10610	10610	10610	9284
		feed posuw mm/min	157	94	94	94	84	64	64	31	31	140	140	140	127	127	127	74
		Ae mm	0.013	0.007	0.007	0.005	0.005	0.003	0.002	0.002	0.002	0.022	0.015	0.015	0.009	0.005	0.005	0.003

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX62

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE BOKIEM

ISO	VDI 3323	DC	1.2	1.5	1.5	1.5	1.5	1.5	1.5	15	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5
		LBS	20	4	6	8	10	12	14	16	20	22	26	6	8	10	12	14	16	20	22	26	30	8
P	1-5	Vc m/min	67	124	124	112	112	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109	109	141
		fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005
		rpm obr/min	17772	26314	26314	23767	23767	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348	17348	17953
		feed posuw mm/min	142	421	421	285	285	285	285	255	255	255	127	346	346	346	311	311	311	311	278	278	278	359
		Ae mm	0.004	0.045	0.032	0.018	0.018	0.018	0.011	0.011	0.007	0.007	0.005	0.06	0.042	0.042	0.024	0.024	0.024	0.015	0.015	0.015	0.009	0.053
	6-8	Vc m/min	67	124	124	112	112	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109	109	141
		fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005
		rpm obr/min	17772	26314	26314	23767	23767	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348	17348	17953
		feed posuw mm/min	142	421	421	285	285	285	285	255	255	255	127	346	346	346	311	311	311	311	278	278	278	359
		Ae mm	0.004	0.045	0.032	0.018	0.018	0.018	0.011	0.011	0.007	0.007	0.005	0.06	0.042	0.042	0.024	0.024	0.024	0.015	0.015	0.015	0.009	0.053
	9	Vc m/min	43	76	76	69	69	69	69	61	61	61	46	87	87	87	78	78	78	78	69	69	69	90
		fz mm/tooth	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.007
		rpm obr/min	11406	16128	16128	14642	14642	14642	14642	12945	12945	12945	9762	13846	13846	13846	12414	12414	12414	12414	10982	10982	10982	11459
		feed posuw mm/min	91	258	258	234	234	234	234	155	155	155	117	277	277	277	248	248	248	248	176	176	176	321
		Ae mm	0.003	0.034	0.024	0.014	0.014	0.014	0.008	0.008	0.005	0.005	0.003	0.045	0.032	0.032	0.018	0.018	0.018	0.011	0.011	0.011	0.007	0.039
	10-11.1	Vc m/min	67	124	124	112	112	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109	109	141
		fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005
		rpm obr/min	17772	26314	26314	23767	23767	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348	17348	17953
		feed posuw mm/min	142	421	421	285	285	285	285	255	255	255	127	346	346	346	311	311	311	311	278	278	278	359
		Ae mm	0.004	0.045	0.032	0.018	0.018	0.018	0.011	0.011	0.007	0.007	0.005	0.06	0.042	0.042	0.024	0.024	0.024	0.015	0.015	0.015	0.009	0.053
	11.2	Vc m/min	43	76	76	69	69	69	69	61	61	61	46	87	87	87	78	78	78	78	69	69	69	90
		fz mm/tooth	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.007
		rpm obr/min	11406	16128	16128	14642	14642	14642	14642	12945	12945	12945	9762	13846	13846	13846	12414	12414	12414	12414	10982	10982	10982	11459
		feed posuw mm/min	91	258	258	234	234	234	234	155	155	155	117	277	277	277	248	248	248	248	176	176	176	321
		Ae mm	0.003	0.034	0.024	0.014	0.014	0.014	0.008	0.008	0.005	0.005	0.003	0.045	0.032	0.032	0.018	0.018	0.018	0.011	0.011	0.011	0.007	0.039
K	15-20	Vc m/min	67	124	124	112	112	112	112	100	100	100	75	136	136	136	122	122	122	122	109	109	109	141
		fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005
		rpm obr/min	17772	26314	26314	23767	23767	23767	23767	21221	21221	21221	15915	21645	21645	21645	19417	19417	19417	19417	17348	17348	17348	17953
		feed posuw mm/min	142	421	421	285	285	285	285	255	255	255	127	346	346	346	311	311	311	311	278	278	278	359
		Ae mm	0.004	0.045	0.032	0.018	0.018	0.018	0.011	0.011	0.007	0.007	0.005	0.06	0.042	0.042	0.024	0.024	0.024	0.015	0.015	0.015	0.009	0.053
H	38.1 - 38.2	Vc m/min	26	48	48	43	43	43	43	38	38	38	29	54	54	54	49	49	49	49	43	43	43	57
		fz mm/tooth	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.005
		rpm obr/min	6897	10186	10186	9125	9125	9125	9125	8064	8064	8064	6154	8594	8594	8594	7799	7799	7799	7799	6844	6844	6844	7257
		feed posuw mm/min	55	122	122	109	109	109	109	97	97	97	49	138	138	138	125	125	125	125	82	82	82	145
		Ae mm	0.002	0.027	0.019	0.011	0.011	0.011	0.007	0.007	0.004	0.004	0.003	0.036	0.025	0.025	0.014	0.014	0.014	0.009	0.009	0.009	0.005	0.032
	40	Vc m/min	43	76	76	69	69	69	69	61	61	61	46	87	87	87	78	78	78	78	69	69	69	90
		fz mm/tooth	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.007
		rpm obr/min	11406	16128	16128	14642	14642	14642	14642	12945	12945	12945	9762	13846	13846	13846	12414	12414	12414	12414	10982	10982	10982	11459
		feed posuw mm/min	91	258	258	234	234	234	234	155	155	155	117	277	277	277	248	248	248	248	176	176	176	321
		Ae mm	0.003	0.034	0.024	0.014	0.014	0.014	0.008	0.008	0.005	0.005	0.003	0.045	0.032	0.032	0.018	0.018	0.018	0.011	0.011	0.011	0.007	0.039
	41	Vc m/min	26	48	48	43	43	43	43	38	38	38	29	54	54	54	49	49	49	49	43	43	43	57
		fz mm/tooth	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.005
		rpm obr/min	6897	10186	10186	9125	9125	9125	9125	8064	8064	8064	6154	8594	8594	8594	7799	7799	7799	7799	6844	6844	6844	7257
		feed posuw mm/min	55	122	122	109	109	109	109	97	97	97	49	138	138	138	125	125	125	125	82	82	82	145
		Ae mm	0.002	0.027	0.019	0.011	0.011	0.011	0.007	0.007	0.004	0.004	0.003	0.036	0.025	0.025	0.014	0.014	0.014	0.009	0.009	0.009	0.005	0.032

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE BOKIEM

ISO	VDI 3323	DC	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0
		LBS	10	12	14	16	20	26	30	8	10	12	14	16	20	26	30	35	40	10	12
P	1-5	Vc m/min	141	141	127	127	127	113	113	150	150	150	150	135	135	135	135	120	120	161	161
		fz mm/tooth	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.01	0.01
		rpm obr/min	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324	14324	12732	12732	12812	12812
		feed posuw mm/min	359	359	323	323	323	230	230	382	382	382	382	344	344	344	344	255	255	512	512
		Ae mm	0.053	0.053	0.03	0.03	0.03	0.019	0.019	0.09	0.063	0.063	0.063	0.036	0.036	0.023	0.023	0.023	0.014	0.12	0.12
	6-8	Vc m/min	141	141	127	127	127	113	113	150	150	150	150	135	135	135	135	120	120	161	161
		fz mm/tooth	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.01	0.01
		rpm obr/min	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324	14324	12732	12732	12812	12812
		feed posuw mm/min	359	359	323	323	323	230	230	382	382	382	382	344	344	344	344	255	255	512	512
		Ae mm	0.053	0.053	0.03	0.03	0.03	0.019	0.019	0.09	0.063	0.063	0.063	0.036	0.036	0.023	0.023	0.023	0.014	0.12	0.12
	9	Vc m/min	90	90	81	81	81	72	72	97	97	97	97	87	87	87	87	78	78	103	103
		fz mm/tooth	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.011	0.011
		rpm obr/min	11459	11459	10313	10313	10313	9167	9167	10292	10292	10292	10292	9231	9231	9231	9231	8276	8276	8196	8196
		feed posuw mm/min	321	321	248	248	248	183	183	329	329	329	329	258	258	258	258	199	199	361	361
		Ae mm	0.039	0.039	0.023	0.023	0.023	0.014	0.014	0.068	0.047	0.047	0.047	0.027	0.027	0.017	0.017	0.017	0.01	0.09	0.09
	10-11.1	Vc m/min	141	141	127	127	127	113	113	150	150	150	150	135	135	135	135	120	120	161	161
		fz mm/tooth	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.01	0.01
		rpm obr/min	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324	14324	12732	12732	12812	12812
		feed posuw mm/min	359	359	323	323	323	230	230	382	382	382	382	344	344	344	344	255	255	512	512
		Ae mm	0.053	0.053	0.03	0.03	0.03	0.019	0.019	0.09	0.063	0.063	0.063	0.036	0.036	0.023	0.023	0.023	0.014	0.12	0.12
	11.2	Vc m/min	90	90	81	81	81	72	72	97	97	97	97	87	87	87	87	78	78	103	103
		fz mm/tooth	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.011	0.011
		rpm obr/min	11459	11459	10313	10313	10313	9167	9167	10292	10292	10292	10292	9231	9231	9231	9231	8276	8276	8196	8196
		feed posuw mm/min	321	321	248	248	248	183	183	329	329	329	329	258	258	258	258	199	199	361	361
		Ae mm	0.039	0.039	0.023	0.023	0.023	0.014	0.014	0.068	0.047	0.047	0.047	0.027	0.027	0.017	0.017	0.017	0.01	0.09	0.09
K	15-20	Vc m/min	141	141	127	127	127	113	113	150	150	150	150	135	135	135	135	120	120	161	161
		fz mm/tooth	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.01	0.01
		rpm obr/min	17953	17953	16170	16170	16170	14388	14388	15915	15915	15915	15915	14324	14324	14324	14324	12732	12732	12812	12812
		feed posuw mm/min	359	359	323	323	323	230	230	382	382	382	382	344	344	344	344	255	255	512	512
		Ae mm	0.053	0.053	0.03	0.03	0.03	0.019	0.019	0.09	0.063	0.063	0.063	0.036	0.036	0.023	0.023	0.023	0.014	0.12	0.12
H	38.1 - 38.2	Vc m/min	57	57	52	52	52	46	46	59	59	59	59	53	53	53	53	48	48	65	65
		fz mm/tooth	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.008
		rpm obr/min	7257	7257	6621	6621	6621	5857	5857	6260	6260	6260	6260	5623	5623	5623	5623	5093	5093	5173	5173
		feed posuw mm/min	145	145	132	132	132	94	94	150	150	150	150	112	112	112	112	102	102	166	166
		Ae mm	0.032	0.032	0.018	0.018	0.018	0.011	0.011	0.054	0.038	0.038	0.038	0.022	0.022	0.014	0.014	0.014	0.008	0.072	0.072
	40	Vc m/min	90	90	81	81	81	72	72	97	97	97	97	87	87	87	87	78	78	103	103
		fz mm/tooth	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.011	0.011
		rpm obr/min	11459	11459	10313	10313	10313	9167	9167	10292	10292	10292	10292	9231	9231	9231	9231	8276	8276	8196	8196
		feed posuw mm/min	321	321	248	248	248	183	183	329	329	329	329	258	258	258	258	199	199	361	361
		Ae mm	0.039	0.039	0.023	0.023	0.023	0.014	0.014	0.068	0.047	0.047	0.047	0.027	0.027	0.017	0.017	0.017	0.01	0.09	0.09
	41	Vc m/min	57	57	52	52	52	46	46	59	59	59	59	53	53	53	53	48	48	65	65
		fz mm/tooth	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.008
		rpm obr/min	7257	7257	6621	6621	6621	5857	5857	6260	6260	6260	6260	5623	5623	5623	5623	5093	5093	5173	5173
		feed posuw mm/min	145	145	132	132	132	94	94	150	150	150	150	112	112	112	112	102	102	166	166
		Ae mm	0.032	0.032	0.018	0.018	0.018	0.011	0.011	0.054	0.038	0.038	0.038	0.022	0.022	0.014	0.014	0.014	0.008	0.072	0.072

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE BOKIEM

ISO	VDI 3323	DC	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	6.0	6.0	8.0	8.0	10.0	10.0	12.0	12.0	16.0	16.0	20.0	20.0
		LBS	14	16	20	26	30	35	40	45	50	15	20	30	25	35	30	40	32	45	35	50	40	55
P	1-5	Vc m/min	161	161	161	145	145	145	145	129	129	173	179	179	181	181	188	188	188	188	187	187	188	188
		fz mm/tooth	0.01	0.01	0.01	0.009	0.009	0.009	0.009	0.008	0.008	0.012	0.013	0.013	0.019	0.019	0.023	0.023	0.022	0.022	0.022	0.022	0.023	0.023
		rpm obr/min	12812	12812	12812	11539	11539	11539	11539	10265	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
		feed posuw mm/min	512	512	512	415	415	415	415	328	328	529	494	494	547	547	551	551	439	439	327	327	275	275
		Ae mm	0.084	0.084	0.084	0.048	0.048	0.03	0.03	0.03	0.03	0.15	0.126	0.126	0.168	0.168	0.3	0.21	0.36	0.252	0.48	0.336	0.6	0.6
	6-8	Vc m/min	161	161	161	145	145	145	145	129	129	173	179	179	181	181	188	188	188	188	187	187	188	188
		fz mm/tooth	0.01	0.01	0.01	0.009	0.009	0.009	0.009	0.008	0.008	0.012	0.013	0.013	0.019	0.019	0.023	0.023	0.022	0.022	0.022	0.022	0.023	0.023
		rpm obr/min	12812	12812	12812	11539	11539	11539	11539	10265	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
		feed posuw mm/min	512	512	512	415	415	415	415	328	328	529	494	494	547	547	551	551	439	439	327	327	275	275
		Ae mm	0.084	0.084	0.084	0.048	0.048	0.03	0.03	0.03	0.03	0.15	0.126	0.126	0.168	0.168	0.3	0.21	0.36	0.252	0.48	0.336	0.6	0.6
	9	Vc m/min	103	103	103	93	93	93	93	82	82	110	113	113	114	114	126	126	126	126	127	127	123	123
		fz mm/tooth	0.011	0.011	0.011	0.01	0.01	0.01	0.01	0.009	0.009	0.015	0.018	0.018	0.024	0.024	0.027	0.027	0.028	0.028	0.028	0.028	0.027	0.027
		rpm obr/min	8196	8196	8196	7401	7401	7401	7401	6525	6525	7003	5995	5995	4536	4536	4011	4011	3342	3342	2527	2527	1958	1958
		feed posuw mm/min	361	361	361	296	296	296	296	235	235	420	432	432	435	435	433	433	374	374	283	283	211	211
		Ae mm	0.063	0.063	0.063	0.036	0.036	0.023	0.023	0.023	0.023	0.113	0.095	0.095	0.126	0.126	0.225	0.158	0.27	0.189	0.36	0.252	0.45	0.45
	10-11.1	Vc m/min	161	161	161	145	145	145	145	129	129	173	179	179	181	181	188	188	188	188	187	187	188	188
		fz mm/tooth	0.01	0.01	0.01	0.009	0.009	0.009	0.009	0.008	0.008	0.012	0.013	0.013	0.019	0.019	0.023	0.023	0.022	0.022	0.022	0.022	0.023	0.023
		rpm obr/min	12812	12812	12812	11539	11539	11539	11539	10265	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
		feed posuw mm/min	512	512	512	415	415	415	415	328	328	529	494	494	547	547	551	551	439	439	327	327	275	275
		Ae mm	0.084	0.084	0.084	0.048	0.048	0.03	0.03	0.03	0.03	0.15	0.126	0.126	0.168	0.168	0.3	0.21	0.36	0.252	0.48	0.336	0.6	0.6
	11.2	Vc m/min	103	103	103	93	93	93	93	82	82	110	113	113	114	114	126	126	126	126	127	127	123	123
		fz mm/tooth	0.011	0.011	0.011	0.01	0.01	0.01	0.01	0.009	0.009	0.015	0.018	0.018	0.024	0.024	0.027	0.027	0.028	0.028	0.028	0.028	0.027	0.027
		rpm obr/min	8196	8196	8196	7401	7401	7401	7401	6525	6525	7003	5995	5995	4536	4536	4011	4011	3342	3342	2527	2527	1958	1958
		feed posuw mm/min	361	361	361	296	296	296	296	235	235	420	432	432	435	435	433	433	374	374	283	283	211	211
		Ae mm	0.063	0.063	0.063	0.036	0.036	0.023	0.023	0.023	0.023	0.113	0.095	0.095	0.126	0.126	0.225	0.158	0.27	0.189	0.36	0.252	0.45	0.45
K	15-20	Vc m/min	161	161	161	145	145	145	145	129	129	173	179	179	181	181	188	188	188	188	187	187	188	188
		fz mm/tooth	0.01	0.01	0.01	0.009	0.009	0.009	0.009	0.008	0.008	0.012	0.013	0.013	0.019	0.019	0.023	0.023	0.022	0.022	0.022	0.022	0.023	0.023
		rpm obr/min	12812	12812	12812	11539	11539	11539	11539	10265	10265	11014	9496	9496	7202	7202	5984	5984	4987	4987	3720	3720	2992	2992
		feed posuw mm/min	512	512	512	415	415	415	415	328	328	529	494	494	547	547	551	551	439	439	327	327	275	275
		Ae mm	0.084	0.084	0.084	0.048	0.048	0.03	0.03	0.03	0.03	0.15	0.126	0.126	0.168	0.168	0.3	0.21	0.36	0.252	0.48	0.336	0.6	0.6
H	38.1 - 38.2	Vc m/min	65	65	65	58	58	58	58	52	52	72	74	74	76	76	76	76	75	75	77	77	75	75
		fz mm/tooth	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.011	0.013	0.013	0.017	0.017	0.021	0.021	0.02	0.02	0.022	0.022	0.021	0.021
		rpm obr/min	5173	5173	5173	4615	4615	4615	4615	4138	4138	4584	3926	3926	3024	3024	2419	2419	1989	1989	1532	1532	1194	1194
		feed posuw mm/min	166	166	166	129	129	129	129	99	99	202	204	204	206	206	203	203	159	159	135	135	100	100
		Ae mm	0.05	0.05	0.05	0.029	0.029	0.018	0.018	0.018	0.018	0.09	0.076	0.076	0.101	0.101	0.18	0.126	0.216	0.151	0.288	0.202	0.36	0.36
	40	Vc m/min	103	103	103	93	93	93	93	82	82	110	113	113	114	114	126	126	126	126	127	127	123	123
		fz mm/tooth	0.011	0.011	0.011	0.01	0.01	0.01	0.01	0.009	0.009	0.015	0.018	0.018	0.024	0.024	0.027	0.027	0.028	0.028	0.028	0.028	0.027	0.027
		rpm obr/min	8196	8196	8196	7401	7401	7401	7401	6525	6525	7003	5995	5995	4536	4536	4011	4011	3342	3342	2527	2527	1958	1958
		feed posuw mm/min	361	361	361	296	296	296	296	235	235	420	432	432	435	435	433	433	374	374	283	283	211	211
		Ae mm	0.063	0.063	0.063	0.036	0.036	0.023	0.023	0.023	0.023	0.113	0.095	0.095	0.126	0.126	0.225	0.158	0.27	0.189	0.36	0.252	0.45	0.45
	41	Vc m/min	65	65	65	58	58	58	58	52	52	72	74	74	76	76	76	76	75	75	77	77	75	75
		fz mm/tooth	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.011	0.013	0.013	0.017	0.017	0.021	0.021	0.02	0.02	0.022	0.022	0.021	0.021
		rpm obr/min	5173	5173	5173	4615	4615	4615	4615	4138	4138	4584	3926	3926	3024	3024	2419	2419	1989	1989	1532	1532	1194	1194
		feed posuw mm/min	166	166	166	129	129	129	129	99	99	202	204	204	206	206	203	203	159	159	135	135	100	100
		Ae mm	0.05	0.05	0.05	0.029	0.029	0.018	0.018	0.018	0.018	0.09	0.076	0.076	0.101	0.101	0.18	0.126	0.216	0.151	0.288	0.202	0.36	0.36

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX67

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX670100400XA002040	0,1	4	0,2	40
UFX670150400XA003040	0,15	4	0,3	40
UFX670200400XA004040	0,2	4	0,4	40
UFX670250400XA005040	0,25	4	0,5	40
UFX670300400XA006040	0,3	4	0,6	40
UFX670350400XA007040	0,35	4	0,7	40
UFX670400400XA008040	0,4	4	0,8	40
UFX670450400XA009040	0,45	4	0,9	40
UFX670500400XA010040	0,5	4	1	40
UFX670550400XA011040	0,55	4	1,1	40
UFX670600400XA012040	0,6	4	1,2	40
UFX670650400XA013040	0,65	4	1,3	40
UFX670700400XA014040	0,7	4	1,4	40
UFX670750400XA015040	0,75	4	1,5	40
UFX670800400XA016040	0,8	4	1,6	40
UFX670850400XA017040	0,85	4	1,7	40
UFX670900400XA018040	0,9	4	1,8	40
UFX670950400XA020040	0,95	4	2	40
UFX6701006000A025050	1	6	2,5	50
UFX6701206000A030050	1,2	6	3	50
UFX6701506000A040050	1,5	6	4	50
UFX6702006000A060050	2	6	6	50
UFX6702506000A070050	2,5	6	7	50
UFX6703006000A080050	3	6	8	50
UFX6703506000A100050	3,5	6	10	50
UFX6704006000A100050	4	6	10	50
UFX6704506000A140050	4,5	6	14	50
UFX6705006000A150060	5	6	15	60
UFX6705506000A150060	5,5	6	15	60
UFX6706006000A150060	6	6	15	60
UFX6706508000A180060	6,5	8	18	60
UFX6707008000A200060	7	8	20	60
UFX6707508000A200060	7,5	8	20	60
UFX6708008000A200070	8	8	20	70
UFX6708510000A220070	8,5	10	22	70
UFX6709010000A220070	9	10	22	70
UFX6709510000A240070	9,5	10	24	70

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –-0.012	h5
OVER TO R6	0 –-0.015	h5

UFX67

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX6710010000A250075	10	10	25	75
UFX6710512000A260075	10,5	12	26	75
UFX6711012000A300075	11	12	30	75
UFX6711512000A300080	11,5	12	30	80
UFX6712012000A300080	12	12	30	80
UFX6713012000A350100	13	12	35	100
UFX6714012000A350100	14	12	35	100
UFX6714014000A350100	14	14	35	100
UFX6714016000A350100	14	16	35	100
UFX6715016000A380100	15	16	38	100
UFX6716016000A400100	16	16	40	100

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFX67

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX6717016000A420100	17	16	42	100
UFX6718016000A450100	18	16	45	100
UFX6718018000A450100	18	18	45	100
UFX6719020000A450100	19	20	45	100
UFX6720020000A450100	20	20	45	100
UFX6721020000A450100	21	20	45	100
UFX6722020000A450100	22	20	45	100
UFX6723025000A500120	23	25	50	120
UFX6724025000A500120	24	25	50	120
UFX6725025000A500120	25	25	50	120

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFX67

2 Finish Medium

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX6701004000A025050	1	4	2,5	50
UFX6701104000A030050	1,1	4	3	50
UFX6701204000A030050	1,2	4	3	50
UFX6701304000A030050	1,3	4	3	50
UFX6701404000A040050	1,4	4	4	50
UFX6701504000A040050	1,5	4	4	50
UFX6701604000A040050	1,6	4	4	50
UFX6701704000A040050	1,7	4	4	50
UFX6701804000A050050	1,8	4	5	50
UFX6701904000A050050	1,9	4	5	50
UFX6702004000A060050	2	4	6	50
UFX6702104000A060050	2,1	4	6	50
UFX6702204000A060050	2,2	4	6	50
UFX6702304000A060050	2,3	4	6	50
UFX6702404000A060050	2,4	4	6	50
UFX6702504000A080050	2,5	4	8	50
UFX6702604000A080050	2,6	4	8	50
UFX6702704000A080050	2,7	4	8	50
UFX6702804000A080050	2,8	4	8	50
UFX6702904000A080050	2,9	4	8	50
UFX6703004000A080050	3	4	8	50
UFX6703504000A100050	3,5	4	10	50
UFX6704004000A100050	4	4	10	50
UFX6704004000A100080	4	4	10	80

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFX67

2 Finish Medium

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX6700103000A002040	0,1	3	0,2	40
UFX6700203000A004040	0,2	3	0,4	40
UFX6700303000A006040	0,3	3	0,6	40
UFX6700403000A008040	0,4	3	0,8	40
UFX6700503000A010040	0,5	3	1	40
UFX6700603000A012040	0,6	3	1,2	40
UFX6700703000A014040	0,7	3	1,4	40
UFX6700803000A016040	0,8	3	1,6	40
UFX6700903000A018040	0,9	3	1,8	40
UFX6701003000A025050	1	3	2,5	50
UFX6701203000A030050	1,2	3	3	50
UFX6701503000A040050	1,5	3	4	50
UFX6702003000A060050	2	3	6	50
UFX6702503000A070050	2,5	3	7	50
UFX6703003000A080050	3	3	8	50

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFX67

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
P	1-5	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	13	26	37	49	57	60	62	63	66
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	41380	41380	39258	38993	36287	31831	28193	25067	23343
				feed posuw mm/min	83	83	79	78	145	127	169	150	187
	6-8	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	13	26	37	49	57	60	62	63	66
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	41380	41380	39258	38993	36287	31831	28193	25067	23343
				feed posuw mm/min	83	83	79	78	145	127	169	150	187
	9	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	8	16	22	29	34	36	37	38	40
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003
				rpm obr/min	25465	25465	23343	23077	21645	19099	16825	15120	14147
				feed posuw mm/min	51	51	47	46	87	76	101	91	85
	10-11.1	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	13	26	37	49	57	60	62	63	66
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	41380	41380	39258	38993	36287	31831	28193	25067	23343
				feed posuw mm/min	83	83	79	78	145	127	169	150	187
	11.2	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	8	16	22	29	34	36	37	38	40
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003
				rpm obr/min	25465	25465	23343	23077	21645	19099	16825	15120	14147
				feed posuw mm/min	51	51	47	46	87	76	101	91	85
M	14.1	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	7	13	18	25	28	30	31	31	33
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003
				rpm obr/min	22282	20690	19099	19894	17825	15915	14097	12335	11671
				feed posuw mm/min	45	41	38	40	71	64	85	74	70
K	15-20	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	13	26	37	49	57	60	62	63	66
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
				rpm obr/min	41380	41380	39258	38993	36287	31831	28193	25067	23343
				feed posuw mm/min	83	83	79	78	145	127	169	150	187
H	38.1-38.2	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	5	11	15	20	23	24	25	25	27
				fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
				rpm obr/min	15915	17507	15915	15915	14642	12732	11368	9947	9549
				feed posuw mm/min	16	35	32	32	29	25	23	40	38
	40	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	8	16	22	29	34	36	37	38	40
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003
				rpm obr/min	25465	25465	23343	23077	21645	19099	16825	15120	14147
				feed posuw mm/min	51	51	47	46	87	76	101	91	85
	41	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	5	11	15	20	23	24	25	25	27
				fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
				rpm obr/min	15915	17507	15915	15915	14642	12732	11368	9947	9549
				feed posuw mm/min	16	35	32	32	29	25	23	40	38

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX67

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.2	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
P	1-5	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	68	68	71	73	80	84	91	95	98	99	102	105	107	107
				fz mm/tooth	0.004	0.005	0.006	0.009	0.01	0.012	0.016	0.021	0.023	0.027	0.03	0.033	0.036	0.039
				rpm obr/min	21645	18038	15067	11618	10186	8913	8276	7560	6932	6303	5903	5570	5240	4866
				feed posuw mm/min	173	180	181	209	204	214	265	318	319	340	354	368	377	380
	6-8	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	68	68	71	73	80	84	91	95	98	99	102	105	107	107
				fz mm/tooth	0.004	0.005	0.006	0.009	0.01	0.012	0.016	0.021	0.023	0.027	0.03	0.033	0.036	0.039
				rpm obr/min	21645	18038	15067	11618	10186	8913	8276	7560	6932	6303	5903	5570	5240	4866
				feed posuw mm/min	173	180	181	209	204	214	265	318	319	340	354	368	377	380
	9	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	41	41	42	48	52	52	56	58	59	59	62	63	64	65
				fz mm/tooth	0.004	0.005	0.006	0.008	0.01	0.013	0.017	0.021	0.023	0.026	0.03	0.034	0.036	0.037
				rpm obr/min	13051	10876	8913	7639	6621	5517	5093	4615	4173	3756	3588	3342	3134	2956
				feed posuw mm/min	104	109	107	122	132	143	173	194	192	195	215	227	226	219
	10-11.1	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	68	68	71	73	80	84	91	95	98	99	102	105	107	107
				fz mm/tooth	0.004	0.005	0.006	0.009	0.01	0.012	0.016	0.021	0.023	0.027	0.03	0.033	0.036	0.039
				rpm obr/min	21645	18038	15067	11618	10186	8913	8276	7560	6932	6303	5903	5570	5240	4866
				feed posuw mm/min	173	180	181	209	204	214	265	318	319	340	354	368	377	380
	11.2	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	41	41	42	48	52	52	56	58	59	59	62	63	64	65
				fz mm/tooth	0.004	0.005	0.006	0.008	0.01	0.013	0.017	0.021	0.023	0.026	0.03	0.034	0.036	0.037
				rpm obr/min	13051	10876	8913	7639	6621	5517	5093	4615	4173	3756	3588	3342	3134	2956
				feed posuw mm/min	104	109	107	122	132	143	173	194	192	195	215	227	226	219
M	14.1	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	34	34	35	40	43	44	47	49	50	50	52	54	54	54
				fz mm/tooth	0.004	0.005	0.006	0.008	0.01	0.014	0.016	0.021	0.023	0.027	0.03	0.033	0.036	0.038
				rpm obr/min	10823	9019	7427	6366	5475	4669	4274	3899	3537	3183	3009	2865	2644	2456
				feed posuw mm/min	87	90	89	102	109	131	137	164	163	172	181	189	190	187
K	15-20	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	68	68	71	73	80	84	91	95	98	99	102	105	107	107
				fz mm/tooth	0.004	0.005	0.006	0.009	0.01	0.012	0.016	0.021	0.023	0.027	0.03	0.033	0.036	0.039
				rpm obr/min	21645	18038	15067	11618	10186	8913	8276	7560	6932	6303	5903	5570	5240	4866
				feed posuw mm/min	173	180	181	209	204	214	265	318	319	340	354	368	377	380
H	38.1-38.2	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	27	27	28	32	33	32	35	37	37	36	37	38	39	40
				fz mm/tooth	0.002	0.002	0.003	0.004	0.005	0.006	0.007	0.007	0.009	0.011	0.013	0.015	0.016	0.018
				rpm obr/min	8594	7162	5942	5093	4202	3395	3183	2944	2617	2292	2141	2016	1910	1819
				feed posuw mm/min	34	29	36	41	42	41	45	41	47	50	56	60	61	65
	40	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	41	41	42	48	52	52	56	58	59	59	62	63	64	65
				fz mm/tooth	0.004	0.005	0.006	0.008	0.01	0.013	0.017	0.021	0.023	0.026	0.03	0.034	0.036	0.037
				rpm obr/min	13051	10876	8913	7639	6621	5517	5093	4615	4173	3756	3588	3342	3134	2956
				feed posuw mm/min	104	109	107	122	132	143	173	194	192	195	215	227	226	219
	41	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	27	27	28	32	33	32	35	37	37	36	37	38	39	40
				fz mm/tooth	0.002	0.002	0.003	0.004	0.005	0.006	0.007	0.007	0.009	0.011	0.013	0.015	0.016	0.018
				rpm obr/min	8594	7162	5942	5093	4202	3395	3183	2944	2617	2292	2141	2016	1910	1819
				feed posuw mm/min	34	29	36	41	42	41	45	41	47	50	56	60	61	65

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX67

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SL0TTING / FREZ 0 2 ZĘBACH R0WK0WANIE

IS0	VDI 3323	Ae mm	Ap mm	DC	7.5	8.0	85	9.0	95	10.0	10.5	11.0	11.5	12.0
P	1-5	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	107	106	106	105	104	102	103	104	104	103
				fz mm/t00th	0.043	0.048	0.049	0.05	0.051	0.053	0.053	0.053	0.053	0.054
				rpm 0br/min	4541	4218	3970	3714	3485	3247	3122	3009	2879	2732
				feed p0suw mm/min	391	405	389	371	355	344	331	319	305	295
	6-8	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	107	106	106	105	104	102	103	104	104	103
				fz mm/t00th	0.043	0.048	0.049	0.05	0.051	0.053	0.053	0.053	0.053	0.054
				rpm 0br/min	4541	4218	3970	3714	3485	3247	3122	3009	2879	2732
				feed p0suw mm/min	391	405	389	371	355	344	331	319	305	295
	9	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	64	63	64	64	64	63	63	64	64	63
				fz mm/t00th	0.039	0.042	0.042	0.042	0.042	0.043	0.042	0.041	0.04	0.04
				rpm 0br/min	2716	2507	2397	2264	2144	2005	1910	1852	1771	1671
				feed p0suw mm/min	212	211	201	190	180	172	160	152	142	134
	10-11.1	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	107	106	106	105	104	102	103	104	104	103
				fz mm/t00th	0.043	0.048	0.049	0.05	0.051	0.053	0.053	0.053	0.053	0.054
				rpm 0br/min	4541	4218	3970	3714	3485	3247	3122	3009	2879	2732
				feed p0suw mm/min	391	405	389	371	355	344	331	319	305	295
	11.2	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	64	63	64	64	64	63	63	64	64	63
				fz mm/t00th	0.039	0.042	0.042	0.042	0.042	0.043	0.042	0.041	0.04	0.04
				rpm 0br/min	2716	2507	2397	2264	2144	2005	1910	1852	1771	1671
				feed p0suw mm/min	212	211	201	190	180	172	160	152	142	134
M	14.1	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	54	53	53	53	53	53	53	53	52	51
				fz mm/t00th	0.042	0.045	0.046	0.048	0.049	0.051	0.05	0.049	0.049	0.05
				rpm 0br/min	2292	2109	1985	1874	1776	1687	1607	1534	1439	1353
				feed p0suw mm/min	193	190	183	180	174	172	161	150	141	135
K	15-20	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	107	106	106	105	104	102	103	104	104	103
				fz mm/t00th	0.043	0.048	0.049	0.05	0.051	0.053	0.053	0.053	0.053	0.054
				rpm 0br/min	4541	4218	3970	3714	3485	3247	3122	3009	2879	2732
				feed p0suw mm/min	391	405	389	371	355	344	331	319	305	295
H	38.1-38.2	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	41	42	43	43	43	43	43	44	44	44
				fz mm/t00th	0.021	0.024	0.023	0.022	0.022	0.023	0.023	0.023	0.024	0.025
				rpm 0br/min	1740	1671	1610	1521	1441	1369	1304	1273	1218	1167
				feed p0suw mm/min	73	80	74	67	63	63	60	59	58	58
	40	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	64	63	64	64	64	63	63	64	64	63
				fz mm/t00th	0.039	0.042	0.042	0.042	0.042	0.043	0.042	0.041	0.04	0.04
				rpm 0br/min	2716	2507	2397	2264	2144	2005	1910	1852	1771	1671
				feed p0suw mm/min	212	211	201	190	180	172	160	152	142	134
	41	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	41	42	43	43	43	43	43	44	44	44
				fz mm/t00th	0.021	0.024	0.023	0.022	0.022	0.023	0.023	0.023	0.024	0.025
				rpm 0br/min	1740	1671	1610	1521	1441	1369	1304	1273	1218	1167
				feed p0suw mm/min	73	80	74	67	63	63	60	59	58	58

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX67

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SL0TTING / FREZ 0 2 ZĘBACH R0WK0WANIE

IS0	VDI 3323	Ae mm	Ap mm	DC	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0
P	1-5	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	106	109	110	111	111	110	108	106	107	107	107	107	107
				fz mm/t00th	0.054	0.054	0.052	0.052	0.052	0.053	0.052	0.054	0.053	0.053	0.051	0.049	0.05
				rpm 0br/min	2595	2478	2334	2208	2078	1945	1809	1687	1622	1548	1481	1419	1362
				feed p0suw mm/min	280	268	243	230	216	206	188	182	172	164	151	139	136
	6-8	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	106	109	110	111	111	110	108	106	107	107	107	107	107
				fz mm/t00th	0.054	0.054	0.052	0.052	0.052	0.053	0.052	0.054	0.053	0.053	0.051	0.049	0.05
				rpm 0br/min	2595	2478	2334	2208	2078	1945	1809	1687	1622	1548	1481	1419	1362
				feed p0suw mm/min	280	268	243	230	216	206	188	182	172	164	151	139	136
	9	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	65	67	68	68	69	68	68	67	67	67	67	67	66
				fz mm/t00th	0.041	0.041	0.042	0.042	0.041	0.041	0.04	0.04	0.04	0.041	0.042	0.043	0.044
				rpm 0br/min	1592	1523	1443	1353	1292	1203	1139	1066	1016	969	927	889	840
				feed p0suw mm/min	131	125	121	114	106	99	91	85	81	79	78	76	74
	10-11.1	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	106	109	110	111	111	110	108	106	107	107	107	107	107
				fz mm/t00th	0.054	0.054	0.052	0.052	0.052	0.053	0.052	0.054	0.053	0.053	0.051	0.049	0.05
				rpm 0br/min	2595	2478	2334	2208	2078	1945	1809	1687	1622	1548	1481	1419	1362
				feed p0suw mm/min	280	268	243	230	216	206	188	182	172	164	151	139	136
	11.2	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	65	67	68	68	69	68	68	67	67	67	67	67	66
				fz mm/t00th	0.041	0.041	0.042	0.042	0.041	0.041	0.04	0.04	0.04	0.041	0.042	0.043	0.044
				rpm 0br/min	1592	1523	1443	1353	1292	1203	1139	1066	1016	969	927	889	840
				feed p0suw mm/min	131	125	121	114	106	99	91	85	81	79	78	76	74
M	14.1	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	52	53	53	53	54	54	53	53	53	54	54	54	53
				fz mm/t00th	0.051	0.052	0.053	0.054	0.052	0.053	0.05	0.05	0.05	0.049	0.048	0.047	0.046
				rpm 0br/min	1273	1205	1125	1054	1011	955	888	844	803	781	747	716	675
				feed p0suw mm/min	130	125	119	114	105	101	89	84	80	77	72	67	62
K	15-20	1.0D	0.5D (up t0 3:02D) (up t0 1:0.15D)	Vc m/min	106	109	110	111	111	110	108	106	107	107	107	107	107
				fz mm/t00th	0.054	0.054	0.052	0.052	0.052	0.053	0.052	0.054	0.053	0.053	0.051	0.049	0.05
				rpm 0br/min	2595	2478	2334	2208	2078	1945	1809	1687	1622	1548	1481	1419	1362
				feed p0suw mm/min	280	268	243	230	216	206	188	182	172	164	151	139	136
H	38.1-38.2	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	45	45	45	45	45	45	44	43	43	43	43	43	42
				fz mm/t00th	0.025	0.024	0.023	0.023	0.023	0.023	0.023	0.024	0.022	0.022	0.021	0.02	0.019
				rpm 0br/min	1102	1023	955	895	843	796	737	684	652	622	595	570	535
				feed p0suw mm/min	55	49	44	41	39	37	34	33	29	27	25	23	20
	40	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	65	67	68	68	69	68	68	67	67	67	67	67	66
				fz mm/t00th	0.041	0.041	0.042	0.042	0.041	0.041	0.04	0.04	0.04	0.041	0.042	0.043	0.044
				rpm 0br/min	1592	1523	1443	1353	1292	1203	1139	1066	1016	969	927	889	840
				feed p0suw mm/min	131	125	121	114	106	99	91	85	81	79	78	76	74
	41	1.0D	0.5D (up t0 1:0.02D)	Vc m/min	45	45	45	45	45	45	44	43	43	43	43	43	42
				fz mm/t00th	0.025	0.024	0.023	0.023	0.023	0.023	0.023	0.024	0.022	0.022	0.021	0.02	0.019
				rpm 0br/min	1102	1023	955	895	843	796	737	684	652	622	595	570	535
				feed p0suw mm/min	55	49	44	41	39	37	34	33	29	27	25	23	20

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX71

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7101006000A030060	1	6	3	60
UFX7101006000A040060	1	6	4	60
UFX7101006000A050060	1	6	5	60
UFX7101006000A060060	1	6	6	60
UFX7101006000A070060	1	6	7	60
UFX7101006000A080060	1	6	8	60
UFX7101006000A100060	1	6	10	60
UFX7101006000A120060	1	6	12	60
UFX7101206000A040060	1,2	6	4	60
UFX7101206000A060060	1,2	6	6	60
UFX7101206000A080060	1,2	6	8	60
UFX7101206000A100060	1,2	6	10	60
UFX7101206000A120060	1,2	6	12	60
UFX7101506000A060060	1,5	6	6	60
UFX7101506000A080060	1,5	6	8	60
UFX7101506000A100060	1,5	6	10	60
UFX7101506000A120060	1,5	6	12	60
UFX7101506000A140060	1,5	6	14	60
UFX7101506000A160060	1,5	6	16	60
UFX7102006000A080060	2	6	8	60
UFX7102006000A100060	2	6	10	60
UFX7102006000A120060	2	6	12	60
UFX7102006000A140060	2	6	14	60
UFX7102006000A160060	2	6	16	60
UFX7102506000A100060	2,5	6	10	60
UFX7102506000A120060	2,5	6	12	60
UFX7102506000A160060	2,5	6	16	60
UFX7102506000A200060	2,5	6	20	60
UFX7102506000A260060	2,5	6	26	60
UFX7103003000A160100	3	3	16	100
UFX7103006000A100070	3	6	10	70
UFX7103006000A120070	3	6	12	70
UFX7103006000A140070	3	6	14	70
UFX7103006000A160070	3	6	16	70
UFX7103006000A200070	3	6	20	70
UFX7103006000A260070	3	6	26	70
UFX7103006000A300070	3	6	30	70

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFX71

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7104004000A200100	4	4	20	100
UFX7104006000A120070	4	6	12	70
UFX7104006000A160070	4	6	16	70
UFX7104006000A200070	4	6	20	70
UFX7104006000A260070	4	6	26	70
UFX7104006000A300070	4	6	30	70
UFX7105006000A200070	5	6	20	70
UFX7105006000A250070	5	6	25	70
UFX7105006000A250100	5	6	25	100
UFX7105006000A300080	5	6	30	80
UFX7105006000A350090	5	6	35	90

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.012	h5

UFX71

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7105006000A400100	5	6	40	100
UFX7106006000A150060	6	6	15	60
UFX7106006000A150080	6	6	15	80
UFX7106006000A200070	6	6	20	70
UFX7106006000A200090	6	6	20	90
UFX7106006000A250075	6	6	25	75
UFX7106006000A300080	6	6	30	80
UFX7106006000A300100	6	6	30	100
UFX7106006000A300150	6	6	30	150
UFX7106006000A350090	6	6	35	90
UFX7106006000A400090	6	6	40	90
UFX7106006000A400120	6	6	40	120
UFX7106006000A450150	6	6	45	150
UFX7108008000A250080	8	8	25	80
UFX7108008000A300080	8	8	30	80
UFX7108008000A300100	8	8	30	100
UFX7108008000A350090	8	8	35	90
UFX7108008000A400090	8	8	40	90
UFX7108008000A400120	8	8	40	120
UFX7108008000A400150	8	8	40	150
UFX7108008000A450100	8	8	45	100
UFX7108008000A500100	8	8	50	100
UFX7108008000A500150	8	8	50	150
UFX7110010000A300080	10	10	30	80
UFX7110010000A300100	10	10	30	100
UFX7110010000A350090	10	10	35	90
UFX7110010000A400090	10	10	40	90
UFX7110010000A400120	10	10	40	120
UFX7110010000A450100	10	10	45	100
UFX7110010000A500100	10	10	50	100
UFX7110010000A500150	10	10	50	150
UFX7110010000A500200	10	10	50	200
UFX7110010000A550150	10	10	55	150
UFX7110010000A600110	10	10	60	110
UFX7110010000A600200	10	10	60	200
UFX7112012000A350090	12	12	35	90
UFX7112012000A400100	12	12	40	100
UFX7112012000A400120	12	12	40	120
UFX7112012000A450130	12	12	45	130
UFX7112012000A500100	12	12	50	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.012	h5

UFX71

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7112012000A500150	12	12	50	150
UFX7112012000A550110	12	12	55	110
UFX7112012000A600110	12	12	60	110
UFX7112012000A600150	12	12	60	150
UFX7112012000A600200	12	12	60	200
UFX7112012000A650150	12	12	65	150
UFX7112012000A700120	12	12	70	120
UFX7112012000A700200	12	12	70	200
UFX7114016000A500110	14	16	50	110
UFX7114016000A600150	14	16	60	150
UFX7116016000A400150	16	16	40	150
UFX7116016000A500110	16	16	50	110
UFX7116016000A500150	16	16	50	150
UFX7116016000A600120	16	16	60	120
UFX7116016000A700130	16	16	70	130
UFX7116016000A700150	16	16	70	150
UFX7116016000A700200	16	16	70	200
UFX7116016000A800150	16	16	80	150
UFX7116016000A900150	16	16	90	150
UFX7116016000A11X200	16	16	110	200
UFX7116016000A12X250	16	16	120	250
UFX7118020000A500120	18	20	50	120
UFX7118020000A700130	18	20	70	130
UFX7118020000A10X200	18	20	100	200
UFX7120020000A500110	20	20	50	110
UFX7120020000A500150	20	20	50	150
UFX7120020000A600130	20	20	60	130
UFX7120020000A700130	20	20	70	130
UFX7120020000A800150	20	20	80	150
UFX7120020000A900150	20	20	90	150
UFX7120020000A900200	20	20	90	200
UFX7120020000A11X200	20	20	110	200
UFX7120020000A12X250	20	20	120	250
UFX7122020000A750150	22	20	75	150
UFX7122020000A11X200	22	20	110	200
UFX7125025000A700150	25	25	70	150
UFX7125025000A900150	25	25	90	150
UFX7125025000A11X200	25	25	110	200
UFX7125025000A12X250	25	25	120	250

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.012	h5

UFX71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2
			LOC	3	4	5	6	7	8	10	12	4	6	8	10
P	1-5	1.0D	Vc m/min	50	50	50	45	45	45	45	40	51	51	46	46
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002
			rpm obr/min	15915	15915	15915	14324	14324	14324	14324	12732	13528	13528	12202	12202
			feed posuw mm/min	64	64	64	57	57	57	57	51	81	81	49	49
	6-8	1.0D	Vc m/min	50	50	50	45	45	45	45	40	51	51	46	46
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002
			rpm obr/min	15915	15915	15915	14324	14324	14324	14324	12732	13528	13528	12202	12202
			feed posuw mm/min	64	64	64	57	57	57	57	51	81	81	49	49
	9	1.0D	Vc m/min	40	40	40	36	36	36	36	32	41	41	37	37
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
			rpm obr/min	12732	12732	12732	11459	11459	11459	11459	10186	10876	10876	9815	9815
			feed posuw mm/min	51	51	51	46	46	46	46	41	65	65	59	39
	10-11.1	1.0D	Vc m/min	50	50	50	45	45	45	45	40	51	51	46	46
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002
			rpm obr/min	15915	15915	15915	14324	14324	14324	14324	12732	13528	13528	12202	12202
			feed posuw mm/min	64	64	64	57	57	57	57	51	81	81	49	49
	11.2	1.0D	Vc m/min	40	40	40	36	36	36	36	32	41	41	37	37
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
			rpm obr/min	12732	12732	12732	11459	11459	11459	11459	10186	10876	10876	9815	9815
			feed posuw mm/min	51	51	51	46	46	46	46	41	65	65	59	39
K	15-20	1.0D	Vc m/min	50	50	50	45	45	45	45	40	51	51	46	46
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002
			rpm obr/min	15915	15915	15915	14324	14324	14324	14324	12732	13528	13528	12202	12202
			feed posuw mm/min	64	64	64	57	57	57	57	51	81	81	49	49
H	38.1 - 38.2	1.0D	Vc m/min	25	25	25	23	23	23	23	20	25	25	23	23
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002
			rpm obr/min	7958	7958	7958	7321	7321	7321	7321	6366	6631	6631	6101	6101
			feed posuw mm/min	32	32	32	29	29	15	15	13	27	27	24	24
	40	1.0D	Vc m/min	40	40	40	36	36	36	36	32	41	41	37	37
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
			rpm obr/min	12732	12732	12732	11459	11459	11459	11459	10186	10876	10876	9815	9815
			feed posuw mm/min	51	51	51	46	46	46	46	41	65	65	59	39
	41	1.0D	Vc m/min	25	25	25	23	23	23	23	20	25	25	23	23
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002
			rpm obr/min	7958	7958	7958	7321	7321	7321	7321	6366	6631	6631	6101	6101
			feed posuw mm/min	32	32	32	29	29	15	15	13	27	27	24	24

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.2	1.5	1.5	1.5	1.5	15	1.5	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0
			LOC	12	6	8	10	12	14	16	8	10	12	14	16	10	12	16	20	26	10	12	14
P	1-5	1.0D	Vc m/min	46	53	48	48	48	48	42	57	57	51	51	51	60	60	54	54	48	60	60	60
			fz mm/tooth	0.002	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.006	0.006	0.005	0.005	0.004	0.008	0.008	0.008
			rpm obr/min	12202	11247	10186	10186	10186	10186	8913	9072	9072	8117	8117	8117	7639	7639	6875	6875	6112	6366	6366	6366
			feed posuw mm/min	49	90	61	61	61	61	53	91	91	65	65	65	92	92	69	69	49	102	102	102
	6-8	1.0D	Vc m/min	46	53	48	48	48	48	42	57	57	51	51	51	60	60	54	54	48	60	60	60
			fz mm/tooth	0.002	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.006	0.006	0.005	0.005	0.004	0.008	0.008	0.008
			rpm obr/min	12202	11247	10186	10186	10186	10186	8913	9072	9072	8117	8117	8117	7639	7639	6875	6875	6112	6366	6366	6366
			feed posuw mm/min	49	90	61	61	61	61	53	91	91	65	65	65	92	92	69	69	49	102	102	102
	9	1.0D	Vc m/min	37	42	38	38	38	38	34	46	46	41	41	41	49	49	44	44	39	49	49	49
			fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.004	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008
			rpm obr/min	9815	8913	8064	8064	8064	8064	7215	7321	7321	6525	6525	6525	6239	6239	5602	5602	4966	5199	5199	5199
			feed posuw mm/min	39	71	65	48	48	48	43	73	73	65	65	52	75	75	67	56	50	83	83	83
	10-11.1	1.0D	Vc m/min	46	53	48	48	48	48	42	57	57	51	51	51	60	60	54	54	48	60	60	60
			fz mm/tooth	0.002	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.006	0.006	0.005	0.005	0.004	0.008	0.008	0.008
			rpm obr/min	12202	11247	10186	10186	10186	10186	8913	9072	9072	8117	8117	8117	7639	7639	6875	6875	6112	6366	6366	6366
			feed posuw mm/min	49	90	61	61	61	61	53	91	91	65	65	65	92	92	69	69	49	102	102	102
	11.2	1.0D	Vc m/min	37	42	38	38	38	38	34	46	46	41	41	41	49	49	44	44	39	49	49	49
			fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.004	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008
			rpm obr/min	9815	8913	8064	8064	8064	8064	7215	7321	7321	6525	6525	6525	6239	6239	5602	5602	4966	5199	5199	5199
			feed posuw mm/min	39	71	65	48	48	48	43	73	73	65	65	52	75	75	67	56	50	83	83	83
K	15-20	1.0D	Vc m/min	46	53	48	48	48	48	42	57	57	51	51	51	60	60	54	54	48	60	60	60
			fz mm/tooth	0.002	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.004	0.006	0.006	0.005	0.005	0.004	0.008	0.008	0.008
			rpm obr/min	12202	11247	10186	10186	10186	10186	8913	9072	9072	8117	8117	8117	7639	7639	6875	6875	6112	6366	6366	6366
			feed posuw mm/min	49	90	61	61	61	61	53	91	91	65	65	65	92	92	69	69	49	102	102	102
H	38.1 - 38.2	1.0D	Vc m/min	23	26	24	24	24	24	21	29	29	26	26	26	30	30	27	27	24	30	30	30
			fz mm/tooth	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.004	0.004	0.003	0.006	0.006	0.006
			rpm obr/min	6101	5517	5093	5093	5093	5093	4456	4615	4615	4138	4138	4138	3820	3820	3438	3438	3056	3183	3183	3183
			feed posuw mm/min	24	33	31	20	20	20	18	37	37	33	33	25	38	38	28	28	18	38	38	38
	40	1.0D	Vc m/min	37	42	38	38	38	38	34	46	46	41	41	41	49	49	44	44	39	49	49	49
			fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.004	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008
			rpm obr/min	9815	8913	8064	8064	8064	8064	7215	7321	7321	6525	6525	6525	6239	6239	5602	5602	4966	5199	5199	5199
			feed posuw mm/min	39	71	65	48	48	48	43	73	73	65	65	52	75	75	67	56	50	83	83	83
	41	1.0D	Vc m/min	23	26	24	24	24	24	21	29	29	26	26	26	30	30	27	27	24	30	30	30
			fz mm/tooth	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.004	0.004	0.003	0.006	0.006	0.006
			rpm obr/min	6101	5517	5093	5093	5093	5093	4456	4615	4615	4138	4138	4138	3820	3820	3438	3438	3056	3183	3183	3183
			feed posuw mm/min	24	33	31	20	20	20	18	37	37	33	33	25	38	38	28	28	18	38	38	38

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	6.0
			LOC	16	20	26	30	12	16	20	26	30	20	25	30	35	40	15
P	1-5	1.0D	Vc m/min	54	54	54	54	65	65	65	58	58	69	69	62	62	62	72
			fz mm/tooth	0.008	0.007	0.006	0.006	0.012	0.012	0.012	0.01	0.01	0.017	0.017	0.015	0.015	0.014	0.024
			rpm obr/min	5730	5730	5730	5730	5173	5173	5173	4615	4615	4393	4393	3947	3947	3947	3820
			feed posuw mm/min	92	80	69	69	124	124	124	92	92	149	149	118	118	111	183
	6-8	1.0D	Vc m/min	54	54	54	54	65	65	65	58	58	69	69	62	62	62	72
			fz mm/tooth	0.008	0.007	0.006	0.006	0.012	0.012	0.012	0.01	0.01	0.017	0.017	0.015	0.015	0.014	0.024
			rpm obr/min	5730	5730	5730	5730	5173	5173	5173	4615	4615	4393	4393	3947	3947	3947	3820
			feed posuw mm/min	92	80	69	69	124	124	124	92	92	149	149	118	118	111	183
	9	1.0D	Vc m/min	44	44	44	44	52	52	52	46	46	55	55	49	49	49	57
			fz mm/tooth	0.008	0.008	0.006	0.006	0.012	0.012	0.012	0.012	0.012	0.018	0.018	0.016	0.016	0.014	0.025
			rpm obr/min	4669	4669	4669	4669	4138	4138	4138	3661	3661	3501	3501	3119	3119	3119	3024
			feed posuw mm/min	75	75	56	56	99	99	99	88	88	126	126	100	100	87	151
	10-11.1	1.0D	Vc m/min	54	54	54	54	65	65	65	58	58	69	69	62	62	62	72
			fz mm/tooth	0.008	0.007	0.006	0.006	0.012	0.012	0.012	0.01	0.01	0.017	0.017	0.015	0.015	0.014	0.024
			rpm obr/min	5730	5730	5730	5730	5173	5173	5173	4615	4615	4393	4393	3947	3947	3947	3820
			feed posuw mm/min	92	80	69	69	124	124	124	92	92	149	149	118	118	111	183
	11.2	1.0D	Vc m/min	44	44	44	44	52	52	52	46	46	55	55	49	49	49	57
			fz mm/tooth	0.008	0.008	0.006	0.006	0.012	0.012	0.012	0.012	0.012	0.018	0.018	0.016	0.016	0.014	0.025
			rpm obr/min	4669	4669	4669	4669	4138	4138	4138	3661	3661	3501	3501	3119	3119	3119	3024
			feed posuw mm/min	75	75	56	56	99	99	99	88	88	126	126	100	100	87	151
K	15-20	1.0D	Vc m/min	54	54	54	54	65	65	65	58	58	69	69	62	62	62	72
			fz mm/tooth	0.008	0.007	0.006	0.006	0.012	0.012	0.012	0.01	0.01	0.017	0.017	0.015	0.015	0.014	0.024
			rpm obr/min	5730	5730	5730	5730	5173	5173	5173	4615	4615	4393	4393	3947	3947	3947	3820
			feed posuw mm/min	92	80	69	69	124	124	124	92	92	149	149	118	118	111	183
H	38.1 - 38.2	1.0D	Vc m/min	27	27	27	27	32	32	32	29	29	36	36	32	32	32	37
			fz mm/tooth	0.007	0.006	0.005	0.005	0.01	0.01	0.01	0.009	0.009	0.012	0.012	0.011	0.011	0.01	0.018
			rpm obr/min	2865	2865	2865	2865	2546	2546	2546	2308	2308	2292	2292	2037	2037	2037	1963
			feed posuw mm/min	40	34	29	29	51	51	51	42	42	55	55	45	45	41	71
	40	1.0D	Vc m/min	44	44	44	44	52	52	52	46	46	55	55	49	49	49	57
			fz mm/tooth	0.008	0.008	0.006	0.006	0.012	0.012	0.012	0.012	0.012	0.018	0.018	0.016	0.016	0.014	0.025
			rpm obr/min	4669	4669	4669	4669	4138	4138	4138	3661	3661	3501	3501	3119	3119	3119	3024
			feed posuw mm/min	75	75	56	56	99	99	99	88	88	126	126	100	100	87	151
	41	1.0D	Vc m/min	27	27	27	27	32	32	32	29	29	36	36	32	32	32	37
			fz mm/tooth	0.007	0.006	0.005	0.005	0.01	0.01	0.01	0.009	0.009	0.012	0.012	0.011	0.011	0.01	0.018
			rpm obr/min	2865	2865	2865	2865	2546	2546	2546	2308	2308	2292	2292	2037	2037	2037	1963
			feed posuw mm/min	40	34	29	29	51	51	51	42	42	55	55	45	45	41	71

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	6.0	6.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	12.0
			LOC	20	25	30	35	40	45	25	30	35	40	45	50	30	35	40	45	50	55	60	35
P	1-5	1.0D	Vc m/min	72	72	72	64	64	64	72	72	72	72	65	65	77	77	77	77	77	69	69	75
			fz mm/tooth	0.024	0.024	0.02	0.02	0.018	0.018	0.033	0.033	0.033	0.028	0.028	0.025	0.039	0.039	0.039	0.033	0.033	0.033	0.029	0.038
			rpm obr/min	3820	3820	3820	3395	3395	3395	2865	2865	2865	2865	2586	2586	2451	2451	2451	2451	2451	2196	2196	1989
			feed posuw mm/min	183	183	153	136	122	122	189	189	189	160	145	129	191	191	191	162	162	145	127	151
	6-8	1.0D	Vc m/min	72	72	72	64	64	64	72	72	72	72	65	65	77	77	77	77	77	69	69	75
			fz mm/tooth	0.024	0.024	0.02	0.02	0.018	0.018	0.033	0.033	0.033	0.028	0.028	0.025	0.039	0.039	0.039	0.033	0.033	0.033	0.029	0.038
			rpm obr/min	3820	3820	3820	3395	3395	3395	2865	2865	2865	2865	2586	2586	2451	2451	2451	2451	2451	2196	2196	1989
			feed posuw mm/min	183	183	153	136	122	122	189	189	189	160	145	129	191	191	191	162	162	145	127	151
	9	1.0D	Vc m/min	57	57	57	52	52	52	57	57	57	57	52	52	63	63	63	63	63	57	57	63
			fz mm/tooth	0.025	0.025	0.021	0.021	0.018	0.018	0.033	0.033	0.033	0.027	0.028	0.024	0.038	0.038	0.038	0.031	0.031	0.032	0.028	0.04
			rpm obr/min	3024	3024	3024	2759	2759	2759	2268	2268	2268	2268	2069	2069	2005	2005	2005	2005	2005	1814	1814	1671
			feed posuw mm/min	151	151	127	116	99	99	150	150	150	122	116	99	152	152	152	124	124	116	102	134
	10-11.1	1.0D	Vc m/min	72	72	72	64	64	64	72	72	72	72	65	65	77	77	77	77	77	69	69	75
			fz mm/tooth	0.024	0.024	0.02	0.02	0.018	0.018	0.033	0.033	0.033	0.028	0.028	0.025	0.039	0.039	0.039	0.033	0.033	0.033	0.029	0.038
			rpm obr/min	3820	3820	3820	3395	3395	3395	2865	2865	2865	2865	2586	2586	2451	2451	2451	2451	2451	2196	2196	1989
			feed posuw mm/min	183	183	153	136	122	122	189	189	189	160	145	129	191	191	191	162	162	145	127	151
	11.2	1.0D	Vc m/min	57	57	57	52	52	52	57	57	57	57	52	52	63	63	63	63	63	57	57	63
			fz mm/tooth	0.025	0.025	0.021	0.021	0.018	0.018	0.033	0.033	0.033	0.027	0.028	0.024	0.038	0.038	0.038	0.031	0.031	0.032	0.028	0.04
			rpm obr/min	3024	3024	3024	2759	2759	2759	2268	2268	2268	2268	2069	2069	2005	2005	2005	2005	2005	1814	1814	1671
			feed posuw mm/min	151	151	127	116	99	99	150	150	150	122	116	99	152	152	152	124	124	116	102	134
K	15-20	1.0D	Vc m/min	72	72	72	64	64	64	72	72	72	72	65	65	77	77	77	77	77	69	69	75
			fz mm/tooth	0.024	0.024	0.02	0.02	0.018	0.018	0.033	0.033	0.033	0.028	0.028	0.025	0.039	0.039	0.039	0.033	0.033	0.033	0.029	0.038
			rpm obr/min	3820	3820	3820	3395	3395	3395	2865	2865	2865	2865	2586	2586	2451	2451	2451	2451	2451	2196	2196	1989
			feed posuw mm/min	183	183	153	136	122	122	189	189	189	160	145	129	191	191	191	162	162	145	127	151
H	38.1 - 38.2	1.0D	Vc m/min	37	37	37	33	33	33	38	38	38	38	34	34	38	38	38	38	38	34	34	38
			fz mm/tooth	0.018	0.018	0.015	0.016	0.014	0.014	0.023	0.023	0.023	0.02	0.02	0.018	0.029	0.029	0.029	0.025	0.025	0.025	0.023	0.027
			rpm obr/min	1963	1963	1963	1751	1751	1751	1512	1512	1512	1512	1353	1353	1210	1210	1210	1210	1210	1082	1082	1008
			feed posuw mm/min	71	71	59	56	49	49	70	70	70	60	54	49	70	70	70	60	60	54	50	54
	40	1.0D	Vc m/min	57	57	57	52	52	52	57	57	57	57	52	52	63	63	63	63	63	57	57	63
			fz mm/tooth	0.025	0.025	0.021	0.021	0.018	0.018	0.033	0.033	0.033	0.027	0.028	0.024	0.038	0.038	0.038	0.031	0.031	0.032	0.028	0.04
			rpm obr/min	3024	3024	3024	2759	2759	2759	2268	2268	2268	2268	2069	2069	2005	2005	2005	2005	2005	1814	1814	1671
			feed posuw mm/min	151	151	127	116	99	99	150	150	150	122	116	99	152	152	152	124	124	116	102	134
	41	1.0D	Vc m/min	37	37	37	33	33	33	38	38	38	38	34	34	38	38	38	38	38	34	34	38
			fz mm/tooth	0.018	0.018	0.015	0.016	0.014	0.014	0.023	0.023	0.023	0.02	0.02	0.018	0.029	0.029	0.029	0.025	0.025	0.025	0.023	0.027
			rpm obr/min	1963	1963	1963	1751	1751	1751	1512	1512	1512	1512	1353	1353	1210	1210	1210	1210	1210	1082	1082	1008
			feed posuw mm/min	71	71	59	56	49	49	70	70	70	60	54	49	70	70	70	60	60	54	50	54

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	12.0	12.0	12.0	12.0	12.0	12.0	12.0	14.0	14.0	16.0	16.0	16.0	16.0	16.0
			LOC	40	45	50	55	60	65	70	50	60	40	50	60	70	80
P	1-5	1.0D	Vc m/min	75	75	75	75	75	68	68	81	81	85	85	85	85	85
			fz mm/tooth	0.038	0.033	0.033	0.033	0.028	0.028	0.028	0.034	0.034	0.041	0.041	0.035	0.035	0.031
			rpm obr/min	1989	1989	1989	1989	1989	1804	1804	1842	1842	1691	1691	1691	1691	1691
			feed posuw mm/min	151	131	131	131	111	101	101	125	125	139	139	118	118	105
	6-8	1.0D	Vc m/min	75	75	75	75	75	68	68	81	81	85	85	85	85	85
			fz mm/tooth	0.038	0.033	0.033	0.033	0.028	0.028	0.028	0.034	0.034	0.041	0.041	0.035	0.035	0.031
			rpm obr/min	1989	1989	1989	1989	1989	1804	1804	1842	1842	1691	1691	1691	1691	1691
			feed posuw mm/min	151	131	131	131	111	101	101	125	125	139	139	118	118	105
	9	1.0D	Vc m/min	63	63	63	63	63	57	57	65	65	64	64	64	64	64
			fz mm/tooth	0.04	0.034	0.034	0.034	0.03	0.03	0.03	0.034	0.034	0.041	0.041	0.035	0.035	0.031
			rpm obr/min	1671	1671	1671	1671	1671	1512	1512	1478	1478	1273	1273	1273	1273	1273
			feed posuw mm/min	134	114	114	114	100	91	91	100	100	104	104	89	89	79
	10-11.1	1.0D	Vc m/min	75	75	75	75	75	68	68	81	81	85	85	85	85	85
			fz mm/tooth	0.038	0.033	0.033	0.033	0.028	0.028	0.028	0.034	0.034	0.041	0.041	0.035	0.035	0.031
			rpm obr/min	1989	1989	1989	1989	1989	1804	1804	1842	1842	1691	1691	1691	1691	1691
			feed posuw mm/min	151	131	131	131	111	101	101	125	125	139	139	118	118	105
	11.2	1.0D	Vc m/min	63	63	63	63	63	57	57	65	65	64	64	64	64	64
			fz mm/tooth	0.04	0.034	0.034	0.034	0.03	0.03	0.03	0.034	0.034	0.041	0.041	0.035	0.035	0.031
			rpm obr/min	1671	1671	1671	1671	1671	1512	1512	1478	1478	1273	1273	1273	1273	1273
			feed posuw mm/min	134	114	114	114	100	91	91	100	100	104	104	89	89	79
K	15-20	1.0D	Vc m/min	75	75	75	75	75	68	68	81	81	85	85	85	85	85
			fz mm/tooth	0.038	0.033	0.033	0.033	0.028	0.028	0.028	0.034	0.034	0.041	0.041	0.035	0.035	0.031
			rpm obr/min	1989	1989	1989	1989	1989	1804	1804	1842	1842	1691	1691	1691	1691	1691
			feed posuw mm/min	151	131	131	131	111	101	101	125	125	139	139	118	118	105
H	38.1 - 38.2	1.0D	Vc m/min	38	38	38	38	38	34	34	40	40	40	40	40	40	40
			fz mm/tooth	0.027	0.022	0.022	0.022	0.02	0.019	0.019	0.025	0.025	0.031	0.031	0.025	0.025	0.022
			rpm obr/min	1008	1008	1008	1008	1008	902	902	909	909	796	796	796	796	796
			feed posuw mm/min	54	44	44	44	40	34	34	45	45	49	49	40	40	35
	40	1.0D	Vc m/min	63	63	63	63	63	57	57	65	65	64	64	64	64	64
			fz mm/tooth	0.04	0.034	0.034	0.034	0.03	0.03	0.03	0.034	0.034	0.041	0.041	0.035	0.035	0.031
			rpm obr/min	1671	1671	1671	1671	1671	1512	1512	1478	1478	1273	1273	1273	1273	1273
			feed posuw mm/min	134	114	114	114	100	91	91	100	100	104	104	89	89	79
	41	1.0D	Vc m/min	38	38	38	38	38	34	34	40	40	40	40	40	40	40
			fz mm/tooth	0.027	0.022	0.022	0.022	0.02	0.019	0.019	0.025	0.025	0.031	0.031	0.025	0.025	0.022
			rpm obr/min	1008	1008	1008	1008	1008	902	902	909	909	796	796	796	796	796
			feed posuw mm/min	54	44	44	44	40	34	34	45	45	49	49	40	40	35

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	16.0	16.0	16.0	18.0	18.0	18.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	22.0	22.0	25.0	25.0	25.0	25.0
			LOC	90	110	120	50	70	100	50	60	70	80	90	110	120	75	110	70	90	110	120
P	1-5	1.0D	Vc m/min	77	77	77	82	82	74	77	77	77	77	77	69	69	76	76	77	77	77	77
			fz mm/tooth	0.031	0.031	0.031	0.041	0.034	0.031	0.041	0.041	0.035	0.035	0.031	0.032	0.032	0.034	0.032	0.041	0.036	0.036	0.031
			rpm obr/min	1532	1532	1532	1450	1450	1309	1225	1225	1225	1225	1225	1098	1098	1100	1100	980	980	980	980
			feed posuw mm/min	95	95	95	119	99	81	100	100	86	86	76	70	70	75	70	80	71	71	61
	6-8	1.0D	Vc m/min	77	77	77	82	82	74	77	77	77	77	77	69	69	76	76	77	77	77	77
			fz mm/tooth	0.031	0.031	0.031	0.041	0.034	0.031	0.041	0.041	0.035	0.035	0.031	0.032	0.032	0.034	0.032	0.041	0.036	0.036	0.031
			rpm obr/min	1532	1532	1532	1450	1450	1309	1225	1225	1225	1225	1225	1098	1098	1100	1100	980	980	980	980
			feed posuw mm/min	95	95	95	119	99	81	100	100	86	86	76	70	70	75	70	80	71	71	61
	9	1.0D	Vc m/min	58	58	58	63	63	57	60	60	60	60	60	54	54	58	58	59	59	59	59
			fz mm/tooth	0.03	0.03	0.03	0.04	0.033	0.03	0.039	0.039	0.034	0.034	0.029	0.029	0.029	0.033	0.03	0.04	0.033	0.033	0.03
			rpm obr/min	1154	1154	1154	1114	1114	1008	955	955	955	955	955	859	859	839	839	751	751	751	751
			feed posuw mm/min	69	69	69	89	74	60	74	74	65	65	55	50	50	55	50	60	50	50	45
	10-11.1	1.0D	Vc m/min	77	77	77	82	82	74	77	77	77	77	77	69	69	76	76	77	77	77	77
			fz mm/tooth	0.031	0.031	0.031	0.041	0.034	0.031	0.041	0.041	0.035	0.035	0.031	0.032	0.032	0.034	0.032	0.041	0.036	0.036	0.031
			rpm obr/min	1532	1532	1532	1450	1450	1309	1225	1225	1225	1225	1225	1098	1098	1100	1100	980	980	980	980
			feed posuw mm/min	95	95	95	119	99	81	100	100	86	86	76	70	70	75	70	80	71	71	61
	11.2	1.0D	Vc m/min	58	58	58	63	63	57	60	60	60	60	60	54	54	58	58	59	59	59	59
			fz mm/tooth	0.03	0.03	0.03	0.04	0.033	0.03	0.039	0.039	0.034	0.034	0.029	0.029	0.029	0.033	0.03	0.04	0.033	0.033	0.03
			rpm obr/min	1154	1154	1154	1114	1114	1008	955	955	955	955	955	859	859	839	839	751	751	751	751
			feed posuw mm/min	69	69	69	89	74	60	74	74	65	65	55	50	50	55	50	60	50	50	45
K	15-20	1.0D	Vc m/min	77	77	77	82	82	74	77	77	77	77	77	69	69	76	76	77	77	77	77
			fz mm/tooth	0.031	0.031	0.031	0.041	0.034	0.031	0.041	0.041	0.035	0.035	0.031	0.032	0.032	0.034	0.032	0.041	0.036	0.036	0.031
			rpm obr/min	1532	1532	1532	1450	1450	1309	1225	1225	1225	1225	1225	1098	1098	1100	1100	980	980	980	980
			feed posuw mm/min	95	95	95	119	99	81	100	100	86	86	76	70	70	75	70	80	71	71	61
H	38.1 - 38.2	1.0D	Vc m/min	36	36	36	40	40	36	38	38	38	38	38	34	34	38	38	38	38	38	38
			fz mm/tooth	0.021	0.021	0.021	0.029	0.025	0.024	0.029	0.029	0.025	0.025	0.021	0.023	0.023	0.027	0.023	0.031	0.026	0.026	0.026
			rpm obr/min	716	716	716	707	707	637	605	605	605	605	605	541	541	550	550	484	484	484	484
			feed posuw mm/min	30	30	30	41	35	31	35	35	30	30	25	25	25	30	25	30	25	25	25
	40	1.0D	Vc m/min	58	58	58	63	63	57	60	60	60	60	60	54	54	58	58	59	59	59	59
			fz mm/tooth	0.03	0.03	0.03	0.04	0.033	0.03	0.039	0.039	0.034	0.034	0.029	0.029	0.029	0.033	0.03	0.04	0.033	0.033	0.03
			rpm obr/min	1154	1154	1154	1114	1114	1008	955	955	955	955	955	859	859	839	839	751	751	751	751
			feed posuw mm/min	69	69	69	89	74	60	74	74	65	65	55	50	50	55	50	60	50	50	45
	41	1.0D	Vc m/min	36	36	36	40	40	36	38	38	38	38	38	34	34	38	38	38	38	38	38
			fz mm/tooth	0.021	0.021	0.021	0.029	0.025	0.024	0.029	0.029	0.025	0.025	0.021	0.023	0.023	0.027	0.023	0.031	0.026	0.026	0.026
			rpm obr/min	716	716	716	707	707	637	605	605	605	605	605	541	541	550	550	484	484	484	484
			feed posuw mm/min	30	30	30	41	35	31	35	35	30	30	25	25	25	30	25	30	25	25	25

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX6900104000A002003	0,1	4	0,15	0,3	40	0,085
UFX6900104000A002005	0,1	4	0,15	0,5	40	0,085
UFX6900104000A002010	0,1	4	0,15	1	40	0,085
UFX6900154000A002003	0,15	4	0,2	0,35	40	0,13
UFX6900204000A003005	0,2	4	0,3	0,5	40	0,17
UFX6900204000A003010	0,2	4	0,3	1	40	0,17
UFX6900204000A003015	0,2	4	0,3	1,5	40	0,17
UFX6900204000A003020	0,2	4	0,3	2	40	0,17
UFX6900304000A005010	0,3	4	0,5	1	40	0,27
UFX6900304000A005015	0,3	4	0,5	1,5	40	0,27
UFX6900304000A005020	0,3	4	0,5	2	40	0,27
UFX6900304000A005025	0,3	4	0,5	2,5	40	0,27
UFX6900304000A005030	0,3	4	0,5	3	40	0,27
UFX6900304000A005040	0,3	4	0,5	4	40	0,27
UFX6900304000A005050	0,3	4	0,5	5	40	0,27
UFX6900404000A006010	0,4	4	0,6	1	40	0,37
UFX6900404000A006015	0,4	4	0,6	1,5	40	0,37
UFX6900404000A006020	0,4	4	0,6	2	40	0,37
UFX6900404000A006025	0,4	4	0,6	2,5	40	0,37
UFX6900404000A006030	0,4	4	0,6	3	40	0,37
UFX6900404000A006040	0,4	4	0,6	4	40	0,37
UFX6900404000A006050	0,4	4	0,6	5	40	0,37
UFX6900404000A006060	0,4	4	0,6	6	40	0,37
UFX6900404000A006080	0,4	4	0,6	8	40	0,37
UFX6900404000A006100	0.4	4	0.6	10	40	0.37
UFX6900504000A007010	0.5	4	0.7	1	45	0.45
UFX6900504000A007015	0.5	4	0.7	1.5	45	0.45
UFX6900504000A007020	0.5	4	0.7	2	45	0.45
UFX6900504000A007025	0.5	4	0.7	2.5	45	0.45
UFX6900504000A007030	0.5	4	0.7	3	45	0.45
UFX6900504000A007040	0.5	4	0.7	4	45	0.45
UFX6900504000A007050	0.5	4	0.7	5	45	0.45
UFX6900504000A007060	0.5	4	0.7	6	45	0.45
UFX6900504000A007080	0.5	4	0.7	8	45	0.45
UFX6900504000A007100	0.5	4	0.7	10	45	0.45
UFX6900504000A007120	0.5	4	0.7	12	45	0.45
UFX6900504000A007140	0.5	4	0.7	14	45	0.45

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFX69

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX6900504000A007160	0.5	4	0.7	16	45	0.45
UFX6900604000A009020	0.6	4	0.9	2	45	0.55
UFX6900604000A009030	0.6	4	0.9	3	45	0.55
UFX6900604000A009040	0.6	4	0.9	4	45	0.55
UFX6900604000A009050	0.6	4	0.9	5	45	0.55
UFX6900604000A009060	0.6	4	0.9	6	45	0.55
UFX6900604000A009080	0.6	4	0.9	8	45	0.55
UFX6900604000A009100	0.6	4	0.9	10	45	0.55
UFX6900604000A009120	0.6	4	0.9	12	45	0.55
UFX6900604000A009140	0.6	4	0.9	14	45	0.55
UFX6900604000A009160	0.6	4	0.9	16	45	0.55

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFX69

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX6900704000A012020	0,7	4	1,2	2	45	0,65
UFX6900704000A012040	0,7	4	1,2	4	45	0,65
UFX6900704000A012060	0,7	4	1,2	6	45	0,65
UFX6900704000A012080	0,7	4	1,2	8	45	0,65
UFX6900704000A012100	0,7	4	1,2	10	45	0,65
UFX6900704000A012120	0,7	4	1,2	12	45	0,65
UFX6900804000A012020	0,8	4	1,2	2	45	0,75
UFX6900804000A012030	0,8	4	1,2	3	45	0,75
UFX6900804000A012040	0,8	4	1,2	4	45	0,75
UFX6900804000A012050	0,8	4	1,2	5	45	0,75
UFX6900804000A012060	0,8	4	1,2	6	45	0,75
UFX6900804000A012080	0,8	4	1,2	8	45	0,75
UFX6900804000A012100	0,8	4	1,2	10	45	0,75
UFX6900804000A012120	0,8	4	1,2	12	45	0,75
UFX6900804000A012140	0,8	4	1,2	14	45	0,75
UFX6900804000A012160	0,8	4	1,2	16	45	0,75
UFX6900804000A012200	0,8	4	1,2	20	45	0,75
UFX6900904000A013060	0,9	4	1,3	6	45	0,85
UFX6900904000A013080	0,9	4	1,3	8	45	0,85
UFX6900904000A013100	0,9	4	1,3	10	45	0,85
UFX6901004000A015020	1	4	1,5	2	50	0,95
UFX6901004000A015030	1	4	1,5	3	50	0,95
UFX6901004000A015040	1	4	1,5	4	50	0,95
UFX6901004000A015050	1	4	1,5	5	50	0,95
UFX6901004000A015060	1	4	1,5	6	50	0,95
UFX6901004000A015070	1	4	1,5	7	50	0,95
UFX6901004000A015080	1	4	1,5	8	50	0,95
UFX6901004000A015100	1	4	1,5	10	50	0,95
UFX6901004000A015120	1	4	1,5	12	50	0,95
UFX6901004000A015140	1	4	1,5	14	50	0,95
UFX6901004000A015160	1	4	1,5	16	50	0,95
UFX6901004000A015180	1	4	1,5	18	50	0,95
UFX6901004000A015200	1	4	1,5	20	50	0,95
UFX6901004000A015220	1	4	1,5	22	60	0,95
UFX6901004000A015260	1	4	1,5	26	60	0,95
UFX6901004000A015300	1	4	1,5	30	70	0,95

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFX69

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX6901004000A015400	1	4	1,5	40	80	0,95
UFX6901004000A015500	1	4	1,5	50	100	0,95
UFX6901204000A018040	1,2	4	1,8	4	50	1,15
UFX6901204000A018060	1,2	4	1,8	6	50	1,15
UFX6901204000A018080	1,2	4	1,8	8	50	1,15
UFX6901204000A018100	1,2	4	1,8	10	50	1,15
UFX6901204000A018120	1,2	4	1,8	12	50	1,15
UFX6901204000A018140	1,2	4	1,8	14	50	1,15
UFX6901204000A018160	1,2	4	1,8	16	50	1,15
UFX6901204000A018200	1,2	4	1,8	20	50	1,15
UFX6901204000A018260	1,2	4	1,8	26	60	1,15
UFX6901204000A018300	1,2	4	1,8	30	70	1,15
UFX6901404000A021060	1,4	4	2,1	6	50	1,35
UFX6901404000A021080	1,4	4	2,1	8	50	1,35
UFX6901404000A021100	1,4	4	2,1	10	50	1,35
UFX6901404000A021140	1,4	4	2,1	14	50	1,35
UFX6901404000A021160	1,4	4	2,1	16	50	1,35
UFX6901404000A021200	1,4	4	2,1	20	50	1,35
UFX6901504000A023040	1,5	4	2,3	4	50	1,45
UFX6901504000A023050	1,5	4	2,3	5	50	1,45
UFX6901504000A023060	1,5	4	2,3	6	50	1,45
UFX6901504000A023070	1,5	4	2,3	7	50	1,45
UFX6901504000A023080	1,5	4	2,3	8	50	1,45
UFX6901504000A023100	1,5	4	2,3	10	50	1,45
UFX6901504000A023120	1,5	4	2,3	12	50	1,45
UFX6901504000A023140	1,5	4	2,3	14	50	1,45
UFX6901504000A023160	1,5	4	2,3	16	50	1,45
UFX6901504000A023180	1,5	4	2,3	18	50	1,45
UFX6901504000A023200	1,5	4	2,3	20	50	1,45
UFX6901504000A023220	1,5	4	2,3	22	60	1,45
UFX6901504000A023260	1,5	4	2,3	26	60	1,45
UFX6901504000A023300	1,5	4	2,3	30	70	1,45
UFX6901604000A023080	1,6	4	2,3	8	50	1,55
UFX6901604000A023100	1,6	4	2,3	10	50	1,55
UFX6901604000A023120	1,6	4	2,3	12	50	1,55
UFX6901604000A023160	1,6	4	2,3	16	50	1,55

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFX69

2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFX69

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX6905006000A080400	5	6	8	40	80	4,85
UFX6905006000A080500	5	6	8	50	90	4,85
UFX6905006000A080600	5	6	8	60	100	4,85
UFX6906006000A090150	6	6	9	15	60	5,85
UFX6906006000A090200	6	6	9	20	60	5,85
UFX6906006000A090300	6	6	9	30	70	5,85
UFX6906006000A090320	6	6	9	32	90	5,85
UFX6908008000A120250	8	8	12	25	70	7,7
UFX6908008000A120300	8	8	12	30	80	7,7
UFX6908008000A120420	8	8	12	42	100	7,7
UFX6910010000A150300	10	10	15	30	75	9,7
UFX6910010000A150350	10	10	15	35	80	9,7
UFX6910010000A150450	10	10	15	45	100	9,7
UFX6912012000A200350	12	12	20	35	80	11,7
UFX6912012000A200400	12	12	20	40	90	11,7
UFX6912012000A200500	12	12	20	50	110	11,7

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.1	0.1	0.1	0.15	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4
			LBS	0.3	0.5	1	0.35	0.5	1	1.5	2	1	1.5	2	2.5	3	4	5	1	1.5
P	1-5	1.0D	Vc m/min	16	16	14	20	24	24	22	22	32	32	29	29	29	26	19	34	34
			fz mm/tooth	0.003	0.003	0.003	0.004	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.01	0.01
			rpm obr/min	50930	50930	44563	42441	38197	38197	35014	35014	33953	33953	30770	30770	30770	27587	20160	27056	27056
			feed posuw mm/min	306	306	267	340	382	382	280	280	407	407	308	308	308	276	161	541	541
			Ap mm	0.009	0.006	0.002	0.013	0.018	0.013	0.007	0.005	0.019	0.019	0.011	0.007	0.007	0.004	0.003	0.036	0.025
	6-8	1.0D	Vc m/min	16	16	14	20	24	24	22	22	32	32	29	29	29	26	19	34	34
			fz mm/tooth	0.003	0.003	0.003	0.004	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.01	0.01
			rpm obr/min	50930	50930	44563	42441	38197	38197	35014	35014	33953	33953	30770	30770	30770	27587	20160	27056	27056
			feed posuw mm/min	306	306	267	340	382	382	280	280	407	407	308	308	308	276	161	541	541
			Ap mm	0.009	0.006	0.002	0.013	0.018	0.013	0.007	0.005	0.019	0.019	0.011	0.007	0.007	0.004	0.003	0.036	0.025
	9	1.0D	Vc m/min	15	15	13	19	23	23	21	21	30	30	27	27	27	24	18	32	32
			fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.007	0.007
			rpm obr/min	47746	47746	41380	40319	36606	36606	33423	33423	31831	31831	28648	28648	28648	25465	19099	25465	25465
			feed posuw mm/min	191	191	166	242	293	293	201	201	255	255	229	229	229	153	115	357	357
			Ap mm	0.007	0.005	0.002	0.010	0.014	0.01	0.006	0.004	0.015	0.015	0.008	0.005	0.005	0.003	0.002	0.028	0.02
	10-11.1	1.0D	Vc m/min	16	16	14	20	24	24	22	22	32	32	29	29	29	26	19	34	34
			fz mm/tooth	0.003	0.003	0.003	0.004	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.01	0.01
			rpm obr/min	50930	50930	44563	42441	38197	38197	35014	35014	33953	33953	30770	30770	30770	27587	20160	27056	27056
			feed posuw mm/min	306	306	267	340	382	382	280	280	407	407	308	308	308	276	161	541	541
			Ap mm	0.009	0.006	0.002	0.013	0.018	0.013	0.007	0.005	0.019	0.019	0.011	0.007	0.007	0.004	0.003	0.036	0.025
	11.2	1.0D	Vc m/min	15	15	13	19	23	23	21	21	30	30	27	27	27	24	18	32	32
			fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.007	0.007
			rpm obr/min	47746	47746	41380	40319	36606	36606	33423	33423	31831	31831	28648	28648	28648	25465	19099	25465	25465
			feed posuw mm/min	191	191	166	242	293	293	201	201	255	255	229	229	229	153	115	357	357
			Ap mm	0.007	0.005	0.002	0.010	0.014	0.01	0.006	0.004	0.015	0.015	0.008	0.005	0.005	0.003	0.002	0.028	0.02
K	15-20	1.0D	Vc m/min	16	16	14	20	24	24	22	22	32	32	29	29	29	26	19	34	34
			fz mm/tooth	0.003	0.003	0.003	0.004	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.01	0.01
			rpm obr/min	50930	50930	44563	42441	38197	38197	35014	35014	33953	33953	30770	30770	30770	27587	20160	27056	27056
			feed posuw mm/min	306	306	267	340	382	382	280	280	407	407	308	308	308	276	161	541	541
			Ap mm	0.009	0.006	0.002	0.013	0.018	0.013	0.007	0.005	0.019	0.019	0.011	0.007	0.007	0.004	0.003	0.036	0.025
H	38.1 - 38.2	1.0D	Vc m/min	13	13	11	16	20	20	18	18	27	27	24	24	24	21	16	29	29
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.006	0.006
			rpm obr/min	41380	41380	35014	33953	31831	31831	28648	28648	28648	28648	25465	25465	25465	22282	16977	23077	23077
			feed posuw mm/min	166	166	140	136	191	191	172	172	229	229	204	204	204	134	102	277	277
			Ap mm	0.005	0.004	0.001	0.007	0.01	0.007	0.004	0.003	0.011	0.011	0.006	0.004	0.004	0.002	0.002	0.02	0.014
	40	1.0D	Vc m/min	15	15	13	19	23	23	21	21	30	30	27	27	27	24	18	32	32
			fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.007	0.007
			rpm obr/min	47746	47746	41380	40319	36606	36606	33423	33423	31831	31831	28648	28648	28648	25465	19099	25465	25465
			feed posuw mm/min	191	191	166	242	293	293	201	201	255	255	229	229	229	153	115	357	357
			Ap mm	0.007	0.005	0.002	0.010	0.014	0.01	0.006	0.004	0.015	0.015	0.008	0.005	0.005	0.003	0.002	0.028	0.02
	41	1.0D	Vc m/min	13	13	11	16	20	20	18	18	27	27	24	24	24	21	16	29	29
			fz mm/tooth	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.006	0.006
			rpm obr/min	41380	41380	35014	33953	31831	31831	28648	28648	28648	28648	25465	25465	25465	22282	16977	23077	23077
			feed posuw mm/min	166	166	140	136	191	191	172	172	229	229	204	204	204	134	102	277	277
			Ap mm	0.005	0.004	0.001	0.007	0.01	0.007	0.004	0.003	0.011	0.011	0.006	0.004	0.004	0.002	0.002	0.02	0.014

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6
			LBS	2	2.5	3	4	5	6	8	10	1	1.5	2	2.5	3	4	5	6	8	10	12	14	16	2	3
P	1-5	1.0D	Vc m/min	34	31	31	31	28	28	21	10	43	43	43	43	39	39	39	34	26	26	13	13	4	52	52
			fz mm/tooth	0.01	0.009	0.009	0.009	0.008	0.008	0.007	0.006	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.005	0.014	0.014
			rpm obr/min	27056	24669	24669	24669	22282	22282	16711	7958	27375	27375	27375	27375	24828	24828	24828	21645	16552	16552	8276	8276	2546	27587	27587
			feed posuw mm/min	541	444	444	444	357	357	234	95	547	547	547	547	447	447	447	346	232	232	99	99	25	772	772
			Ap mm	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007	0.005	0.005	0.005	0.005	0.038	0.038
	6-8	1.0D	Vc m/min	34	31	31	31	28	28	21	10	43	43	43	43	39	39	39	34	26	26	13	13	4	52	52
			fz mm/tooth	0.01	0.009	0.009	0.009	0.008	0.008	0.007	0.006	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.005	0.014	0.014
			rpm obr/min	27056	24669	24669	24669	22282	22282	16711	7958	27375	27375	27375	27375	24828	24828	24828	21645	16552	16552	8276	8276	2546	27587	27587
			feed posuw mm/min	541	444	444	444	357	357	234	95	547	547	547	547	447	447	447	346	232	232	99	99	25	772	772
			Ap mm	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007	0.005	0.005	0.005	0.005	0.038	0.038
	9	1.0D	Vc m/min	32	29	29	29	26	26	19	10	41	41	41	41	36	36	36	32	24	24	12	12	4	49	49
			fz mm/tooth	0.007	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.004	0.011	0.011
			rpm obr/min	25465	23077	23077	23077	20690	20690	15120	7958	26101	26101	26101	26101	22918	22918	22918	20372	15279	15279	7639	7639	2546	25995	25995
			feed posuw mm/min	357	323	323	323	248	248	151	80	418	418	418	418	321	321	321	285	183	183	76	76	20	572	572
			Ap mm	0.02	0.011	0.011	0.007	0.007	0.004	0.003	0.003	0.035	0.035	0.025	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.004	0.004	0.029	0.029
	10-11.1	1.0D	Vc m/min	34	31	31	31	28	28	21	10	43	43	43	43	39	39	39	34	26	26	13	13	4	52	52
			fz mm/tooth	0.01	0.009	0.009	0.009	0.008	0.008	0.007	0.006	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.005	0.014	0.014
			rpm obr/min	27056	24669	24669	24669	22282	22282	16711	7958	27375	27375	27375	27375	24828	24828	24828	21645	16552	16552	8276	8276	2546	27587	27587
			feed posuw mm/min	541	444	444	444	357	357	234	95	547	547	547	547	447	447	447	346	232	232	99	99	25	772	772
			Ap mm	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007	0.005	0.005	0.005	0.005	0.038	0.038
	11.2	1.0D	Vc m/min	32	29	29	29	26	26	19	10	41	41	41	41	36	36	36	32	24	24	12	12	4	49	49
			fz mm/tooth	0.007	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.004	0.011	0.011
			rpm obr/min	25465	23077	23077	23077	20690	20690	15120	7958	26101	26101	26101	26101	22918	22918	22918	20372	15279	15279	7639	7639	2546	25995	25995
			feed posuw mm/min	357	323	323	323	248	248	151	80	418	418	418	418	321	321	321	285	183	183	76	76	20	572	572
			Ap mm	0.02	0.011	0.011	0.007	0.007	0.004	0.003	0.003	0.035	0.035	0.025	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.004	0.004	0.029	0.029
K	15-20	1.0D	Vc m/min	34	31	31	31	28	28	21	10	43	43	43	43	39	39	39	34	26	26	13	13	4	52	52
			fz mm/tooth	0.01	0.009	0.009	0.009	0.008	0.008	0.007	0.006	0.01	0.01	0.01	0.01	0.009	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.005	0.014	0.014
			rpm obr/min	27056	24669	24669	24669	22282	22282	16711	7958	27375	27375	27375	27375	24828	24828	24828	21645	16552	16552	8276	8276	2546	27587	27587
			feed posuw mm/min	541	444	444	444	357	357	234	95	547	547	547	547	447	447	447	346	232	232	99	99	25	772	772
			Ap mm	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.045	0.045	0.032	0.032	0.018	0.018	0.011	0.011	0.007	0.005	0.005	0.005	0.005	0.038	0.038
H	38.1 - 38.2	1.0D	Vc m/min	29	26	26	26	23	23	17	9	36	36	36	36	32	32	32	29	21	21	11	11	4	43	43
			fz mm/tooth	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.004	0.004	0.004	0.003	0.009	0.009
			rpm obr/min	23077	20690	20690	20690	18303	18303	13528	7162	22918	22918	22918	22918	20372	20372	20372	18462	13369	13369	7003	7003	2546	22812	22812
			feed posuw mm/min	277	207	207	207	183	183	108	57	275	275	275	275	244	244	244	185	107	107	56	56	15	411	411
			Ap mm	0.014	0.008	0.008	0.005	0.005	0.003	0.002	0.002	0.025	0.025	0.018	0.018	0.01	0.01	0.006	0.006	0.004	0.003	0.003	0.003	0.003	0.021	0.021
	40	1.0D	Vc m/min	32	29	29	29	26	26	19	10	41	41	41	41	36	36	36	32	24	24	12	12	4	49	49
			fz mm/tooth	0.007	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.004	0.011	0.011
			rpm obr/min	25465	23077	23077	23077	20690	20690	15120	7958	26101	26101	26101	26101	22918	22918	22918	20372	15279	15279	7639	7639	2546	25995	25995
			feed posuw mm/min	357	323	323	323	248	248	151	80	418	418	418	418	321	321	321	285	183	183	76	76	20	572	572
			Ap mm	0.02	0.011	0.011	0.007	0.007	0.004	0.003	0.003	0.035	0.035	0.025	0.025	0.014	0.014	0.009	0.009	0.005	0.004	0.004	0.004	0.004	0.029	0.029
	41	1.0D	Vc m/min	29	26	26	26	23	23	17	9	36	36	36	36	32	32	32	29	21	21	11	11	4	43	43
			fz mm/tooth	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.004	0.004	0.004	0.004	0.003	0.009	0.009
			rpm obr/min	23077	20690	20690	20690	18303	18303	13528	7162	22918	22918	22918	22918	20372	20372	20372	18462	13369	13369	7003	7003	2546	22812	22812
			feed posuw mm/min	277	207	207	207	183	183	108	57	275	275	275	275	244	244	244	185	107	107	56	56	15	411	411
			Ap mm	0.014	0.008	0.008	0.005	0.005	0.003	0.002	0.002	0.025	0.025	0.018	0.018	0.01	0.01	0.006	0.006	0.004	0.003	0.003	0.003	0.003	0.021	0.021

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
			LBS	4	5	6	8	10	12	14	16	2	4	6	8	10	12	2	3	4	5	6
P	1-5	1.0D	Vc m/min	46	46	46	41	31	31	15	15	60	54	54	48	48	36	69	69	69	62	62
			fz mm/tooth	0.013	0.013	0.013	0.011	0.01	0.01	0.009	0.009	0.014	0.013	0.013	0.011	0.011	0.01	0.014	0.014	0.014	0.013	0.013
			rpm obr/min	24404	24404	24404	21751	16446	16446	7958	7958	27284	24555	24555	21827	21827	16370	27454	27454	27454	24669	24669
			feed posuw mm/min	634	634	634	479	329	329	143	143	764	638	638	480	480	327	769	769	769	641	641
			Ap mm	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029
	6-8	1.0D	Vc m/min	46	46	46	41	31	31	15	15	60	54	54	48	48	36	69	69	69	62	62
			fz mm/tooth	0.013	0.013	0.013	0.011	0.01	0.01	0.009	0.009	0.014	0.013	0.013	0.011	0.011	0.01	0.014	0.014	0.014	0.013	0.013
			rpm obr/min	24404	24404	24404	21751	16446	16446	7958	7958	27284	24555	24555	21827	21827	16370	27454	27454	27454	24669	24669
			feed posuw mm/min	634	634	634	479	329	329	143	143	764	638	638	480	480	327	769	769	769	641	641
			Ap mm	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029
	9	1.0D	Vc m/min	44	44	44	39	29	29	15	15	57	51	51	45	45	34	65	65	65	58	58
			fz mm/tooth	0.009	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.011	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.011	0.011
			rpm obr/min	23343	23343	23343	20690	15385	15385	7958	7958	25920	23191	23191	20463	20463	15461	25863	25863	25863	23077	23077
			feed posuw mm/min	420	420	420	331	215	215	95	95	570	417	417	327	327	216	621	621	621	508	508
			Ap mm	0.017	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.049	0.02	0.012	0.012	0.007	0.005	0.056	0.039	0.039	0.022	0.022
	10-11.1	1.0D	Vc m/min	46	46	46	41	31	31	15	15	60	54	54	48	48	36	69	69	69	62	62
			fz mm/tooth	0.013	0.013	0.013	0.011	0.01	0.01	0.009	0.009	0.014	0.013	0.013	0.011	0.011	0.01	0.014	0.014	0.014	0.013	0.013
			rpm obr/min	24404	24404	24404	21751	16446	16446	7958	7958	27284	24555	24555	21827	21827	16370	27454	27454	27454	24669	24669
			feed posuw mm/min	634	634	634	479	329	329	143	143	764	638	638	480	480	327	769	769	769	641	641
			Ap mm	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029
	11.2	1.0D	Vc m/min	44	44	44	39	29	29	15	15	57	51	51	45	45	34	65	65	65	58	58
			fz mm/tooth	0.009	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.011	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.011	0.011
			rpm obr/min	23343	23343	23343	20690	15385	15385	7958	7958	25920	23191	23191	20463	20463	15461	25863	25863	25863	23077	23077
			feed posuw mm/min	420	420	420	331	215	215	95	95	570	417	417	327	327	216	621	621	621	508	508
			Ap mm	0.017	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.049	0.02	0.012	0.012	0.007	0.005	0.056	0.039	0.039	0.022	0.022
K	15-20	1.0D	Vc m/min	46	46	46	41	31	31	15	15	60	54	54	48	48	36	69	69	69	62	62
			fz mm/tooth	0.013	0.013	0.013	0.011	0.01	0.01	0.009	0.009	0.014	0.013	0.013	0.011	0.011	0.01	0.014	0.014	0.014	0.013	0.013
			rpm obr/min	24404	24404	24404	21751	16446	16446	7958	7958	27284	24555	24555	21827	21827	16370	27454	27454	27454	24669	24669
			feed posuw mm/min	634	634	634	479	329	329	143	143	764	638	638	480	480	327	769	769	769	641	641
			Ap mm	0.022	0.014	0.014	0.008	0.005	0.005	0.005	0.005	0.063	0.025	0.016	0.016	0.009	0.006	0.072	0.05	0.05	0.029	0.029
H	38.1 - 38.2	1.0D	Vc m/min	39	39	39	34	26	26	13	13	50	45	45	40	40	30	57	57	57	52	52
			fz mm/tooth	0.008	0.008	0.008	0.007	0.006	0.006	0.005	0.005	0.009	0.008	0.008	0.007	0.007	0.006	0.01	0.01	0.01	0.009	0.009
			rpm obr/min	20690	20690	20690	18038	13793	13793	6897	6897	22736	20463	20463	18189	18189	13642	22680	22680	22680	20690	20690
			feed posuw mm/min	331	331	331	253	166	166	69	69	409	327	327	255	255	164	454	454	454	372	372
			Ap mm	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.003	0.035	0.014	0.009	0.009	0.005	0.004	0.04	0.028	0.028	0.016	0.016
	40	1.0D	Vc m/min	44	44	44	39	29	29	15	15	57	51	51	45	45	34	65	65	65	58	58
			fz mm/tooth	0.009	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.011	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.011	0.011
			rpm obr/min	23343	23343	23343	20690	15385	15385	7958	7958	25920	23191	23191	20463	20463	15461	25863	25863	25863	23077	23077
			feed posuw mm/min	420	420	420	331	215	215	95	95	570	417	417	327	327	216	621	621	621	508	508
			Ap mm	0.017	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.049	0.02	0.012	0.012	0.007	0.005	0.056	0.039	0.039	0.022	0.022
	41	1.0D	Vc m/min	39	39	39	34	26	26	13	13	50	45	45	40	40	30	57	57	57	52	52
			fz mm/tooth	0.008	0.008	0.008	0.007	0.006	0.006	0.005	0.005	0.009	0.008	0.008	0.007	0.007	0.006	0.01	0.01	0.01	0.009	0.009
			rpm obr/min	20690	20690	20690	18038	13793	13793	6897	6897	22736	20463	20463	18189	18189	13642	22680	22680	22680	20690	20690
			feed posuw mm/min	331	331	331	253	166	166	69	69	409	327	327	255	255	164	454	454	454	372	372
			Ap mm	0.012	0.008	0.008	0.005	0.003	0.003	0.003	0.003	0.035	0.014	0.009	0.009	0.005	0.004	0.04	0.028	0.028	0.016	0.016

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			LBS	8	10	12	14	16	20	6	8	10	2	3	4	5	6	7	8	10	12	14	16	18	20	22
P	1-5	1.0D	Vc m/min	62	55	55	41	41	21	63	63	56	77	77	77	77	70	70	70	70	62	62	46	46	46	23
			fz mm/tooth	0.013	0.011	0.011	0.01	0.01	0.009	0.013	0.013	0.012	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.015	0.013
			rpm obr/min	24669	21884	21884	16313	16313	8356	22282	22282	19806	24510	24510	24510	24510	22282	22282	22282	22282	19735	19735	14642	14642	14642	7321
			feed posuw mm/min	641	481	481	326	326	150	579	579	475	1029	1029	1029	1029	847	847	847	847	671	671	439	439	439	190
			Ap mm	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.02	0.02	0.09	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009
	6-8	1.0D	Vc m/min	62	55	55	41	41	21	63	63	56	77	77	77	77	70	70	70	70	62	62	46	46	46	23
			fz mm/tooth	0.013	0.011	0.011	0.01	0.01	0.009	0.013	0.013	0.012	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.015	0.013
			rpm obr/min	24669	21884	21884	16313	16313	8356	22282	22282	19806	24510	24510	24510	24510	22282	22282	22282	22282	19735	19735	14642	14642	14642	7321
			feed posuw mm/min	641	481	481	326	326	150	579	579	475	1029	1029	1029	1029	847	847	847	847	671	671	439	439	439	190
			Ap mm	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.02	0.02	0.09	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009
	9	1.0D	Vc m/min	58	52	52	39	39	19	59	59	53	73	73	73	73	66	66	66	66	59	59	44	44	44	22
			fz mm/tooth	0.011	0.009	0.009	0.008	0.008	0.007	0.01	0.01	0.009	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.013	0.013	0.013	0.011
			rpm obr/min	23077	20690	20690	15518	15518	7560	20867	20867	18745	23237	23237	23237	23237	21008	21008	21008	21008	18780	18780	14006	14006	14006	7003
			feed posuw mm/min	508	372	372	248	248	106	417	417	337	883	883	883	883	714	714	714	714	563	563	364	364	364	154
			Ap mm	0.014	0.014	0.008	0.006	0.006	0.006	0.025	0.016	0.016	0.07	0.07	0.049	0.049	0.028	0.028	0.028	0.018	0.018	0.011	0.011	0.007	0.007	0.007
	10-11.1	1.0D	Vc m/min	62	55	55	41	41	21	63	63	56	77	77	77	77	70	70	70	70	62	62	46	46	46	23
			fz mm/tooth	0.013	0.011	0.011	0.01	0.01	0.009	0.013	0.013	0.012	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.015	0.013
			rpm obr/min	24669	21884	21884	16313	16313	8356	22282	22282	19806	24510	24510	24510	24510	22282	22282	22282	22282	19735	19735	14642	14642	14642	7321
			feed posuw mm/min	641	481	481	326	326	150	579	579	475	1029	1029	1029	1029	847	847	847	847	671	671	439	439	439	190
			Ap mm	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.02	0.02	0.09	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009
	11.2	1.0D	Vc m/min	58	52	52	39	39	19	59	59	53	73	73	73	73	66	66	66	66	59	59	44	44	44	22
			fz mm/tooth	0.011	0.009	0.009	0.008	0.008	0.007	0.01	0.01	0.009	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.013	0.013	0.013	0.011
			rpm obr/min	23077	20690	20690	15518	15518	7560	20867	20867	18745	23237	23237	23237	23237	21008	21008	21008	21008	18780	18780	14006	14006	14006	7003
			feed posuw mm/min	508	372	372	248	248	106	417	417	337	883	883	883	883	714	714	714	714	563	563	364	364	364	154
			Ap mm	0.014	0.014	0.008	0.006	0.006	0.006	0.025	0.016	0.016	0.07	0.07	0.049	0.049	0.028	0.028	0.028	0.018	0.018	0.011	0.011	0.007	0.007	0.007
K	15-20	1.0D	Vc m/min	62	55	55	41	41	21	63	63	56	77	77	77	77	70	70	70	70	62	62	46	46	46	23
			fz mm/tooth	0.013	0.011	0.011	0.01	0.01	0.009	0.013	0.013	0.012	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.017	0.017	0.015	0.015	0.015	0.013
			rpm obr/min	24669	21884	21884	16313	16313	8356	22282	22282	19806	24510	24510	24510	24510	22282	22282	22282	22282	19735	19735	14642	14642	14642	7321
			feed posuw mm/min	641	481	481	326	326	150	579	579	475	1029	1029	1029	1029	847	847	847	847	671	671	439	439	439	190
			Ap mm	0.018	0.018	0.011	0.007	0.007	0.007	0.032	0.02	0.02	0.09	0.09	0.063	0.063	0.036	0.036	0.036	0.023	0.023	0.014	0.014	0.009	0.009	0.009
H	38.1 - 38.2	1.0D	Vc m/min	52	46	46	34	34	17	52	52	46	64	64	64	64	58	58	58	58	52	52	39	39	39	19
			fz mm/tooth	0.009	0.008	0.008	0.007	0.007	0.006	0.009	0.009	0.008	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.013	0.013	0.011	0.011	0.011	0.01
			rpm obr/min	20690	18303	18303	13528	13528	6764	18391	18391	16269	20372	20372	20372	20372	18462	18462	18462	18462	16552	16552	12414	12414	12414	6048
			feed posuw mm/min	372	293	293	189	189	81	331	331	260	652	652	652	652	554	554	554	554	430	430	273	273	273	121
			Ap mm	0.01	0.01	0.006	0.004	0.004	0.004	0.018	0.011	0.011	0.05	0.05	0.035	0.035	0.02	0.02	0.02	0.013	0.013	0.008	0.008	0.005	0.005	0.005
	40	1.0D	Vc m/min	58	52	52	39	39	19	59	59	53	73	73	73	73	66	66	66	66	59	59	44	44	44	22
			fz mm/tooth	0.011	0.009	0.009	0.008	0.008	0.007	0.01	0.01	0.009	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.013	0.013	0.013	0.011
			rpm obr/min	23077	20690	20690	15518	15518	7560	20867	20867	18745	23237	23237	23237	23237	21008	21008	21008	21008	18780	18780	14006	14006	14006	7003
			feed posuw mm/min	508	372	372	248	248	106	417	417	337	883	883	883	883	714	714	714	714	563	563	364	364	364	154
			Ap mm	0.014	0.014	0.008	0.006	0.006	0.006	0.025	0.016	0.016	0.07	0.07	0.049	0.049	0.028	0.028	0.028	0.018	0.018	0.011	0.011	0.007	0.007	0.007
	41	1.0D	Vc m/min	52	46	46	34	34	17	52	52	46	64	64	64	64	58	58	58	58	52	52	39	39	39	19
			fz mm/tooth	0.009	0.008	0.008	0.007	0.007	0.006	0.009	0.009	0.008	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.013	0.013	0.011	0.011	0.011	0.01
			rpm obr/min	20690	18303	18303	13528	13528	6764	18391	18391	16269	20372	20372	20372	20372	18462	18462	18462	18462	16552	16552	12414	12414	12414	6048
			feed posuw mm/min	372	293	293	189	189	81	331	331	260	652	652	652	652	554	554	554	554	430	430	273	273	273	121
			Ap mm	0.01	0.01	0.006	0.004	0.004	0.004	0.018	0.011	0.011	0.05	0.05	0.035	0.035	0.02	0.02	0.02	0.013	0.013	0.008	0.008	0.005	0.005	0.005

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.4
			LBS	26	30	40	50	4	6	8	10	12	14	16	20	26	30	6	8	10	14	16
P	1-5	1.0D	Vc m/min	23	23	8	8	83	83	74	74	74	66	66	50	25	25	84	76	76	76	68
			fz mm/tooth	0.013	0.013	0.01	0.01	0.021	0.021	0.019	0.019	0.019	0.017	0.017	0.015	0.013	0.013	0.021	0.019	0.019	0.019	0.017
			rpm obr/min	7321	7321	2546	2546	22016	22016	19629	19629	19629	17507	17507	13263	6631	6631	19099	17280	17280	17280	15461
			feed posuw mm/min	190	190	51	51	925	925	746	746	746	595	595	398	172	172	802	657	657	657	526
			Ap mm	0.009	0.009	0.009	0.006	0.076	0.076	0.043	0.027	0.027	0.027	0.016	0.011	0.011	0.011	0.088	0.05	0.05	0.032	0.032
	6-8	1.0D	Vc m/min	23	23	8	8	83	83	74	74	74	66	66	50	25	25	84	76	76	76	68
			fz mm/tooth	0.013	0.013	0.01	0.01	0.021	0.021	0.019	0.019	0.019	0.017	0.017	0.015	0.013	0.013	0.021	0.019	0.019	0.019	0.017
			rpm obr/min	7321	7321	2546	2546	22016	22016	19629	19629	19629	17507	17507	13263	6631	6631	19099	17280	17280	17280	15461
			feed posuw mm/min	190	190	51	51	925	925	746	746	746	595	595	398	172	172	802	657	657	657	526
			Ap mm	0.009	0.009	0.009	0.006	0.076	0.076	0.043	0.027	0.027	0.027	0.016	0.011	0.011	0.011	0.088	0.05	0.05	0.032	0.032
	9	1.0D	Vc m/min	22	22	7	7	78	78	70	70	70	62	62	47	23	23	80	72	72	72	64
			fz mm/tooth	0.011	0.011	0.01	0.01	0.017	0.017	0.016	0.016	0.016	0.014	0.014	0.012	0.01	0.01	0.016	0.014	0.014	0.014	0.013
			rpm obr/min	7003	7003	2228	2228	20690	20690	18568	18568	18568	16446	16446	12467	6101	6101	18189	16370	16370	16370	14551
			feed posuw mm/min	154	154	45	45	703	703	594	594	594	460	460	299	122	122	582	458	458	458	378
			Ap mm	0.007	0.007	0.007	0.005	0.059	0.059	0.034	0.021	0.021	0.021	0.013	0.008	0.008	0.008	0.069	0.039	0.039	0.025	0.025
	10-11.1	1.0D	Vc m/min	23	23	8	8	83	83	74	74	74	66	66	50	25	25	84	76	76	76	68
			fz mm/tooth	0.013	0.013	0.01	0.01	0.021	0.021	0.019	0.019	0.019	0.017	0.017	0.015	0.013	0.013	0.021	0.019	0.019	0.019	0.017
			rpm obr/min	7321	7321	2546	2546	22016	22016	19629	19629	19629	17507	17507	13263	6631	6631	19099	17280	17280	17280	15461
			feed posuw mm/min	190	190	51	51	925	925	746	746	746	595	595	398	172	172	802	657	657	657	526
			Ap mm	0.009	0.009	0.009	0.006	0.076	0.076	0.043	0.027	0.027	0.027	0.016	0.011	0.011	0.011	0.088	0.05	0.05	0.032	0.032
	11.2	1.0D	Vc m/min	22	22	7	7	78	78	70	70	70	62	62	47	23	23	80	72	72	72	64
			fz mm/tooth	0.011	0.011	0.01	0.01	0.017	0.017	0.016	0.016	0.016	0.014	0.014	0.012	0.01	0.01	0.016	0.014	0.014	0.014	0.013
			rpm obr/min	7003	7003	2228	2228	20690	20690	18568	18568	18568	16446	16446	12467	6101	6101	18189	16370	16370	16370	14551
			feed posuw mm/min	154	154	45	45	703	703	594	594	594	460	460	299	122	122	582	458	458	458	378
			Ap mm	0.007	0.007	0.007	0.005	0.059	0.059	0.034	0.021	0.021	0.021	0.013	0.008	0.008	0.008	0.069	0.039	0.039	0.025	0.025
K	15-20	1.0D	Vc m/min	23	23	8	8	83	83	74	74	74	66	66	50	25	25	84	76	76	76	68
			fz mm/tooth	0.013	0.013	0.01	0.01	0.021	0.021	0.019	0.019	0.019	0.017	0.017	0.015	0.013	0.013	0.021	0.019	0.019	0.019	0.017
			rpm obr/min	7321	7321	2546	2546	22016	22016	19629	19629	19629	17507	17507	13263	6631	6631	19099	17280	17280	17280	15461
			feed posuw mm/min	190	190	51	51	925	925	746	746	746	595	595	398	172	172	802	657	657	657	526
			Ap mm	0.009	0.009	0.009	0.006	0.076	0.076	0.043	0.027	0.027	0.027	0.016	0.011	0.011	0.011	0.088	0.05	0.05	0.032	0.032
H	38.1 - 38.2	1.0D	Vc m/min	19	19	6	6	69	69	62	62	62	55	55	41	21	21	70	63	63	63	56
			fz mm/tooth	0.01	0.01	0.009	0.009	0.013	0.013	0.012	0.012	0.012	0.011	0.011	0.009	0.008	0.008	0.013	0.012	0.012	0.012	0.011
			rpm obr/min	6048	6048	1910	1910	18303	18303	16446	16446	16446	14589	14589	10876	5570	5570	15915	14324	14324	14324	12732
			feed posuw mm/min	121	121	34	34	476	476	395	395	395	321	321	196	89	89	414	344	344	344	280
			Ap mm	0.005	0.005	0.005	0.003	0.042	0.042	0.024	0.015	0.015	0.015	0.009	0.006	0.006	0.006	0.049	0.028	0.028	0.018	0.018
	40	1.0D	Vc m/min	22	22	7	7	78	78	70	70	70	62	62	47	23	23	80	72	72	72	64
			fz mm/tooth	0.011	0.011	0.01	0.01	0.017	0.017	0.016	0.016	0.016	0.014	0.014	0.012	0.01	0.01	0.016	0.014	0.014	0.014	0.013
			rpm obr/min	7003	7003	2228	2228	20690	20690	18568	18568	18568	16446	16446	12467	6101	6101	18189	16370	16370	16370	14551
			feed posuw mm/min	154	154	45	45	703	703	594	594	594	460	460	299	122	122	582	458	458	458	378
			Ap mm	0.007	0.007	0.007	0.005	0.059	0.059	0.034	0.021	0.021	0.021	0.013	0.008	0.008	0.008	0.069	0.039	0.039	0.025	0.025
	41	1.0D	Vc m/min	19	19	6	6	69	69	62	62	62	55	55	41	21	21	70	63	63	63	56
			fz mm/tooth	0.01	0.01	0.009	0.009	0.013	0.013	0.012	0.012	0.012	0.011	0.011	0.009	0.008	0.008	0.013	0.012	0.012	0.012	0.011
			rpm obr/min	6048	6048	1910	1910	18303	18303	16446	16446	16446	14589	14589	10876	5570	5570	15915	14324	14324	14324	12732
			feed posuw mm/min	121	121	34	34	476	476	395	395	395	321	321	196	89	89	414	344	344	344	280
			Ap mm	0.005	0.005	0.005	0.003	0.042	0.042	0.024	0.015	0.015	0.015	0.009	0.006	0.006	0.006	0.049	0.028	0.028	0.018	0.018

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.4	15	1.5	1.5	1.5	1.5	15	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.8	1.8	1.8
			LBS	20	4	5	6	7	8	10	12	14	16	18	20	22	26	30	8	10	12	16	20	8	10	12
P	1-5	1.0D	Vc m/min	68	90	90	90	90	81	81	81	81	72	72	72	72	54	54	89	81	81	81	72	101	91	91
			fz mm/tooth	0.017	0.024	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.016	0.016	0.024	0.021	0.021	0.021	0.019	0.024	0.021	0.021
			rpm obr/min	15461	19099	19099	19099	19099	17189	17189	17189	17189	15279	15279	15279	15279	11459	11459	17706	16114	16114	16114	14324	17861	16092	16092
			feed posuw mm/min	526	917	917	917	917	722	722	722	722	581	581	581	581	367	367	850	677	677	677	544	857	676	676
			Ap mm	0.019	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034	0.034	0.034	0.02	0.02	0.014	0.014	0.101	0.058	0.058	0.036	0.036	0.113	0.065	0.065
	6-8	1.0D	Vc m/min	68	90	90	90	90	81	81	81	81	72	72	72	72	54	54	89	81	81	81	72	101	91	91
			fz mm/tooth	0.017	0.024	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.016	0.016	0.024	0.021	0.021	0.021	0.019	0.024	0.021	0.021
			rpm obr/min	15461	19099	19099	19099	19099	17189	17189	17189	17189	15279	15279	15279	15279	11459	11459	17706	16114	16114	16114	14324	17861	16092	16092
			feed posuw mm/min	526	917	917	917	917	722	722	722	722	581	581	581	581	367	367	850	677	677	677	544	857	676	676
			Ap mm	0.019	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034	0.034	0.034	0.02	0.02	0.014	0.014	0.101	0.058	0.058	0.036	0.036	0.113	0.065	0.065
	9	1.0D	Vc m/min	64	85	85	85	85	77	77	77	77	68	68	68	68	51	51	84	76	76	76	68	95	86	86
			fz mm/tooth	0.013	0.018	0.018	0.018	0.018	0.016	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.012	0.012	0.019	0.018	0.018	0.018	0.016	0.019	0.018	0.018
			rpm obr/min	14551	18038	18038	18038	18038	16340	16340	16340	16340	14430	14430	14430	14430	10823	10823	16711	15120	15120	15120	13528	16800	15208	15208
			feed posuw mm/min	378	649	649	649	649	523	523	523	523	404	404	404	404	260	260	635	544	544	544	433	638	547	547
			Ap mm	0.015	0.105	0.074	0.074	0.074	0.042	0.042	0.042	0.026	0.026	0.026	0.016	0.016	0.011	0.011	0.078	0.045	0.045	0.028	0.028	0.088	0.05	0.05
	10-11.1	1.0D	Vc m/min	68	90	90	90	90	81	81	81	81	72	72	72	72	54	54	89	81	81	81	72	101	91	91
			fz mm/tooth	0.017	0.024	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.016	0.016	0.024	0.021	0.021	0.021	0.019	0.024	0.021	0.021
			rpm obr/min	15461	19099	19099	19099	19099	17189	17189	17189	17189	15279	15279	15279	15279	11459	11459	17706	16114	16114	16114	14324	17861	16092	16092
			feed posuw mm/min	526	917	917	917	917	722	722	722	722	581	581	581	581	367	367	850	677	677	677	544	857	676	676
			Ap mm	0.019	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034	0.034	0.034	0.02	0.02	0.014	0.014	0.101	0.058	0.058	0.036	0.036	0.113	0.065	0.065
	11.2	1.0D	Vc m/min	64	85	85	85	85	77	77	77	77	68	68	68	68	51	51	84	76	76	76	68	95	86	86
			fz mm/tooth	0.013	0.018	0.018	0.018	0.018	0.016	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.012	0.012	0.019	0.018	0.018	0.018	0.016	0.019	0.018	0.018
			rpm obr/min	14551	18038	18038	18038	18038	16340	16340	16340	16340	14430	14430	14430	14430	10823	10823	16711	15120	15120	15120	13528	16800	15208	15208
			feed posuw mm/min	378	649	649	649	649	523	523	523	523	404	404	404	404	260	260	635	544	544	544	433	638	547	547
			Ap mm	0.015	0.105	0.074	0.074	0.074	0.042	0.042	0.042	0.026	0.026	0.026	0.016	0.016	0.011	0.011	0.078	0.045	0.045	0.028	0.028	0.088	0.05	0.05
K	15-20	1.0D	Vc m/min	68	90	90	90	90	81	81	81	81	72	72	72	72	54	54	89	81	81	81	72	101	91	91
			fz mm/tooth	0.017	0.024	0.024	0.024	0.024	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.019	0.016	0.016	0.024	0.021	0.021	0.021	0.019	0.024	0.021	0.021
			rpm obr/min	15461	19099	19099	19099	19099	17189	17189	17189	17189	15279	15279	15279	15279	11459	11459	17706	16114	16114	16114	14324	17861	16092	16092
			feed posuw mm/min	526	917	917	917	917	722	722	722	722	581	581	581	581	367	367	850	677	677	677	544	857	676	676
			Ap mm	0.019	0.135	0.095	0.095	0.095	0.054	0.054	0.054	0.034	0.034	0.034	0.02	0.02	0.014	0.014	0.101	0.058	0.058	0.036	0.036	0.113	0.065	0.065
H	38.1 - 38.2	1.0D	Vc m/min	56	75	75	75	75	68	68	68	68	60	60	60	60	45	45	74	67	67	67	60	84	75	75
			fz mm/tooth	0.011	0.015	0.015	0.015	0.015	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.01	0.01	0.017	0.015	0.015	0.015	0.013	0.017	0.015	0.015
			rpm obr/min	12732	15915	15915	15915	15915	14430	14430	14430	14430	12732	12732	12732	12732	9549	9549	14722	13329	13329	13329	11937	14854	13263	13263
			feed posuw mm/min	280	477	477	477	477	375	375	375	375	306	306	306	306	191	191	501	400	400	400	310	505	398	398
			Ap mm	0.011	0.075	0.053	0.053	0.053	0.03	0.03	0.03	0.019	0.019	0.019	0.011	0.011	0.008	0.008	0.056	0.032	0.032	0.02	0.02	0.063	0.036	0.036
	40	1.0D	Vc m/min	64	85	85	85	85	77	77	77	77	68	68	68	68	51	51	84	76	76	76	68	95	86	86
			fz mm/tooth	0.013	0.018	0.018	0.018	0.018	0.016	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.012	0.012	0.019	0.018	0.018	0.018	0.016	0.019	0.018	0.018
			rpm obr/min	14551	18038	18038	18038	18038	16340	16340	16340	16340	14430	14430	14430	14430	10823	10823	16711	15120	15120	15120	13528	16800	15208	15208
			feed posuw mm/min	378	649	649	649	649	523	523	523	523	404	404	404	404	260	260	635	544	544	544	433	638	547	547
			Ap mm	0.015	0.105	0.074	0.074	0.074	0.042	0.042	0.042	0.026	0.026	0.026	0.016	0.016	0.011	0.011	0.078	0.045	0.045	0.028	0.028	0.088	0.05	0.05
	41	1.0D	Vc m/min	56	75	75	75	75	68	68	68	68	60	60	60	60	45	45	74	67	67	67	60	84	75	75
			fz mm/tooth	0.011	0.015	0.015	0.015	0.015	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.01	0.01	0.017	0.015	0.015	0.015	0.013	0.017	0.015	0.015
			rpm obr/min	12732	15915	15915	15915	15915	14430	14430	14430	14430	12732	12732	12732	12732	9549	9549	14722	13329	13329	13329	11937	14854	13263	13263
			feed posuw mm/min	280	477	477	477	477	375	375	375	375	306	306	306	306	191	191	501	400	400	400	310	505	398	398
			Ap mm	0.011	0.075	0.053	0.053	0.053	0.03	0.03	0.03	0.019	0.019	0.019	0.011	0.011	0.008	0.008	0.056	0.032	0.032	0.02	0.02	0.063	0.036	0.036

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	1.8	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5
			LBS	16	20	6	8	10	12	14	16	18	20	22	26	30	35	40	45	50	60	8
P	1-5	1.0D	Vc m/min	91	81	90	90	90	81	81	81	81	81	72	72	72	54	54	27	27	27	97
			fz mm/tooth	0.021	0.019	0.028	0.028	0.028	0.026	0.026	0.026	0.026	0.026	0.023	0.023	0.023	0.02	0.02	0.017	0.017	0.017	0.039
			rpm obr/min	16092	14324	14324	14324	14324	12892	12892	12892	12892	12892	11459	11459	11459	8594	8594	4297	4297	4297	12350
			feed posuw mm/min	676	544	802	802	802	670	670	670	670	670	527	527	527	344	344	146	146	146	963
			Ap mm	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018	0.018	0.158
	6-8	1.0D	Vc m/min	91	81	90	90	90	81	81	81	81	81	72	72	72	54	54	27	27	27	97
			fz mm/tooth	0.021	0.019	0.028	0.028	0.028	0.026	0.026	0.026	0.026	0.026	0.023	0.023	0.023	0.02	0.02	0.017	0.017	0.017	0.039
			rpm obr/min	16092	14324	14324	14324	14324	12892	12892	12892	12892	12892	11459	11459	11459	8594	8594	4297	4297	4297	12350
			feed posuw mm/min	676	544	802	802	802	670	670	670	670	670	527	527	527	344	344	146	146	146	963
			Ap mm	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018	0.018	0.158
	9	1.0D	Vc m/min	86	76	85	85	85	77	77	77	77	77	68	68	68	51	51	26	26	26	91
			fz mm/tooth	0.018	0.016	0.023	0.023	0.023	0.02	0.02	0.02	0.02	0.02	0.018	0.018	0.018	0.016	0.016	0.013	0.013	0.013	0.029
			rpm obr/min	15208	13440	13528	13528	13528	12255	12255	12255	12255	12255	10823	10823	10823	8117	8117	4138	4138	4138	11586
			feed posuw mm/min	547	430	622	622	622	490	490	490	490	490	390	390	390	260	260	108	108	108	672
			Ap mm	0.032	0.032	0.14	0.098	0.098	0.056	0.056	0.056	0.035	0.035	0.035	0.035	0.021	0.014	0.014	0.014	0.014	0.014	0.123
	10-11.1	1.0D	Vc m/min	91	81	90	90	90	81	81	81	81	81	72	72	72	54	54	27	27	27	97
			fz mm/tooth	0.021	0.019	0.028	0.028	0.028	0.026	0.026	0.026	0.026	0.026	0.023	0.023	0.023	0.02	0.02	0.017	0.017	0.017	0.039
			rpm obr/min	16092	14324	14324	14324	14324	12892	12892	12892	12892	12892	11459	11459	11459	8594	8594	4297	4297	4297	12350
			feed posuw mm/min	676	544	802	802	802	670	670	670	670	670	527	527	527	344	344	146	146	146	963
			Ap mm	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018	0.018	0.158
	11.2	1.0D	Vc m/min	86	76	85	85	85	77	77	77	77	77	68	68	68	51	51	26	26	26	91
			fz mm/tooth	0.018	0.016	0.023	0.023	0.023	0.02	0.02	0.02	0.02	0.02	0.018	0.018	0.018	0.016	0.016	0.013	0.013	0.013	0.029
			rpm obr/min	15208	13440	13528	13528	13528	12255	12255	12255	12255	12255	10823	10823	10823	8117	8117	4138	4138	4138	11586
			feed posuw mm/min	547	430	622	622	622	490	490	490	490	490	390	390	390	260	260	108	108	108	672
			Ap mm	0.032	0.032	0.14	0.098	0.098	0.056	0.056	0.056	0.035	0.035	0.035	0.035	0.021	0.014	0.014	0.014	0.014	0.014	0.123
K	15-20	1.0D	Vc m/min	91	81	90	90	90	81	81	81	81	81	72	72	72	54	54	27	27	27	97
			fz mm/tooth	0.021	0.019	0.028	0.028	0.028	0.026	0.026	0.026	0.026	0.026	0.023	0.023	0.023	0.02	0.02	0.017	0.017	0.017	0.039
			rpm obr/min	16092	14324	14324	14324	14324	12892	12892	12892	12892	12892	11459	11459	11459	8594	8594	4297	4297	4297	12350
			feed posuw mm/min	676	544	802	802	802	670	670	670	670	670	527	527	527	344	344	146	146	146	963
			Ap mm	0.041	0.041	0.18	0.126	0.126	0.072	0.072	0.072	0.045	0.045	0.045	0.045	0.027	0.018	0.018	0.018	0.018	0.018	0.158
H	38.1 - 38.2	1.0D	Vc m/min	75	67	75	75	75	68	68	68	68	68	60	60	60	45	45	23	23	23	81
			fz mm/tooth	0.015	0.013	0.02	0.02	0.02	0.018	0.018	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.012	0.012	0.012	0.025
			rpm obr/min	13263	11848	11937	11937	11937	10823	10823	10823	10823	10823	9549	9549	9549	7162	7162	3661	3661	3661	10313
			feed posuw mm/min	398	308	477	477	477	390	390	390	390	390	306	306	306	201	201	88	88	88	516
			Ap mm	0.023	0.023	0.1	0.07	0.07	0.04	0.04	0.04	0.025	0.025	0.025	0.025	0.015	0.01	0.01	0.01	0.01	0.01	0.088
	40	1.0D	Vc m/min	86	76	85	85	85	77	77	77	77	77	68	68	68	51	51	26	26	26	91
			fz mm/tooth	0.018	0.016	0.023	0.023	0.023	0.02	0.02	0.02	0.02	0.02	0.018	0.018	0.018	0.016	0.016	0.013	0.013	0.013	0.029
			rpm obr/min	15208	13440	13528	13528	13528	12255	12255	12255	12255	12255	10823	10823	10823	8117	8117	4138	4138	4138	11586
			feed posuw mm/min	547	430	622	622	622	490	490	490	490	490	390	390	390	260	260	108	108	108	672
			Ap mm	0.032	0.032	0.14	0.098	0.098	0.056	0.056	0.056	0.035	0.035	0.035	0.035	0.021	0.014	0.014	0.014	0.014	0.014	0.123
	41	1.0D	Vc m/min	75	67	75	75	75	68	68	68	68	68	60	60	60	45	45	23	23	23	81
			fz mm/tooth	0.015	0.013	0.02	0.02	0.02	0.018	0.018	0.018	0.018	0.018	0.016	0.016	0.016	0.014	0.014	0.012	0.012	0.012	0.025
			rpm obr/min	13263	11848	11937	11937	11937	10823	10823	10823	10823	10823	9549	9549	9549	7162	7162	3661	3661	3661	10313
			feed posuw mm/min	398	308	477	477	477	390	390	390	390	390	306	306	306	201	201	88	88	88	516
			Ap mm	0.023	0.023	0.1	0.07	0.07	0.04	0.04	0.04	0.025	0.025	0.025	0.025	0.015	0.01	0.01	0.01	0.01	0.01	0.088

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	2.5	25	2.5	2.5	2.5	2.5	25	2.5	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
			LBS	10	12	14	16	18	20	22	26	30	35	40	45	50	6	8	10	12	14	16	18	20	22	26
P	1-5	1.0D	Vc m/min	97	97	87	87	87	87	87	77	77	77	58	58	58	103	103	103	103	103	92	92	92	92	92
			fz mm/tooth	0.039	0.039	0.035	0.035	0.035	0.035	0.035	0.032	0.032	0.032	0.027	0.027	0.027	0.039	0.039	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.035
			rpm obr/min	12350	12350	11077	11077	11077	11077	11077	9804	9804	9804	7385	7385	7385	10929	10929	10929	10929	10929	9762	9762	9762	9762	9762
			feed posuw mm/min	963	963	775	775	775	775	775	627	627	627	399	399	399	852	852	852	852	852	683	683	683	683	683
			Ap mm	0.158	0.158	0.09	0.09	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189	0.189	0.108	0.108	0.108	0.108	0.068
	6-8	1.0D	Vc m/min	97	97	87	87	87	87	87	77	77	77	58	58	58	103	103	103	103	103	92	92	92	92	92
			fz mm/tooth	0.039	0.039	0.035	0.035	0.035	0.035	0.035	0.032	0.032	0.032	0.027	0.027	0.027	0.039	0.039	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.035
			rpm obr/min	12350	12350	11077	11077	11077	11077	11077	9804	9804	9804	7385	7385	7385	10929	10929	10929	10929	10929	9762	9762	9762	9762	9762
			feed posuw mm/min	963	963	775	775	775	775	775	627	627	627	399	399	399	852	852	852	852	852	683	683	683	683	683
			Ap mm	0.158	0.158	0.09	0.09	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189	0.189	0.108	0.108	0.108	0.108	0.068
	9	1.0D	Vc m/min	91	91	82	82	82	82	82	73	73	73	55	55	55	97	97	97	97	97	87	87	87	87	87
			fz mm/tooth	0.029	0.029	0.026	0.026	0.026	0.026	0.026	0.023	0.023	0.023	0.02	0.02	0.02	0.029	0.029	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.026
			rpm obr/min	11586	11586	10441	10441	10441	10441	10441	9295	9295	9295	7003	7003	7003	10292	10292	10292	10292	10292	9231	9231	9231	9231	9231
			feed posuw mm/min	672	672	543	543	543	543	543	428	428	428	280	280	280	597	597	597	597	597	480	480	480	480	480
			Ap mm	0.123	0.123	0.07	0.07	0.07	0.07	0.044	0.044	0.044	0.026	0.026	0.018	0.018	0.21	0.21	0.147	0.147	0.147	0.084	0.084	0.084	0.084	0.053
	10-11.1	1.0D	Vc m/min	97	97	87	87	87	87	87	77	77	77	58	58	58	103	103	103	103	103	92	92	92	92	92
			fz mm/tooth	0.039	0.039	0.035	0.035	0.035	0.035	0.035	0.032	0.032	0.032	0.027	0.027	0.027	0.039	0.039	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.035
			rpm obr/min	12350	12350	11077	11077	11077	11077	11077	9804	9804	9804	7385	7385	7385	10929	10929	10929	10929	10929	9762	9762	9762	9762	9762
			feed posuw mm/min	963	963	775	775	775	775	775	627	627	627	399	399	399	852	852	852	852	852	683	683	683	683	683
			Ap mm	0.158	0.158	0.09	0.09	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189	0.189	0.108	0.108	0.108	0.108	0.068
	11.2	1.0D	Vc m/min	91	91	82	82	82	82	82	73	73	73	55	55	55	97	97	97	97	97	87	87	87	87	87
			fz mm/tooth	0.029	0.029	0.026	0.026	0.026	0.026	0.026	0.023	0.023	0.023	0.02	0.02	0.02	0.029	0.029	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.026
			rpm obr/min	11586	11586	10441	10441	10441	10441	10441	9295	9295	9295	7003	7003	7003	10292	10292	10292	10292	10292	9231	9231	9231	9231	9231
			feed posuw mm/min	672	672	543	543	543	543	543	428	428	428	280	280	280	597	597	597	597	597	480	480	480	480	480
			Ap mm	0.123	0.123	0.07	0.07	0.07	0.07	0.044	0.044	0.044	0.026	0.026	0.018	0.018	0.21	0.21	0.147	0.147	0.147	0.084	0.084	0.084	0.084	0.053
K	15-20	1.0D	Vc m/min	97	97	87	87	87	87	87	77	77	77	58	58	58	103	103	103	103	103	92	92	92	92	92
			fz mm/tooth	0.039	0.039	0.035	0.035	0.035	0.035	0.035	0.032	0.032	0.032	0.027	0.027	0.027	0.039	0.039	0.039	0.039	0.039	0.035	0.035	0.035	0.035	0.035
			rpm obr/min	12350	12350	11077	11077	11077	11077	11077	9804	9804	9804	7385	7385	7385	10929	10929	10929	10929	10929	9762	9762	9762	9762	9762
			feed posuw mm/min	963	963	775	775	775	775	775	627	627	627	399	399	399	852	852	852	852	852	683	683	683	683	683
			Ap mm	0.158	0.158	0.09	0.09	0.09	0.09	0.056	0.056	0.056	0.034	0.034	0.023	0.023	0.27	0.27	0.189	0.189	0.189	0.108	0.108	0.108	0.108	0.068
H	38.1 - 38.2	1.0D	Vc m/min	81	81	73	73	73	73	73	65	65	65	49	49	49	62	62	62	62	62	56	56	56	56	56
			fz mm/tooth	0.025	0.025	0.022	0.022	0.022	0.022	0.022	0.02	0.02	0.02	0.017	0.017	0.017	0.034	0.034	0.034	0.034	0.034	0.031	0.031	0.031	0.031	0.031
			rpm obr/min	10313	10313	9295	9295	9295	9295	9295	8276	8276	8276	6239	6239	6239	6578	6578	6578	6578	6578	5942	5942	5942	5942	5942
			feed posuw mm/min	516	516	409	409	409	409	409	331	331	331	212	212	212	447	447	447	447	447	368	368	368	368	368
			Ap mm	0.088	0.088	0.05	0.05	0.05	0.05	0.031	0.031	0.031	0.019	0.019	0.013	0.013	0.15	0.15	0.105	0.105	0.105	0.06	0.06	0.06	0.06	0.038
	40	1.0D	Vc m/min	91	91	82	82	82	82	82	73	73	73	55	55	55	97	97	97	97	97	87	87	87	87	87
			fz mm/tooth	0.029	0.029	0.026	0.026	0.026	0.026	0.026	0.023	0.023	0.023	0.02	0.02	0.02	0.029	0.029	0.029	0.029	0.029	0.026	0.026	0.026	0.026	0.026
			rpm obr/min	11586	11586	10441	10441	10441	10441	10441	9295	9295	9295	7003	7003	7003	10292	10292	10292	10292	10292	9231	9231	9231	9231	9231
			feed posuw mm/min	672	672	543	543	543	543	543	428	428	428	280	280	280	597	597	597	597	597	480	480	480	480	480
			Ap mm	0.123	0.123	0.07	0.07	0.07	0.07	0.044	0.044	0.044	0.026	0.026	0.018	0.018	0.21	0.21	0.147	0.147	0.147	0.084	0.084	0.084	0.084	0.053
	41	1.0D	Vc m/min	81	81	73	73	73	73	73	65	65	65	49	49	49	62	62	62	62	62	56	56	56	56	56
			fz mm/tooth	0.025	0.025	0.022	0.022	0.022	0.022	0.022	0.02	0.02	0.02	0.017	0.017	0.017	0.034	0.034	0.034	0.034	0.034	0.031	0.031	0.031	0.031	0.031
			rpm obr/min	10313	10313	9295	9295	9295	9295	9295	8276	8276	8276	6239	6239	6239	6578	6578	6578	6578	6578	5942	5942	5942	5942	5942
			feed posuw mm/min	516	516	409	409	409	409	409	331	331	331	212	212	212	447	447	447	447	447	368	368	368	368	368
			Ap mm	0.088	0.088	0.05	0.05	0.05	0.05	0.031	0.031	0.031	0.019	0.019	0.013	0.013	0.15	0.15	0.105	0.105	0.105	0.06	0.06	0.06	0.06	0.038

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
			LBS	30	35	40	45	50	60	8	10	12	14	16	18	20	22	26	30	35	40	45
P	1-5	1.0D	Vc m/min	92	82	82	82	62	62	101	101	101	101	101	101	101	90	90	90	90	90	80
			fz mm/tooth	0.035	0.032	0.032	0.032	0.028	0.028	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.073	0.073	0.073	0.073	0.073	0.065
			rpm obr/min	9762	8700	8700	8700	6578	6578	8037	8037	8037	8037	8037	8037	8037	7162	7162	7162	7162	7162	6366
			feed posuw mm/min	683	557	557	557	368	368	1302	1302	1302	1302	1302	1302	1302	1046	1046	1046	1046	1046	828
			Ap mm	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144	0.144	0.144	0.09	0.09	0.09
	6-8	1.0D	Vc m/min	92	82	82	82	62	62	101	101	101	101	101	101	101	90	90	90	90	90	80
			fz mm/tooth	0.035	0.032	0.032	0.032	0.028	0.028	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.073	0.073	0.073	0.073	0.073	0.065
			rpm obr/min	9762	8700	8700	8700	6578	6578	8037	8037	8037	8037	8037	8037	8037	7162	7162	7162	7162	7162	6366
			feed posuw mm/min	683	557	557	557	368	368	1302	1302	1302	1302	1302	1302	1302	1046	1046	1046	1046	1046	828
			Ap mm	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144	0.144	0.144	0.09	0.09	0.09
	9	1.0D	Vc m/min	87	78	78	78	58	58	96	96	96	96	96	96	96	86	86	86	86	86	76
			fz mm/tooth	0.026	0.023	0.023	0.023	0.021	0.021	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.069	0.069	0.069	0.069	0.069	0.061
			rpm obr/min	9231	8276	8276	8276	6154	6154	7639	7639	7639	7639	7639	7639	7639	6844	6844	6844	6844	6844	6048
			feed posuw mm/min	480	381	381	381	258	258	1161	1161	1161	1161	1161	1161	1161	944	944	944	944	944	738
			Ap mm	0.053	0.053	0.032	0.032	0.021	0.021	0.28	0.28	0.28	0.196	0.196	0.196	0.196	0.112	0.112	0.112	0.07	0.07	0.07
	10-11.1	1.0D	Vc m/min	92	82	82	82	62	62	101	101	101	101	101	101	101	90	90	90	90	90	80
			fz mm/tooth	0.035	0.032	0.032	0.032	0.028	0.028	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.073	0.073	0.073	0.073	0.073	0.065
			rpm obr/min	9762	8700	8700	8700	6578	6578	8037	8037	8037	8037	8037	8037	8037	7162	7162	7162	7162	7162	6366
			feed posuw mm/min	683	557	557	557	368	368	1302	1302	1302	1302	1302	1302	1302	1046	1046	1046	1046	1046	828
			Ap mm	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144	0.144	0.144	0.09	0.09	0.09
	11.2	1.0D	Vc m/min	87	78	78	78	58	58	96	96	96	96	96	96	96	86	86	86	86	86	76
			fz mm/tooth	0.026	0.023	0.023	0.023	0.021	0.021	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.069	0.069	0.069	0.069	0.069	0.061
			rpm obr/min	9231	8276	8276	8276	6154	6154	7639	7639	7639	7639	7639	7639	7639	6844	6844	6844	6844	6844	6048
			feed posuw mm/min	480	381	381	381	258	258	1161	1161	1161	1161	1161	1161	1161	944	944	944	944	944	738
			Ap mm	0.053	0.053	0.032	0.032	0.021	0.021	0.28	0.28	0.28	0.196	0.196	0.196	0.196	0.112	0.112	0.112	0.07	0.07	0.07
K	15-20	1.0D	Vc m/min	92	82	82	82	62	62	101	101	101	101	101	101	101	90	90	90	90	90	80
			fz mm/tooth	0.035	0.032	0.032	0.032	0.028	0.028	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.073	0.073	0.073	0.073	0.073	0.065
			rpm obr/min	9762	8700	8700	8700	6578	6578	8037	8037	8037	8037	8037	8037	8037	7162	7162	7162	7162	7162	6366
			feed posuw mm/min	683	557	557	557	368	368	1302	1302	1302	1302	1302	1302	1302	1046	1046	1046	1046	1046	828
			Ap mm	0.068	0.068	0.041	0.041	0.027	0.027	0.36	0.36	0.36	0.252	0.252	0.252	0.252	0.144	0.144	0.144	0.09	0.09	0.09
H	38.1 - 38.2	1.0D	Vc m/min	56	50	50	50	37	37	84	84	84	84	84	84	84	76	76	76	76	76	67
			fz mm/tooth	0.031	0.027	0.027	0.027	0.024	0.024	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.052	0.052	0.052	0.052	0.052	0.046
			rpm obr/min	5942	5305	5305	5305	3926	3926	6685	6685	6685	6685	6685	6685	6685	6048	6048	6048	6048	6048	5332
			feed posuw mm/min	368	286	286	286	188	188	762	762	762	762	762	762	762	629	629	629	629	629	491
			Ap mm	0.038	0.038	0.023	0.023	0.015	0.015	0.2	0.2	0.2	0.14	0.14	0.14	0.14	0.08	0.08	0.08	0.05	0.05	0.05
	40	1.0D	Vc m/min	87	78	78	78	58	58	96	96	96	96	96	96	96	86	86	86	86	86	76
			fz mm/tooth	0.026	0.023	0.023	0.023	0.021	0.021	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.069	0.069	0.069	0.069	0.069	0.061
			rpm obr/min	9231	8276	8276	8276	6154	6154	7639	7639	7639	7639	7639	7639	7639	6844	6844	6844	6844	6844	6048
			feed posuw mm/min	480	381	381	381	258	258	1161	1161	1161	1161	1161	1161	1161	944	944	944	944	944	738
			Ap mm	0.053	0.053	0.032	0.032	0.021	0.021	0.28	0.28	0.28	0.196	0.196	0.196	0.196	0.112	0.112	0.112	0.07	0.07	0.07
	41	1.0D	Vc m/min	56	50	50	50	37	37	84	84	84	84	84	84	84	76	76	76	76	76	67
			fz mm/tooth	0.031	0.027	0.027	0.027	0.024	0.024	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.052	0.052	0.052	0.052	0.052	0.046
			rpm obr/min	5942	5305	5305	5305	3926	3926	6685	6685	6685	6685	6685	6685	6685	6048	6048	6048	6048	6048	5332
			feed posuw mm/min	368	286	286	286	188	188	762	762	762	762	762	762	762	629	629	629	629	629	491
			Ap mm	0.038	0.038	0.023	0.023	0.015	0.015	0.2	0.2	0.2	0.14	0.14	0.14	0.14	0.08	0.08	0.08	0.05	0.05	0.05

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	10.0	10.0	10.0	12.0	12.0	12.0
			LBS	50	60	16	20	26	30	35	40	50	60	15	20	30	32	25	30	42	30	35	45	35	40	50
P	1-5	1.0D	Vc m/min	80	80	101	101	90	90	90	90	90	80	100	100	100	90	101	101	90	101	101	101	100	100	100
			fz mm/tooth	0.065	0.065	0.09	0.09	0.081	0.081	0.081	0.081	0.081	0.072	0.1	0.1	0.1	0.09	0.119	0.119	0.107	0.141	0.141	0.141	0.151	0.151	0.151
			rpm obr/min	6366	6366	6430	6430	5730	5730	5730	5730	5730	5093	5305	5305	5305	4775	4019	4019	3581	3215	3215	3215	2653	2653	2653
			feed posuw mm/min	828	828	1157	1157	928	928	928	928	928	733	1061	1061	1061	859	956	956	766	907	907	907	801	801	801
			Ap mm	0.09	0.054	0.315	0.315	0.18	0.18	0.18	0.18	0.113	0.113	0.54	0.378	0.378	0.216	0.504	0.504	0.288	0.9	0.63	0.63	1.08	0.756	0.756
	6-8	1.0D	Vc m/min	80	80	101	101	90	90	90	90	90	80	100	100	100	90	101	101	90	101	101	101	100	100	100
			fz mm/tooth	0.065	0.065	0.09	0.09	0.081	0.081	0.081	0.081	0.081	0.072	0.1	0.1	0.1	0.09	0.119	0.119	0.107	0.141	0.141	0.141	0.151	0.151	0.151
			rpm obr/min	6366	6366	6430	6430	5730	5730	5730	5730	5730	5093	5305	5305	5305	4775	4019	4019	3581	3215	3215	3215	2653	2653	2653
			feed posuw mm/min	828	828	1157	1157	928	928	928	928	928	733	1061	1061	1061	859	956	956	766	907	907	907	801	801	801
			Ap mm	0.09	0.054	0.315	0.315	0.18	0.18	0.18	0.18	0.113	0.113	0.54	0.378	0.378	0.216	0.504	0.504	0.288	0.9	0.63	0.63	1.08	0.756	0.756
	9	1.0D	Vc m/min	76	76	96	96	86	86	86	86	86	77	94	94	94	85	96	96	85	96	96	96	95	95	95
			fz mm/tooth	0.061	0.061	0.074	0.074	0.066	0.066	0.066	0.066	0.066	0.059	0.082	0.082	0.082	0.074	0.099	0.099	0.089	0.111	0.111	0.111	0.119	0.119	0.119
			rpm obr/min	6048	6048	6112	6112	5475	5475	5475	5475	5475	4902	4987	4987	4987	4509	3820	3820	3382	3056	3056	3056	2520	2520	2520
			feed posuw mm/min	738	738	905	905	723	723	723	723	723	578	818	818	818	667	756	756	602	678	678	678	600	600	600
			Ap mm	0.07	0.042	0.245	0.245	0.14	0.14	0.14	0.14	0.088	0.088	0.42	0.294	0.294	0.168	0.392	0.392	0.224	0.7	0.49	0.49	0.84	0.588	0.588
	10-11.1	1.0D	Vc m/min	80	80	101	101	90	90	90	90	90	80	100	100	100	90	101	101	90	101	101	101	100	100	100
			fz mm/tooth	0.065	0.065	0.09	0.09	0.081	0.081	0.081	0.081	0.081	0.072	0.1	0.1	0.1	0.09	0.119	0.119	0.107	0.141	0.141	0.141	0.151	0.151	0.151
			rpm obr/min	6366	6366	6430	6430	5730	5730	5730	5730	5730	5093	5305	5305	5305	4775	4019	4019	3581	3215	3215	3215	2653	2653	2653
			feed posuw mm/min	828	828	1157	1157	928	928	928	928	928	733	1061	1061	1061	859	956	956	766	907	907	907	801	801	801
			Ap mm	0.09	0.054	0.315	0.315	0.18	0.18	0.18	0.18	0.113	0.113	0.54	0.378	0.378	0.216	0.504	0.504	0.288	0.9	0.63	0.63	1.08	0.756	0.756
	11.2	1.0D	Vc m/min	76	76	96	96	86	86	86	86	86	77	94	94	94	85	96	96	85	96	96	96	95	95	95
			fz mm/tooth	0.061	0.061	0.074	0.074	0.066	0.066	0.066	0.066	0.066	0.059	0.082	0.082	0.082	0.074	0.099	0.099	0.089	0.111	0.111	0.111	0.119	0.119	0.119
			rpm obr/min	6048	6048	6112	6112	5475	5475	5475	5475	5475	4902	4987	4987	4987	4509	3820	3820	3382	3056	3056	3056	2520	2520	2520
			feed posuw mm/min	738	738	905	905	723	723	723	723	723	578	818	818	818	667	756	756	602	678	678	678	600	600	600
			Ap mm	0.07	0.042	0.245	0.245	0.14	0.14	0.14	0.14	0.088	0.088	0.42	0.294	0.294	0.168	0.392	0.392	0.224	0.7	0.49	0.49	0.84	0.588	0.588
K	15-20	1.0D	Vc m/min	80	80	101	101	90	90	90	90	90	80	100	100	100	90	101	101	90	101	101	101	100	100	100
			fz mm/tooth	0.065	0.065	0.09	0.09	0.081	0.081	0.081	0.081	0.081	0.072	0.1	0.1	0.1	0.09	0.119	0.119	0.107	0.141	0.141	0.141	0.151	0.151	0.151
			rpm obr/min	6366	6366	6430	6430	5730	5730	5730	5730	5730	5093	5305	5305	5305	4775	4019	4019	3581	3215	3215	3215	2653	2653	2653
			feed posuw mm/min	828	828	1157	1157	928	928	928	928	928	733	1061	1061	1061	859	956	956	766	907	907	907	801	801	801
			Ap mm	0.09	0.054	0.315	0.315	0.18	0.18	0.18	0.18	0.113	0.113	0.54	0.378	0.378	0.216	0.504	0.504	0.288	0.9	0.63	0.63	1.08	0.756	0.756
H	38.1 - 38.2	1.0D	Vc m/min	67	67	85	85	76	76	76	76	76	68	83	83	83	75	83	83	74	83	83	83	82	82	82
			fz mm/tooth	0.046	0.046	0.056	0.056	0.05	0.05	0.05	0.05	0.05	0.045	0.063	0.063	0.063	0.056	0.076	0.076	0.069	0.076	0.076	0.076	0.08	0.08	0.08
			rpm obr/min	5332	5332	5411	5411	4838	4838	4838	4838	4838	4329	4403	4403	4403	3979	3302	3302	2944	2642	2642	2642	2175	2175	2175
			feed posuw mm/min	491	491	606	606	484	484	484	484	484	390	555	555	555	446	502	502	406	402	402	402	348	348	348
			Ap mm	0.05	0.03	0.175	0.175	0.1	0.1	0.1	0.1	0.063	0.063	0.3	0.21	0.21	0.12	0.28	0.28	0.16	0.5	0.35	0.35	0.6	0.42	0.42
	40	1.0D	Vc m/min	76	76	96	96	86	86	86	86	86	77	94	94	94	85	96	96	85	96	96	96	95	95	95
			fz mm/tooth	0.061	0.061	0.074	0.074	0.066	0.066	0.066	0.066	0.066	0.059	0.082	0.082	0.082	0.074	0.099	0.099	0.089	0.111	0.111	0.111	0.119	0.119	0.119
			rpm obr/min	6048	6048	6112	6112	5475	5475	5475	5475	5475	4902	4987	4987	4987	4509	3820	3820	3382	3056	3056	3056	2520	2520	2520
			feed posuw mm/min	738	738	905	905	723	723	723	723	723	578	818	818	818	667	756	756	602	678	678	678	600	600	600
			Ap mm	0.07	0.042	0.245	0.245	0.14	0.14	0.14	0.14	0.088	0.088	0.42	0.294	0.294	0.168	0.392	0.392	0.224	0.7	0.49	0.49	0.84	0.588	0.588
	41	1.0D	Vc m/min	67	67	85	85	76	76	76	76	76	68	83	83	83	75	83	83	74	83	83	83	82	82	82
			fz mm/tooth	0.046	0.046	0.056	0.056	0.05	0.05	0.05	0.05	0.05	0.045	0.063	0.063	0.063	0.056	0.076	0.076	0.069	0.076	0.076	0.076	0.08	0.08	0.08
			rpm obr/min	5332	5332	5411	5411	4838	4838	4838	4838	4838	4329	4403	4403	4403	3979	3302	3302	2944	2642	2642	2642	2175	2175	2175
			feed posuw mm/min	491	491	606	606	484	484	484	484	484	390	555	555	555	446	502	502	406	402	402	402	348	348	348
			Ap mm	0.05	0.03	0.175	0.175	0.1	0.1	0.1	0.1	0.063	0.063	0.3	0.21	0.21	0.12	0.28	0.28	0.16	0.5	0.35	0.35	0.6	0.42	0.42

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX70

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7000804000A016040	0,8	4	1,6	40
UFX7000904000A018040	0,9	4	1,8	40
UFX7001004000A025050	1	4	2,5	50
UFX7001006000A025050	1	6	2,5	50
UFX7001204000A030050	1,2	4	3	50
UFX7001206000A030050	1,2	6	3	50
UFX7001504000A040050	1,5	4	4	50
UFX7001506000A040050	1,5	6	4	50
UFX7002004000A060050	2	4	6	50
UFX7002006000A060050	2	6	6	50
UFX7002504000A070050	2,5	4	7	50
UFX7002506000A070050	2,5	6	7	50
UFX7003006000A080050	3	6	8	50
UFX7003506000A100050	3,5	6	10	50
UFX7004006000A100050	4	6	10	50
UFX7004506000A140050	4,5	6	14	50
UFX7005006000A150060	5	6	15	60
UFX7005506000A150060	5,5	6	15	60
UFX7006006000A150060	6	6	15	60
UFX7006508000A180060	6,5	8	18	60
UFX7007008000A200060	7	8	20	60
UFX7007508000A200060	7,5	8	20	60
UFX7008008000A200070	8	8	20	70
UFX7008510000A220070	8,5	10	22	70
UFX7009010000A220070	9	10	22	70
UFX7009510000A240070	9,5	10	24	70
UFX7010010000A250075	10	10	25	75
UFX7010512000A260075	10,5	12	26	75
UFX7011012000A300075	11	12	30	75
UFX7011512000A300080	11,5	12	30	80
UFX7012012000A300080	12	12	30	80
UFX7013012000A350100	13	12	35	100
UFX7014012000A350100	14	12	35	100
UFX7014014000A350100	14	14	35	100
UFX7014016000A350100	14	16	35	100
UFX7015016000A380100	15	16	38	100
UFX7016016000A400100	16	16	40	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX70

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7017016000A420100	17	16	42	100
UFX7018016000A450100	18	16	45	100
UFX7018018000A450100	18	18	45	100
UFX7019020000A450100	19	20	45	100
UFX7020020000A450100	20	20	45	100
UFX7021020000A450100	21	20	45	100
UFX7022020000A450100	22	20	45	100
UFX7023025000A500120	23	25	50	120
UFX7024025000A500120	24	25	50	120
UFX7025025000A500120	25	25	50	120

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	0.8	0.9	1.0	1.2	1.5	2.0	2.5	3.0
P	1-5	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
	6-8	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
	9	0.05D	1.00D	Vc m/min	47	50	51	51	53	59	64	66
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	18701	17684	16234	13528	11247	9390	8149	7003
				feed posuw mm/min	150	141	130	162	180	188	196	224
	10-11.1	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
	11.2	0.05D	1.00D	Vc m/min	47	50	51	51	53	59	64	66
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	18701	17684	16234	13528	11247	9390	8149	7003
				feed posuw mm/min	150	141	130	162	180	188	196	224
M	14.1	0.05D	1.00D	Vc m/min	39	41	42	42	44	50	54	54
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	15518	14501	13369	11141	9337	7958	6875	5730
				feed posuw mm/min	124	116	107	134	149	159	165	183
K	15-20	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
H	38.1-38.2	0.05D	1.00D	Vc m/min	31	33	34	34	35	40	41	40
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004
				rpm obr/min	12335	11671	10823	9019	7427	6366	5220	4244
				feed posuw mm/min	49	47	43	36	59	51	63	68
	40	0.05D	1.00D	Vc m/min	47	50	51	51	53	59	64	66
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	18701	17684	16234	13528	11247	9390	8149	7003
				feed posuw mm/min	150	141	130	162	180	188	196	224
	41	0.05D	1.00D	Vc m/min	31	33	34	34	35	40	41	40
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004
				rpm obr/min	12335	11671	10823	9019	7427	6366	5220	4244
				feed posuw mm/min	49	47	43	36	59	51	63	68

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
P	1-5	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
	6-8	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
	9	0.05D	1.00D	Vc m/min	70	73	74	74	77	79	80	81	80	79	80	80
				fz mm/tooth	0.011	0.016	0.018	0.02	0.023	0.026	0.027	0.028	0.03	0.032	0.032	0.031
				rpm obr/min	6366	5809	5234	4711	4456	4191	3918	3683	3395	3143	2996	2829
				feed posuw mm/min	280	372	377	377	410	436	423	413	407	402	383	351
	10-11.1	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
	11.2	0.05D	1.00D	Vc m/min	70	73	74	74	77	79	80	81	80	79	80	80
				fz mm/tooth	0.011	0.016	0.018	0.02	0.023	0.026	0.027	0.028	0.03	0.032	0.032	0.031
				rpm obr/min	6366	5809	5234	4711	4456	4191	3918	3683	3395	3143	2996	2829
				feed posuw mm/min	280	372	377	377	410	436	423	413	407	402	383	351
M	14.1	0.05D	1.00D	Vc m/min	58	61	62	62	65	67	68	68	67	66	66	67
				fz mm/tooth	0.011	0.015	0.017	0.02	0.022	0.024	0.026	0.029	0.031	0.035	0.036	0.036
				rpm obr/min	5275	4854	4386	3947	3762	3554	3330	3092	2844	2626	2472	2370
				feed posuw mm/min	232	291	298	316	331	341	346	359	353	368	356	341
K	15-20	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
H	38.1-38.2	0.05D	1.00D	Vc m/min	43	46	47	46	47	47	49	51	52	53	53	54
				fz mm/tooth	0.004	0.004	0.005	0.006	0.007	0.009	0.01	0.011	0.013	0.014	0.014	0.014
				rpm obr/min	3911	3661	3325	2928	2720	2493	2400	2319	2207	2109	1985	1910
				feed posuw mm/min	63	59	66	70	76	90	96	102	115	118	111	107
	40	0.05D	1.00D	Vc m/min	70	73	74	74	77	79	80	81	80	79	80	80
				fz mm/tooth	0.011	0.016	0.018	0.02	0.023	0.026	0.027	0.028	0.03	0.032	0.032	0.031
				rpm obr/min	6366	5809	5234	4711	4456	4191	3918	3683	3395	3143	2996	2829
				feed posuw mm/min	280	372	377	377	410	436	423	413	407	402	383	351
	41	0.05D	1.00D	Vc m/min	43	46	47	46	47	47	49	51	52	53	53	54
				fz mm/tooth	0.004	0.004	0.005	0.006	0.007	0.009	0.01	0.011	0.013	0.014	0.014	0.014
				rpm obr/min	3911	3661	3325	2928	2720	2493	2400	2319	2207	2109	1985	1910
				feed posuw mm/min	63	59	66	70	76	90	96	102	115	118	111	107

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	9.5	10.0	10.5	11.0	11.5	12.0	13.0	14.0
P	1-5	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
	6-8	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
	9	0.05D	1.00D	Vc m/min	79	79	79	79	79	79	82	84
				fz mm/tooth	0.031	0.032	0.032	0.032	0.032	0.032	0.031	0.031
				rpm obr/min	2647	2515	2395	2286	2187	2096	2008	1910
				feed posuw mm/min	328	322	307	293	280	268	249	237
	10-11.1	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
	11.2	0.05D	1.00D	Vc m/min	79	79	79	79	79	79	82	84
				fz mm/tooth	0.031	0.032	0.032	0.032	0.032	0.032	0.031	0.031
				rpm obr/min	2647	2515	2395	2286	2187	2096	2008	1910
				feed posuw mm/min	328	322	307	293	280	268	249	237
M	14.1	0.05D	1.00D	Vc m/min	67	66	66	66	65	64	66	68
				fz mm/tooth	0.037	0.038	0.038	0.038	0.038	0.037	0.037	0.037
				rpm obr/min	2245	2101	2001	1910	1799	1698	1616	1546
				feed posuw mm/min	332	319	304	290	273	251	239	229
K	15-20	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
H	38.1-38.2	0.05D	1.00D	Vc m/min	54	53	54	55	55	55	56	57
				fz mm/tooth	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.015
				rpm obr/min	1809	1687	1637	1592	1522	1459	1371	1296
				feed posuw mm/min	101	94	92	89	91	88	82	78
	40	0.05D	1.00D	Vc m/min	79	79	79	79	79	79	82	84
				fz mm/tooth	0.031	0.032	0.032	0.032	0.032	0.032	0.031	0.031
				rpm obr/min	2647	2515	2395	2286	2187	2096	2008	1910
				feed posuw mm/min	328	322	307	293	280	268	249	237
	41	0.05D	1.00D	Vc m/min	54	53	54	55	55	55	56	57
				fz mm/tooth	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.015
				rpm obr/min	1809	1687	1637	1592	1522	1459	1371	1296
				feed posuw mm/min	101	94	92	89	91	88	82	78

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0
P	1-5	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
	6-8	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
	9	0.05D	1.00D	Vc m/min	85	85	86	85	85	84	84	84	84	84	82
				fz mm/tooth	0.031	0.032	0.031	0.031	0.032	0.032	0.032	0.033	0.031	0.032	0.032
				rpm obr/min	1804	1691	1610	1503	1424	1337	1273	1215	1163	1114	1044
				feed posuw mm/min	224	216	200	186	182	171	163	160	144	143	134
	10-11.1	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
	11.2	0.05D	1.00D	Vc m/min	85	85	86	85	85	84	84	84	84	84	82
				fz mm/tooth	0.031	0.032	0.031	0.031	0.032	0.032	0.032	0.033	0.031	0.032	0.032
				rpm obr/min	1804	1691	1610	1503	1424	1337	1273	1215	1163	1114	1044
				feed posuw mm/min	224	216	200	186	182	171	163	160	144	143	134
M	14.1	0.05D	1.00D	Vc m/min	69	69	69	68	67	66	67	67	67	67	67
				fz mm/tooth	0.038	0.038	0.039	0.038	0.039	0.038	0.037	0.037	0.038	0.037	0.037
				rpm obr/min	1464	1373	1292	1203	1122	1050	1016	969	927	889	853
				feed posuw mm/min	223	209	202	183	175	160	150	143	141	132	126
K	15-20	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
H	38.1-38.2	0.05D	1.00D	Vc m/min	57	57	57	56	55	53	54	54	54	54	53
				fz mm/tooth	0.014	0.014	0.014	0.014	0.013	0.012	0.013	0.013	0.012	0.011	0.012
				rpm obr/min	1210	1134	1067	990	921	844	819	781	747	716	675
				feed posuw mm/min	68	64	60	55	48	40	43	41	36	32	32
	40	0.05D	1.00D	Vc m/min	85	85	86	85	85	84	84	84	84	84	82
				fz mm/tooth	0.031	0.032	0.031	0.031	0.032	0.032	0.032	0.033	0.031	0.032	0.032
				rpm obr/min	1804	1691	1610	1503	1424	1337	1273	1215	1163	1114	1044
				feed posuw mm/min	224	216	200	186	182	171	163	160	144	143	134
	41	0.05D	1.00D	Vc m/min	57	57	57	56	55	53	54	54	54	54	53
				fz mm/tooth	0.014	0.014	0.014	0.014	0.013	0.012	0.013	0.013	0.012	0.011	0.012
				rpm obr/min	1210	1134	1067	990	921	844	819	781	747	716	675
				feed posuw mm/min	68	64	60	55	48	40	43	41	36	32	32

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX75

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○

ISO	N															S								H			
HRc																15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100								200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37		38	39	40	41				
																				○		●	○				

CODE	DC	DCON	APMX	OAL
UFX7501004000A010040	1	4	1	40
UFX7501004000A020040	1	4	2	40
UFX7501004000A025050	1	4	2,5	50
UFX7501004000A030050	1	4	3	50
UFX7501004000A040050	1	4	4	50
UFX7501004000A060050	1	4	6	50
UFX7501006000A010040	1	6	1	40
UFX7501006000A020040	1	6	2	40
UFX7501006000A025050	1	6	2,5	50
UFX7501006000A030050	1	6	3	50
UFX7501006000A040050	1	6	4	50
UFX7501006000A060050	1	6	6	50
UFX7501204000A020040	1,2	4	2	40
UFX7501204000A030050	1,2	4	3	50
UFX7501204000A040050	1,2	4	4	50
UFX7501204000A060050	1,2	4	6	50
UFX7501206000A020040	1,2	6	2	40
UFX7501206000A030050	1,2	6	3	50
UFX7501206000A040050	1,2	6	4	50
UFX7501206000A060050	1,2	6	6	50
UFX7501504000A015040	1,5	4	1,5	40
UFX7501504000A030040	1,5	4	3	40
UFX7501504000A040050	1,5	4	4	50
UFX7501504000A060050	1,5	4	6	50
UFX7501504000A080050	1,5	4	8	50
UFX7501504000A100050	1,5	4	10	50
UFX7501506000A015040	1,5	6	1,5	40
UFX7501506000A030040	1,5	6	3	40
UFX7501506000A040050	1,5	6	4	50
UFX7501506000A060050	1,5	6	6	50
UFX7501506000A080050	1,5	6	8	50
UFX7501506000A100050	1,5	6	10	50
UFX7502004000A020040	2	4	2	40
UFX7502004000A040040	2	4	4	40
UFX7502004000A060050	2	4	6	50
UFX7502004000A080050	2	4	8	50
UFX7502004000A100050	2	4	10	50

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX75

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7502004000A120050	2	4	12	50
UFX7502006000A020040	2	6	2	40
UFX7502006000A040040	2	6	4	40
UFX7502006000A060050	2	6	6	50
UFX7502006000A080050	2	6	8	50
UFX7502006000A100050	2	6	10	50
UFX7502006000A120050	2	6	12	50
UFX7502504000A025040	2,5	4	2,5	40
UFX7502504000A050040	2,5	4	5	40
UFX7502504000A070050	2,5	4	7	50
UFX7502504000A100050	2,5	4	10	50
UFX7502504000A120050	2,5	4	12	50
UFX7502506000A025040	2,5	6	2,5	40
UFX7502506000A050040	2,5	6	5	40
UFX7502506000A070050	2,5	6	7	50
UFX7502506000A100050	2,5	6	10	50
UFX7502506000A120050	2,5	6	12	50
UFX7503006000A030040	3	6	3	40
UFX7503006000A060040	3	6	6	40
UFX7503006000A080050	3	6	8	50
UFX7503006000A100050	3	6	10	50
UFX7503006000A120050	3	6	12	50
UFX7503006000A140050	3	6	14	50
UFX7504006000A040040	4	6	4	40
UFX7504006000A080040	4	6	8	40
UFX7504006000A100050	4	6	10	50
UFX7504006000A120050	4	6	12	50
UFX7504006000A140050	4	6	14	50
UFX7504006000A160050	4	6	16	50
UFX7505006000A050050	5	6	5	50
UFX7505006000A100050	5	6	10	50
UFX7505006000A150060	5	6	15	60
UFX7505006000A200060	5	6	20	60
UFX7505006000A250060	5	6	25	60
UFX7506006000A060050	6	6	6	50
UFX7506006000A120050	6	6	12	50
UFX7506006000A150060	6	6	15	60

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX75

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7506006000A200060	6	6	20	60
UFX7506006000A250060	6	6	25	60
UFX7508008000A160060	8	8	16	60
UFX7508008000A200070	8	8	20	70
UFX7508008000A250070	8	8	25	70
UFX7508008000A300070	8	8	30	70
UFX7510010000A220065	10	10	22	65
UFX7510010000A250075	10	10	25	75
UFX7510010000A300075	10	10	30	75
UFX7510010000A350075	10	10	35	75
UFX7512012000A260070	12	12	26	70
UFX7512012000A300080	12	12	30	80
UFX7512012000A350080	12	12	35	80
UFX7512012000A400080	12	12	40	80
UFX7514016000A350100	14	16	35	100
UFX7516016000A320100	16	16	32	100
UFX7516016000A400100	16	16	40	100
UFX7518020000A450100	18	20	45	100
UFX7520020000A450100	20	20	45	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX75

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	0.8	0.9	1.0	1.2	1.5	2.0	2.5	3.0
P	1-5	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
	6-8	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
	9	0.05D	1.00D	Vc m/min	47	50	51	51	53	59	64	66
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	18701	17684	16234	13528	11247	9390	8149	7003
				feed posuw mm/min	150	141	130	162	180	188	196	224
	10-11.1	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
	11.2	0.05D	1.00D	Vc m/min	47	50	51	51	53	59	64	66
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	18701	17684	16234	13528	11247	9390	8149	7003
				feed posuw mm/min	150	141	130	162	180	188	196	224
M	14.1	0.05D	1.00D	Vc m/min	39	41	42	42	44	50	54	54
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	15518	14501	13369	11141	9337	7958	6875	5730
				feed posuw mm/min	124	116	107	134	149	159	165	183
K	15-20	0.05D	1.00D	Vc m/min	79	83	84	85	88	91	101	105
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	31433	29355	26738	22547	18674	14483	12860	11141
				feed posuw mm/min	251	235	214	271	299	290	309	357
H	38.1-38.2	0.05D	1.00D	Vc m/min	31	33	34	34	35	40	41	40
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004
				rpm obr/min	12335	11671	10823	9019	7427	6366	5220	4244
				feed posuw mm/min	49	47	43	36	59	51	63	68
	40	0.05D	1.00D	Vc m/min	47	50	51	51	53	59	64	66
				fz mm/tooth	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.008
				rpm obr/min	18701	17684	16234	13528	11247	9390	8149	7003
				feed posuw mm/min	150	141	130	162	180	188	196	224
	41	0.05D	1.00D	Vc m/min	31	33	34	34	35	40	41	40
				fz mm/tooth	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004
				rpm obr/min	12335	11671	10823	9019	7427	6366	5220	4244
				feed posuw mm/min	49	47	43	36	59	51	63	68

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX75

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
P	1-5	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
	6-8	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
	9	0.05D	1.00D	Vc m/min	70	73	74	74	77	79	80	81	80	79	80	80
				fz mm/tooth	0.011	0.016	0.018	0.02	0.023	0.026	0.027	0.028	0.03	0.032	0.032	0.031
				rpm obr/min	6366	5809	5234	4711	4456	4191	3918	3683	3395	3143	2996	2829
				feed posuw mm/min	280	372	377	377	410	436	423	413	407	402	383	351
	10-11.1	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
	11.2	0.05D	1.00D	Vc m/min	70	73	74	74	77	79	80	81	80	79	80	80
				fz mm/tooth	0.011	0.016	0.018	0.02	0.023	0.026	0.027	0.028	0.03	0.032	0.032	0.031
				rpm obr/min	6366	5809	5234	4711	4456	4191	3918	3683	3395	3143	2996	2829
				feed posuw mm/min	280	372	377	377	410	436	423	413	407	402	383	351
M	14.1	0.05D	1.00D	Vc m/min	58	61	62	62	65	67	68	68	67	66	66	67
				fz mm/tooth	0.011	0.015	0.017	0.02	0.022	0.024	0.026	0.029	0.031	0.035	0.036	0.036
				rpm obr/min	5275	4854	4386	3947	3762	3554	3330	3092	2844	2626	2472	2370
				feed posuw mm/min	232	291	298	316	331	341	346	359	353	368	356	341
K	15-20	0.05D	1.00D	Vc m/min	113	119	122	124	128	131	133	134	134	132	132	132
				fz mm/tooth	0.011	0.016	0.018	0.02	0.022	0.025	0.027	0.03	0.032	0.035	0.036	0.037
				rpm obr/min	10277	9470	8630	7894	7408	6950	6513	6093	5687	5252	4943	4669
				feed posuw mm/min	452	606	621	632	652	695	703	731	728	735	712	691
H	38.1-38.2	0.05D	1.00D	Vc m/min	43	46	47	46	47	47	49	51	52	53	53	54
				fz mm/tooth	0.004	0.004	0.005	0.006	0.007	0.009	0.01	0.011	0.013	0.014	0.014	0.014
				rpm obr/min	3911	3661	3325	2928	2720	2493	2400	2319	2207	2109	1985	1910
				feed posuw mm/min	63	59	66	70	76	90	96	102	115	118	111	107
	40	0.05D	1.00D	Vc m/min	70	73	74	74	77	79	80	81	80	79	80	80
				fz mm/tooth	0.011	0.016	0.018	0.02	0.023	0.026	0.027	0.028	0.03	0.032	0.032	0.031
				rpm obr/min	6366	5809	5234	4711	4456	4191	3918	3683	3395	3143	2996	2829
				feed posuw mm/min	280	372	377	377	410	436	423	413	407	402	383	351
	41	0.05D	1.00D	Vc m/min	43	46	47	46	47	47	49	51	52	53	53	54
				fz mm/tooth	0.004	0.004	0.005	0.006	0.007	0.009	0.01	0.011	0.013	0.014	0.014	0.014
				rpm obr/min	3911	3661	3325	2928	2720	2493	2400	2319	2207	2109	1985	1910
				feed posuw mm/min	63	59	66	70	76	90	96	102	115	118	111	107

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX75

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	9.5	10.0	10.5	11.0	11.5	12.0	13.0	14.0
P	1-5	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
	6-8	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
	9	0.05D	1.00D	Vc m/min	79	79	79	79	79	79	82	84
				fz mm/tooth	0.031	0.032	0.032	0.032	0.032	0.032	0.031	0.031
				rpm obr/min	2647	2515	2395	2286	2187	2096	2008	1910
				feed posuw mm/min	328	322	307	293	280	268	249	237
	10-11.1	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
	11.2	0.05D	1.00D	Vc m/min	79	79	79	79	79	79	82	84
				fz mm/tooth	0.031	0.032	0.032	0.032	0.032	0.032	0.031	0.031
				rpm obr/min	2647	2515	2395	2286	2187	2096	2008	1910
				feed posuw mm/min	328	322	307	293	280	268	249	237
M	14.1	0.05D	1.00D	Vc m/min	67	66	66	66	65	64	66	68
				fz mm/tooth	0.037	0.038	0.038	0.038	0.038	0.037	0.037	0.037
				rpm obr/min	2245	2101	2001	1910	1799	1698	1616	1546
				feed posuw mm/min	332	319	304	290	273	251	239	229
K	15-20	0.05D	1.00D	Vc m/min	130	128	129	130	130	129	133	136
				fz mm/tooth	0.038	0.039	0.04	0.04	0.04	0.04	0.04	0.04
				rpm obr/min	4356	4074	3911	3762	3598	3422	3257	3092
				feed posuw mm/min	662	636	626	602	576	547	521	495
H	38.1-38.2	0.05D	1.00D	Vc m/min	54	53	54	55	55	55	56	57
				fz mm/tooth	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.015
				rpm obr/min	1809	1687	1637	1592	1522	1459	1371	1296
				feed posuw mm/min	101	94	92	89	91	88	82	78
	40	0.05D	1.00D	Vc m/min	79	79	79	79	79	79	82	84
				fz mm/tooth	0.031	0.032	0.032	0.032	0.032	0.032	0.031	0.031
				rpm obr/min	2647	2515	2395	2286	2187	2096	2008	1910
				feed posuw mm/min	328	322	307	293	280	268	249	237
	41	0.05D	1.00D	Vc m/min	54	53	54	55	55	55	56	57
				fz mm/tooth	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.015
				rpm obr/min	1809	1687	1637	1592	1522	1459	1371	1296
				feed posuw mm/min	101	94	92	89	91	88	82	78

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX75

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0
P	1-5	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
	6-8	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
	9	0.05D	1.00D	Vc m/min	85	85	86	85	85	84	84	84	84	84	82
				fz mm/tooth	0.031	0.032	0.031	0.031	0.032	0.032	0.032	0.033	0.031	0.032	0.032
				rpm obr/min	1804	1691	1610	1503	1424	1337	1273	1215	1163	1114	1044
				feed posuw mm/min	224	216	200	186	182	171	163	160	144	143	134
	10-11.1	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
	11.2	0.05D	1.00D	Vc m/min	85	85	86	85	85	84	84	84	84	84	82
				fz mm/tooth	0.031	0.032	0.031	0.031	0.032	0.032	0.032	0.033	0.031	0.032	0.032
				rpm obr/min	1804	1691	1610	1503	1424	1337	1273	1215	1163	1114	1044
				feed posuw mm/min	224	216	200	186	182	171	163	160	144	143	134
M	14.1	0.05D	1.00D	Vc m/min	69	69	69	68	67	66	67	67	67	67	67
				fz mm/tooth	0.038	0.038	0.039	0.038	0.039	0.038	0.037	0.037	0.038	0.037	0.037
				rpm obr/min	1464	1373	1292	1203	1122	1050	1016	969	927	889	853
				feed posuw mm/min	223	209	202	183	175	160	150	143	141	132	126
K	15-20	0.05D	1.00D	Vc m/min	138	138	138	137	135	132	133	134	134	134	134
				fz mm/tooth	0.039	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.039
				rpm obr/min	2928	2745	2584	2423	2262	2101	2016	1939	1855	1777	1706
				feed posuw mm/min	457	439	413	388	362	336	323	310	297	277	266
H	38.1-38.2	0.05D	1.00D	Vc m/min	57	57	57	56	55	53	54	54	54	54	53
				fz mm/tooth	0.014	0.014	0.014	0.014	0.013	0.012	0.013	0.013	0.012	0.011	0.012
				rpm obr/min	1210	1134	1067	990	921	844	819	781	747	716	675
				feed posuw mm/min	68	64	60	55	48	40	43	41	36	32	32
	40	0.05D	1.00D	Vc m/min	85	85	86	85	85	84	84	84	84	84	82
				fz mm/tooth	0.031	0.032	0.031	0.031	0.032	0.032	0.032	0.033	0.031	0.032	0.032
				rpm obr/min	1804	1691	1610	1503	1424	1337	1273	1215	1163	1114	1044
				feed posuw mm/min	224	216	200	186	182	171	163	160	144	143	134
	41	0.05D	1.00D	Vc m/min	57	57	57	56	55	53	54	54	54	54	53
				fz mm/tooth	0.014	0.014	0.014	0.014	0.013	0.012	0.013	0.013	0.012	0.011	0.012
				rpm obr/min	1210	1134	1067	990	921	844	819	781	747	716	675
				feed posuw mm/min	68	64	60	55	48	40	43	41	36	32	32

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX73

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7301006000A030060	1	6	3	60
UFX7301006000A040060	1	6	4	60
UFX7301006000A050060	1	6	5	60
UFX7301006000A060060	1	6	6	60
UFX7301006000A070060	1	6	7	60
UFX7301006000A080060	1	6	8	60
UFX7301006000A100060	1	6	10	60
UFX7301006000A120060	1	6	12	60
UFX7301206000A040060	1,2	6	4	60
UFX7301206000A060060	1,2	6	6	60
UFX7301206000A080060	1,2	6	8	60
UFX7301206000A100060	1,2	6	10	60
UFX7301206000A120060	1,2	6	12	60
UFX7301506000A060060	1,5	6	6	60
UFX7301506000A080060	1,5	6	8	60
UFX7301506000A100060	1,5	6	10	60
UFX7301506000A120060	1,5	6	12	60
UFX7301506000A140060	1,5	6	14	60
UFX7301506000A160060	1,5	6	16	60
UFX7302006000A080060	2	6	8	60
UFX7302006000A100060	2	6	10	60
UFX7302006000A120060	2	6	12	60
UFX7302006000A140060	2	6	14	60
UFX7302006000A160060	2	6	16	60
UFX7302506000A100060	2,5	6	10	60
UFX7302506000A120060	2,5	6	12	60
UFX7302506000A160060	2,5	6	16	60
UFX7302506000A200060	2,5	6	20	60
UFX7302506000A260060	2,5	6	26	60
UFX7303003000A160100	3	3	16	100
UFX7303006000A100070	3	6	10	70
UFX7303006000A120070	3	6	12	70
UFX7303006000A140070	3	6	14	70
UFX7303006000A160070	3	6	16	70
UFX7303006000A200070	3	6	20	70
UFX7303006000A260070	3	6	26	70
UFX7303006000A300070	3	6	30	70

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX73

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7304004000A200100	4	4	20	100
UFX7304006000A120070	4	6	12	70
UFX7304006000A160070	4	6	16	70
UFX7304006000A200070	4	6	20	70
UFX7304006000A260070	4	6	26	70
UFX7304006000A300070	4	6	30	70
UFX7305006000A200070	5	6	20	70
UFX7305006000A250070	5	6	25	70
UFX7305006000A250100	5	6	25	100
UFX7305006000A300080	5	6	30	80
UFX7305006000A350090	5	6	35	90

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX73

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7305006000A400100	5	6	40	100
UFX7306006000A150060	6	6	15	60
UFX7306006000A150080	6	6	15	80
UFX7306006000A200070	6	6	20	70
UFX7306006000A200090	6	6	20	90
UFX7306006000A250075	6	6	25	75
UFX7306006000A300080	6	6	30	80
UFX7306006000A300100	6	6	30	100
UFX7306006000A300150	6	6	30	150
UFX7306006000A350090	6	6	35	90
UFX7306006000A400090	6	6	40	90
UFX7306006000A400120	6	6	40	120
UFX7306006000A450150	6	6	45	150
UFX7308008000A250080	8	8	25	80
UFX7308008000A300080	8	8	30	80
UFX7308008000A300100	8	8	30	100
UFX7308008000A350090	8	8	35	90
UFX7308008000A400090	8	8	40	90
UFX7308008000A400120	8	8	40	120
UFX7308008000A400150	8	8	40	150
UFX7308008000A450100	8	8	45	100
UFX7308008000A500100	8	8	50	100
UFX7308008000A500150	8	8	50	150
UFX7310010000A300080	10	10	30	80
UFX7310010000A300100	10	10	30	100
UFX7310010000A350090	10	10	35	90
UFX7310010000A400090	10	10	40	90
UFX7310010000A400120	10	10	40	120
UFX7310010000A450100	10	10	45	100
UFX7310010000A500100	10	10	50	100
UFX7310010000A500150	10	10	50	150
UFX7310010000A500200	10	10	50	200
UFX7310010000A550150	10	10	55	150
UFX7310010000A600110	10	10	60	110
UFX7310010000A600200	10	10	60	200
UFX7312012000A350090	12	12	35	90
UFX7312012000A400100	12	12	40	100
UFX7312012000A400120	12	12	40	120
UFX7312012000A450130	12	12	45	130
UFX7312012000A500100	12	12	50	100
UFX7312012000A500150	12	12	50	150

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX73

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7312012000A550110	12	12	55	110
UFX7312012000A600110	12	12	60	110
UFX7312012000A600150	12	12	60	150
UFX7312012000A600200	12	12	60	200
UFX7312012000A650150	12	12	65	150
UFX7312012000A700120	12	12	70	120
UFX7312012000A700200	12	12	70	200
UFX7314016000A500110	14	16	50	110
UFX7314016000A600150	14	16	60	150
UFX7316016000A400150	16	16	40	150
UFX7316016000A500110	16	16	50	110
UFX7316016000A500150	16	16	50	150
UFX7316016000A600120	16	16	60	120
UFX7316016000A700130	16	16	70	130
UFX7316016000A700150	16	16	70	150
UFX7316016000A700200	16	16	70	200
UFX7316016000A800150	16	16	80	150
UFX7316016000A900150	16	16	90	150
UFX7316016000A11X200	16	16	110	200
UFX7316016000A12X250	16	16	120	250
UFX7318020000A500120	18	20	50	120
UFX7318020000A700130	18	20	70	130
UFX7318020000A10X200	18	20	100	200
UFX7320020000A500110	20	20	50	110
UFX7320020000A500150	20	20	50	150
UFX7320020000A600130	20	20	60	130
UFX7320020000A700130	20	20	70	130
UFX7320020000A800150	20	20	80	150
UFX7320020000A900150	20	20	90	150
UFX7320020000A900200	20	20	90	200
UFX7320020000A11X200	20	20	110	200
UFX7320020000A12X250	20	20	120	250
UFX7322020000A750150	22	20	75	150
UFX7322020000A11X200	22	20	110	200
UFX7325025000A700150	25	25	70	150
UFX7325025000A900150	25	25	90	150
UFX7325025000A11X200	25	25	110	200
UFX7325025000A12X250	25	25	120	250

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKOIEM

ISO	VDI 3323	Ae mm	DC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12	1.2	1.2	1.2
			LOC	3	4	5	6	7	8	10	12	4	6	8	10
P	1-5	1.0D	Vc m/min	60	60	60	54	54	54	54	48	61	61	55	55
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
			rpm obr/min	19099	19099	19099	17189	17189	17189	17189	15279	16181	16181	14589	14589
			feed posuw mm/min	153	153	153	138	138	138	138	122	194	194	175	117
	6-8	1.0D	Vc m/min	60	60	60	54	54	54	54	48	61	61	55	55
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
			rpm obr/min	19099	19099	19099	17189	17189	17189	17189	15279	16181	16181	14589	14589
			feed posuw mm/min	153	153	153	138	138	138	138	122	194	194	175	117
	9	1.0D	Vc m/min	34	34	34	31	31	31	31	28	35	35	31	31
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002
			rpm obr/min	10823	10823	10823	9868	9868	9868	9868	8913	9284	9284	8223	8223
			feed posuw mm/min	87	87	87	79	79	39	39	36	74	74	66	66
	10-11.1	1.0D	Vc m/min	60	60	60	54	54	54	54	48	61	61	55	55
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
			rpm obr/min	19099	19099	19099	17189	17189	17189	17189	15279	16181	16181	14589	14589
			feed posuw mm/min	153	153	153	138	138	138	138	122	194	194	175	117
	11.2	1.0D	Vc m/min	34	34	34	31	31	31	31	28	35	35	31	31
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002
			rpm obr/min	10823	10823	10823	9868	9868	9868	9868	8913	9284	9284	8223	8223
			feed posuw mm/min	87	87	87	79	79	39	39	36	74	74	66	66
K	15-20	1.0D	Vc m/min	60	60	60	54	54	54	54	48	61	61	55	55
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
			rpm obr/min	19099	19099	19099	17189	17189	17189	17189	15279	16181	16181	14589	14589
			feed posuw mm/min	153	153	153	138	138	138	138	122	194	194	175	117
H	38.1 - 38.2	1.0D	Vc m/min	21	21	21	19	19	19	19	17	21	21	19	19
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.001
			rpm obr/min	6685	6685	6685	6048	6048	6048	6048	5411	5570	5570	5040	5040
			feed posuw mm/min	27	27	27	24	24	24	24	22	45	45	40	20
	40	1.0D	Vc m/min	34	34	34	31	31	31	31	28	35	35	31	31
			fz mm/tooth	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002
			rpm obr/min	10823	10823	10823	9868	9868	9868	9868	8913	9284	9284	8223	8223
			feed posuw mm/min	87	87	87	79	79	39	39	36	74	74	66	66
	41	1.0D	Vc m/min	21	21	21	19	19	19	19	17	21	21	19	19
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.001
			rpm obr/min	6685	6685	6685	6048	6048	6048	6048	5411	5570	5570	5040	5040
			feed posuw mm/min	27	27	27	24	24	24	24	22	45	45	40	20

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKOIEM

ISO	VDI 3323	Ae mm	DC	1.2	1.5	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5	2.5	3.0	3.0
			LOC	12	6	8	10	12	14	16	8	10	12	14	16	10	12	16	20	26	10	12
P	1-5	1.0D	Vc m/min	55	65	59	59	59	59	52	66	66	60	60	60	71	71	64	64	57	70	70
			fz mm/tooth	0.002	0.004	0.004	0.004	0.003	0.003	0.003	0.006	0.006	0.005	0.005	0.005	0.007	0.007	0.006	0.006	0.005	0.009	0.009
			rpm obr/min	14589	13793	12520	12520	12520	12520	11035	10504	10504	9549	9549	9549	9040	9040	8149	8149	7257	7427	7427
			feed posuw mm/min	117	221	200	200	150	150	132	252	252	191	191	191	253	253	196	196	145	267	267
	6-8	1.0D	Vc m/min	55	65	59	59	59	59	52	66	66	60	60	60	71	71	64	64	57	70	70
			fz mm/tooth	0.002	0.004	0.004	0.004	0.003	0.003	0.003	0.006	0.006	0.005	0.005	0.005	0.007	0.007	0.006	0.006	0.005	0.009	0.009
			rpm obr/min	14589	13793	12520	12520	12520	12520	11035	10504	10504	9549	9549	9549	9040	9040	8149	8149	7257	7427	7427
			feed posuw mm/min	117	221	200	200	150	150	132	252	252	191	191	191	253	253	196	196	145	267	267
	9	1.0D	Vc m/min	31	37	33	33	33	33	30	38	38	34	34	34	41	41	37	37	32	40	40
			fz mm/tooth	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.007	0.007
			rpm obr/min	8223	7852	7003	7003	7003	7003	6366	6048	6048	5411	5411	5411	5220	5220	4711	4711	4074	4244	4244
			feed posuw mm/min	66	94	84	56	56	56	51	97	97	87	87	65	104	104	94	75	65	119	119
	10-11.1	1.0D	Vc m/min	55	65	59	59	59	59	52	66	66	60	60	60	71	71	64	64	57	70	70
			fz mm/tooth	0.002	0.004	0.004	0.004	0.003	0.003	0.003	0.006	0.006	0.005	0.005	0.005	0.007	0.007	0.006	0.006	0.005	0.009	0.009
			rpm obr/min	14589	13793	12520	12520	12520	12520	11035	10504	10504	9549	9549	9549	9040	9040	8149	8149	7257	7427	7427
			feed posuw mm/min	117	221	200	200	150	150	132	252	252	191	191	191	253	253	196	196	145	267	267
	11.2	1.0D	Vc m/min	31	37	33	33	33	33	30	38	38	34	34	34	41	41	37	37	32	40	40
			fz mm/tooth	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.007	0.007
			rpm obr/min	8223	7852	7003	7003	7003	7003	6366	6048	6048	5411	5411	5411	5220	5220	4711	4711	4074	4244	4244
			feed posuw mm/min	66	94	84	56	56	56	51	97	97	87	87	65	104	104	94	75	65	119	119
K	15-20	1.0D	Vc m/min	55	65	59	59	59	59	52	66	66	60	60	60	71	71	64	64	57	70	70
			fz mm/tooth	0.002	0.004	0.004	0.004	0.003	0.003	0.003	0.006	0.006	0.005	0.005	0.005	0.007	0.007	0.006	0.006	0.005	0.009	0.009
			rpm obr/min	14589	13793	12520	12520	12520	12520	11035	10504	10504	9549	9549	9549	9040	9040	8149	8149	7257	7427	7427
			feed posuw mm/min	117	221	200	200	150	150	132	252	252	191	191	191	253	253	196	196	145	267	267
H	38.1 - 38.2	1.0D	Vc m/min	19	23	20	20	20	20	18	24	24	21	21	21	25	25	23	23	20	25	25
			fz mm/tooth	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.003	0.006	0.006
			rpm obr/min	5040	4881	4244	4244	4244	4244	3820	3820	3820	3342	3342	3342	3183	3183	2928	2928	2546	2653	2653
			feed posuw mm/min	20	39	34	34	34	34	31	61	61	40	40	40	64	64	47	47	31	64	64
	40	1.0D	Vc m/min	31	37	33	33	33	33	30	38	38	34	34	34	41	41	37	37	32	40	40
			fz mm/tooth	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.007	0.007
			rpm obr/min	8223	7852	7003	7003	7003	7003	6366	6048	6048	5411	5411	5411	5220	5220	4711	4711	4074	4244	4244
			feed posuw mm/min	66	94	84	56	56	56	51	97	97	87	87	65	104	104	94	75	65	119	119
	41	1.0D	Vc m/min	19	23	20	20	20	20	18	24	24	21	21	21	25	25	23	23	20	25	25
			fz mm/tooth	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.003	0.003	0.003	0.005	0.005	0.004	0.004	0.003	0.006	0.006
			rpm obr/min	5040	4881	4244	4244	4244	4244	3820	3820	3820	3342	3342	3342	3183	3183	2928	2928	2546	2653	2653
			feed posuw mm/min	20	39	34	34	34	34	31	61	61	40	40	40	64	64	47	47	31	64	64

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKOIEM

ISO	VDI 3323	Ae mm	DC	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0
			LOC	14	16	20	26	30	12	16	20	26	30	20	25	30	35	40
P	1-5	1.0D	Vc m/min	70	63	63	63	63	75	75	75	68	68	80	80	72	72	72
			fz mm/tooth	0.009	0.009	0.008	0.008	0.008	0.014	0.014	0.014	0.013	0.013	0.021	0.021	0.019	0.019	0.017
			rpm obr/min	7427	6685	6685	6685	6685	5968	5968	5968	5411	5411	5093	5093	4584	4584	4584
			feed posuw mm/min	267	241	214	214	214	334	334	334	281	281	428	428	348	348	312
	6-8	1.0D	Vc m/min	70	63	63	63	63	75	75	75	68	68	80	80	72	72	72
			fz mm/tooth	0.009	0.009	0.008	0.008	0.008	0.014	0.014	0.014	0.013	0.013	0.021	0.021	0.019	0.019	0.017
			rpm obr/min	7427	6685	6685	6685	6685	5968	5968	5968	5411	5411	5093	5093	4584	4584	4584
			feed posuw mm/min	267	241	214	214	214	334	334	334	281	281	428	428	348	348	312
	9	1.0D	Vc m/min	40	36	36	36	36	43	43	43	39	39	46	46	41	41	41
			fz mm/tooth	0.007	0.007	0.006	0.006	0.006	0.01	0.01	0.01	0.009	0.009	0.015	0.015	0.013	0.013	0.011
			rpm obr/min	4244	3820	3820	3820	3820	3422	3422	3422	3104	3104	2928	2928	2610	2610	2610
			feed posuw mm/min	119	107	92	92	92	137	137	137	112	112	176	176	136	136	115
	10-11.1	1.0D	Vc m/min	70	63	63	63	63	75	75	75	68	68	80	80	72	72	72
			fz mm/tooth	0.009	0.009	0.008	0.008	0.008	0.014	0.014	0.014	0.013	0.013	0.021	0.021	0.019	0.019	0.017
			rpm obr/min	7427	6685	6685	6685	6685	5968	5968	5968	5411	5411	5093	5093	4584	4584	4584
			feed posuw mm/min	267	241	214	214	214	334	334	334	281	281	428	428	348	348	312
	11.2	1.0D	Vc m/min	40	36	36	36	36	43	43	43	39	39	46	46	41	41	41
			fz mm/tooth	0.007	0.007	0.006	0.006	0.006	0.01	0.01	0.01	0.009	0.009	0.015	0.015	0.013	0.013	0.011
			rpm obr/min	4244	3820	3820	3820	3820	3422	3422	3422	3104	3104	2928	2928	2610	2610	2610
			feed posuw mm/min	119	107	92	92	92	137	137	137	112	112	176	176	136	136	115
K	15-20	1.0D	Vc m/min	70	63	63	63	63	75	75	75	68	68	80	80	72	72	72
			fz mm/tooth	0.009	0.009	0.008	0.008	0.008	0.014	0.014	0.014	0.013	0.013	0.021	0.021	0.019	0.019	0.017
			rpm obr/min	7427	6685	6685	6685	6685	5968	5968	5968	5411	5411	5093	5093	4584	4584	4584
			feed posuw mm/min	267	241	214	214	214	334	334	334	281	281	428	428	348	348	312
H	38.1 - 38.2	1.0D	Vc m/min	25	22	22	22	22	27	27	27	24	24	30	30	27	27	27
			fz mm/tooth	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.008	0.011	0.011	0.01	0.01	0.009
			rpm obr/min	2653	2334	2334	2334	2334	2149	2149	2149	1910	1910	1910	1910	1719	1719	1719
			feed posuw mm/min	64	56	56	47	47	69	69	69	61	61	84	84	69	69	62
	40	1.0D	Vc m/min	40	36	36	36	36	43	43	43	39	39	46	46	41	41	41
			fz mm/tooth	0.007	0.007	0.006	0.006	0.006	0.01	0.01	0.01	0.009	0.009	0.015	0.015	0.013	0.013	0.011
			rpm obr/min	4244	3820	3820	3820	3820	3422	3422	3422	3104	3104	2928	2928	2610	2610	2610
			feed posuw mm/min	119	107	92	92	92	137	137	137	112	112	176	176	136	136	115
	41	1.0D	Vc m/min	25	22	22	22	22	27	27	27	24	24	30	30	27	27	27
			fz mm/tooth	0.006	0.006	0.006	0.005	0.005	0.008	0.008	0.008	0.008	0.008	0.011	0.011	0.01	0.01	0.009
			rpm obr/min	2653	2334	2334	2334	2334	2149	2149	2149	1910	1910	1910	1910	1719	1719	1719
			feed posuw mm/min	64	56	56	47	47	69	69	69	61	61	84	84	69	69	62

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKOIEM

ISO	VDI 3323	Ae mm	DC	6.0	6.0	6.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0
			LOC	15	20	25	30	35	40	45	25	30	35	40	45	50	30	35	40	45	50	55
P	1-5	1.0D	Vc m/min	83	83	83	83	75	75	75	84	84	84	84	76	76	89	89	89	89	89	80
			fz mm/tooth	0.029	0.029	0.029	0.025	0.025	0.022	0.022	0.041	0.041	0.041	0.035	0.035	0.031	0.049	0.049	0.049	0.042	0.042	0.041
			rpm obr/min	4403	4403	4403	4403	3979	3979	3979	3342	3342	3342	3342	3024	3024	2833	2833	2833	2833	2833	2546
			feed posuw mm/min	511	511	511	440	398	350	350	548	548	548	468	423	375	555	555	555	476	476	418
	6-8	1.0D	Vc m/min	83	83	83	83	75	75	75	84	84	84	84	76	76	89	89	89	89	89	80
			fz mm/tooth	0.029	0.029	0.029	0.025	0.025	0.022	0.022	0.041	0.041	0.041	0.035	0.035	0.031	0.049	0.049	0.049	0.042	0.042	0.041
			rpm obr/min	4403	4403	4403	4403	3979	3979	3979	3342	3342	3342	3342	3024	3024	2833	2833	2833	2833	2833	2546
			feed posuw mm/min	511	511	511	440	398	350	350	548	548	548	468	423	375	555	555	555	476	476	418
	9	1.0D	Vc m/min	48	48	48	48	43	43	43	48	48	48	48	43	43	52	52	52	52	52	46
			fz mm/tooth	0.021	0.021	0.021	0.018	0.018	0.016	0.016	0.028	0.028	0.028	0.024	0.024	0.021	0.033	0.033	0.033	0.028	0.028	0.028
			rpm obr/min	2546	2546	2546	2546	2281	2281	2281	1910	1910	1910	1910	1711	1711	1655	1655	1655	1655	1655	1464
			feed posuw mm/min	214	214	214	183	164	146	146	214	214	214	183	164	144	218	218	218	185	185	164
	10-11.1	1.0D	Vc m/min	83	83	83	83	75	75	75	84	84	84	84	76	76	89	89	89	89	89	80
			fz mm/tooth	0.029	0.029	0.029	0.025	0.025	0.022	0.022	0.041	0.041	0.041	0.035	0.035	0.031	0.049	0.049	0.049	0.042	0.042	0.041
			rpm obr/min	4403	4403	4403	4403	3979	3979	3979	3342	3342	3342	3342	3024	3024	2833	2833	2833	2833	2833	2546
			feed posuw mm/min	511	511	511	440	398	350	350	548	548	548	468	423	375	555	555	555	476	476	418
	11.2	1.0D	Vc m/min	48	48	48	48	43	43	43	48	48	48	48	43	43	52	52	52	52	52	46
			fz mm/tooth	0.021	0.021	0.021	0.018	0.018	0.016	0.016	0.028	0.028	0.028	0.024	0.024	0.021	0.033	0.033	0.033	0.028	0.028	0.028
			rpm obr/min	2546	2546	2546	2546	2281	2281	2281	1910	1910	1910	1910	1711	1711	1655	1655	1655	1655	1655	1464
			feed posuw mm/min	214	214	214	183	164	146	146	214	214	214	183	164	144	218	218	218	185	185	164
K	15-20	1.0D	Vc m/min	83	83	83	83	75	75	75	84	84	84	84	76	76	89	89	89	89	89	80
			fz mm/tooth	0.029	0.029	0.029	0.025	0.025	0.022	0.022	0.041	0.041	0.041	0.035	0.035	0.031	0.049	0.049	0.049	0.042	0.042	0.041
			rpm obr/min	4403	4403	4403	4403	3979	3979	3979	3342	3342	3342	3342	3024	3024	2833	2833	2833	2833	2833	2546
			feed posuw mm/min	511	511	511	440	398	350	350	548	548	548	468	423	375	555	555	555	476	476	418
H	38.1 - 38.2	1.0D	Vc m/min	31	31	31	31	28	28	28	32	32	32	32	28	28	32	32	32	32	32	29
			fz mm/tooth	0.017	0.017	0.017	0.014	0.014	0.013	0.013	0.022	0.022	0.022	0.018	0.019	0.017	0.027	0.027	0.027	0.022	0.022	0.023
			rpm obr/min	1645	1645	1645	1645	1485	1485	1485	1273	1273	1273	1273	1114	1114	1019	1019	1019	1019	1019	923
			feed posuw mm/min	112	112	112	92	83	77	77	112	112	112	92	85	76	110	110	110	90	90	85
	40	1.0D	Vc m/min	48	48	48	48	43	43	43	48	48	48	48	43	43	52	52	52	52	52	46
			fz mm/tooth	0.021	0.021	0.021	0.018	0.018	0.016	0.016	0.028	0.028	0.028	0.024	0.024	0.021	0.033	0.033	0.033	0.028	0.028	0.028
			rpm obr/min	2546	2546	2546	2546	2281	2281	2281	1910	1910	1910	1910	1711	1711	1655	1655	1655	1655	1655	1464
			feed posuw mm/min	214	214	214	183	164	146	146	214	214	214	183	164	144	218	218	218	185	185	164
	41	1.0D	Vc m/min	31	31	31	31	28	28	28	32	32	32	32	28	28	32	32	32	32	32	29
			fz mm/tooth	0.017	0.017	0.017	0.014	0.014	0.013	0.013	0.022	0.022	0.022	0.018	0.019	0.017	0.027	0.027	0.027	0.022	0.022	0.023
			rpm obr/min	1645	1645	1645	1645	1485	1485	1485	1273	1273	1273	1273	1114	1114	1019	1019	1019	1019	1019	923
			feed posuw mm/min	112	112	112	92	83	77	77	112	112	112	92	85	76	110	110	110	90	90	85

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKOIEM

ISO	VDI 3323	Ae mm	DC	10.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	14.0	14.0	16.0	16.0	16.0	16.0
			LOC	60	35	40	45	50	55	60	65	70	50	60	40	50	60	70
P	1-5	1.0D	Vc m/min	80	87	87	87	87	87	87	78	78	93	93	98	98	98	98
			fz mm/tooth	0.037	0.047	0.047	0.04	0.04	0.04	0.035	0.035	0.035	0.041	0.041	0.05	0.05	0.042	0.042
			rpm obr/min	2546	2308	2308	2308	2308	2308	2308	2069	2069	2114	2114	1950	1950	1950	1950
			feed posuw mm/min	377	434	434	369	369	369	323	290	290	347	347	390	390	328	328
	6-8	1.0D	Vc m/min	80	87	87	87	87	87	87	78	78	93	93	98	98	98	98
			fz mm/tooth	0.037	0.047	0.047	0.04	0.04	0.04	0.035	0.035	0.035	0.041	0.041	0.05	0.05	0.042	0.042
			rpm obr/min	2546	2308	2308	2308	2308	2308	2308	2069	2069	2114	2114	1950	1950	1950	1950
			feed posuw mm/min	377	434	434	369	369	369	323	290	290	347	347	390	390	328	328
	9	1.0D	Vc m/min	46	52	52	52	52	52	52	47	47	54	54	54	54	54	54
			fz mm/tooth	0.024	0.034	0.034	0.03	0.03	0.03	0.026	0.026	0.026	0.029	0.029	0.035	0.035	0.03	0.03
			rpm obr/min	1464	1379	1379	1379	1379	1379	1379	1247	1247	1228	1228	1074	1074	1074	1074
			feed posuw mm/min	141	188	188	166	166	166	143	130	130	142	142	150	150	129	129
	10-11.1	1.0D	Vc m/min	80	87	87	87	87	87	87	78	78	93	93	98	98	98	98
			fz mm/tooth	0.037	0.047	0.047	0.04	0.04	0.04	0.035	0.035	0.035	0.041	0.041	0.05	0.05	0.042	0.042
			rpm obr/min	2546	2308	2308	2308	2308	2308	2308	2069	2069	2114	2114	1950	1950	1950	1950
			feed posuw mm/min	377	434	434	369	369	369	323	290	290	347	347	390	390	328	328
	11.2	1.0D	Vc m/min	46	52	52	52	52	52	52	47	47	54	54	54	54	54	54
			fz mm/tooth	0.024	0.034	0.034	0.03	0.03	0.03	0.026	0.026	0.026	0.029	0.029	0.035	0.035	0.03	0.03
			rpm obr/min	1464	1379	1379	1379	1379	1379	1379	1247	1247	1228	1228	1074	1074	1074	1074
			feed posuw mm/min	141	188	188	166	166	166	143	130	130	142	142	150	150	129	129
K	15-20	1.0D	Vc m/min	80	87	87	87	87	87	87	78	78	93	93	98	98	98	98
			fz mm/tooth	0.037	0.047	0.047	0.04	0.04	0.04	0.035	0.035	0.035	0.041	0.041	0.05	0.05	0.042	0.042
			rpm obr/min	2546	2308	2308	2308	2308	2308	2308	2069	2069	2114	2114	1950	1950	1950	1950
			feed posuw mm/min	377	434	434	369	369	369	323	290	290	347	347	390	390	328	328
H	38.1 - 38.2	1.0D	Vc m/min	29	32	32	32	32	32	32	29	29	33	33	34	34	34	34
			fz mm/tooth	0.021	0.025	0.025	0.021	0.021	0.021	0.019	0.018	0.018	0.021	0.021	0.026	0.026	0.022	0.022
			rpm obr/min	923	849	849	849	849	849	849	769	769	750	750	676	676	676	676
			feed posuw mm/min	78	85	85	71	71	71	65	55	55	63	63	70	70	60	60
	40	1.0D	Vc m/min	46	52	52	52	52	52	52	47	47	54	54	54	54	54	54
			fz mm/tooth	0.024	0.034	0.034	0.03	0.03	0.03	0.026	0.026	0.026	0.029	0.029	0.035	0.035	0.03	0.03
			rpm obr/min	1464	1379	1379	1379	1379	1379	1379	1247	1247	1228	1228	1074	1074	1074	1074
			feed posuw mm/min	141	188	188	166	166	166	143	130	130	142	142	150	150	129	129
	41	1.0D	Vc m/min	29	32	32	32	32	32	32	29	29	33	33	34	34	34	34
			fz mm/tooth	0.021	0.025	0.025	0.021	0.021	0.021	0.019	0.018	0.018	0.021	0.021	0.026	0.026	0.022	0.022
			rpm obr/min	923	849	849	849	849	849	849	769	769	750	750	676	676	676	676
			feed posuw mm/min	78	85	85	71	71	71	65	55	55	63	63	70	70	60	60

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKOIEM

ISO	VDI 3323	Ae mm	DC	16.0	16.0	16.0	16.0	18.0	18.0	18.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	22.0	22.0	25.0	25.0	25.0	25.0
			LOC	80	90	110	120	50	70	100	50	60	70	80	90	110	120	75	110	70	90	110	120
P	1-5	1.0D	Vc m/min	98	88	88	88	95	95	85	89	89	89	89	89	80	80	87	87	86	86	86	86
			fz mm/tooth	0.037	0.037	0.037	0.037	0.049	0.042	0.037	0.048	0.048	0.041	0.041	0.036	0.036	0.036	0.041	0.036	0.049	0.042	0.042	0.036
			rpm obr/min	1950	1751	1751	1751	1680	1680	1503	1416	1416	1416	1416	1416	1273	1273	1259	1259	1095	1095	1095	1095
			feed posuw mm/min	289	259	259	259	329	282	222	272	272	232	232	204	183	183	206	181	215	184	184	158
	6-8	1.0D	Vc m/min	98	88	88	88	95	95	85	89	89	89	89	89	80	80	87	87	86	86	86	86
			fz mm/tooth	0.037	0.037	0.037	0.037	0.049	0.042	0.037	0.048	0.048	0.041	0.041	0.036	0.036	0.036	0.041	0.036	0.049	0.042	0.042	0.036
			rpm obr/min	1950	1751	1751	1751	1680	1680	1503	1416	1416	1416	1416	1416	1273	1273	1259	1259	1095	1095	1095	1095
			feed posuw mm/min	289	259	259	259	329	282	222	272	272	232	232	204	183	183	206	181	215	184	184	158
	9	1.0D	Vc m/min	54	48	48	48	53	53	48	52	52	52	52	52	46	46	57	57	64	64	64	64
			fz mm/tooth	0.027	0.026	0.026	0.026	0.035	0.029	0.025	0.034	0.034	0.027	0.027	0.024	0.026	0.026	0.027	0.024	0.034	0.027	0.027	0.024
			rpm obr/min	1074	955	955	955	937	937	849	828	828	828	828	828	732	732	825	825	815	815	815	815
			feed posuw mm/min	116	99	99	99	131	109	85	113	113	89	89	79	76	76	89	79	111	88	88	78
	10-11.1	1.0D	Vc m/min	98	88	88	88	95	95	85	89	89	89	89	89	80	80	87	87	86	86	86	86
			fz mm/tooth	0.037	0.037	0.037	0.037	0.049	0.042	0.037	0.048	0.048	0.041	0.041	0.036	0.036	0.036	0.041	0.036	0.049	0.042	0.042	0.036
			rpm obr/min	1950	1751	1751	1751	1680	1680	1503	1416	1416	1416	1416	1416	1273	1273	1259	1259	1095	1095	1095	1095
			feed posuw mm/min	289	259	259	259	329	282	222	272	272	232	232	204	183	183	206	181	215	184	184	158
	11.2	1.0D	Vc m/min	54	48	48	48	53	53	48	52	52	52	52	52	46	46	57	57	64	64	64	64
			fz mm/tooth	0.027	0.026	0.026	0.026	0.035	0.029	0.025	0.034	0.034	0.027	0.027	0.024	0.026	0.026	0.027	0.024	0.034	0.027	0.027	0.024
			rpm obr/min	1074	955	955	955	937	937	849	828	828	828	828	828	732	732	825	825	815	815	815	815
			feed posuw mm/min	116	99	99	99	131	109	85	113	113	89	89	79	76	76	89	79	111	88	88	78
K	15-20	1.0D	Vc m/min	98	88	88	88	95	95	85	89	89	89	89	89	80	80	87	87	86	86	86	86
			fz mm/tooth	0.037	0.037	0.037	0.037	0.049	0.042	0.037	0.048	0.048	0.041	0.041	0.036	0.036	0.036	0.041	0.036	0.049	0.042	0.042	0.036
			rpm obr/min	1950	1751	1751	1751	1680	1680	1503	1416	1416	1416	1416	1416	1273	1273	1259	1259	1095	1095	1095	1095
			feed posuw mm/min	289	259	259	259	329	282	222	272	272	232	232	204	183	183	206	181	215	184	184	158
H	38.1 - 38.2	1.0D	Vc m/min	34	30	30	30	33	33	30	31	31	31	31	31	28	28	35	35	39	39	39	39
			fz mm/tooth	0.021	0.021	0.021	0.021	0.028	0.023	0.021	0.028	0.028	0.023	0.023	0.02	0.019	0.019	0.023	0.02	0.028	0.023	0.023	0.02
			rpm obr/min	676	597	597	597	584	584	531	493	493	493	493	493	446	446	506	506	497	497	497	497
			feed posuw mm/min	57	50	50	50	65	54	45	55	55	45	45	39	34	34	47	41	56	46	46	40
	40	1.0D	Vc m/min	54	48	48	48	53	53	48	52	52	52	52	52	46	46	57	57	64	64	64	64
			fz mm/tooth	0.027	0.026	0.026	0.026	0.035	0.029	0.025	0.034	0.034	0.027	0.027	0.024	0.026	0.026	0.027	0.024	0.034	0.027	0.027	0.024
			rpm obr/min	1074	955	955	955	937	937	849	828	828	828	828	828	732	732	825	825	815	815	815	815
			feed posuw mm/min	116	99	99	99	131	109	85	113	113	89	89	79	76	76	89	79	111	88	88	78
	41	1.0D	Vc m/min	34	30	30	30	33	33	30	31	31	31	31	31	28	28	35	35	39	39	39	39
			fz mm/tooth	0.021	0.021	0.021	0.021	0.028	0.023	0.021	0.028	0.028	0.023	0.023	0.02	0.019	0.019	0.023	0.02	0.028	0.023	0.023	0.02
			rpm obr/min	676	597	597	597	584	584	531	493	493	493	493	493	446	446	506	506	497	497	497	497
			feed posuw mm/min	57	50	50	50	65	54	45	55	55	45	45	39	34	34	47	41	56	46	46	40

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX74

4 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFX74

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S								H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX7403006000A045100	3	6	4,5	10	50	2,85
UFX7403006000A045120	3	6	4,5	12	50	2,85
UFX7403006000A045140	3	6	4,5	14	60	2,85
UFX7403006000A045160	3	6	4,5	16	60	2,85
UFX7403006000A045180	3	6	4,5	18	60	2,85
UFX7403006000A045200	3	6	4,5	20	60	2,85
UFX7403006000A045220	3	6	4,5	22	65	2,85
UFX7403006000A045260	3	6	4,5	26	65	2,85
UFX7403006000A045300	3	6	4,5	30	70	2,85
UFX7403006000A045350	3	6	4,5	35	70	2,85
UFX7403006000A045400	3	6	4,5	40	80	2,85
UFX7403006000A045450	3	6	4,5	45	90	2,85
UFX7403006000A045500	3	6	4,5	50	100	2,85
UFX7403006000A045600	3	6	4,5	60	100	2,85
UFX7404006000A060080	4	6	6	8	50	3,85
UFX7404006000A060100	4	6	6	10	50	3,85
UFX7404006000A060120	4	6	6	12	50	3,85
UFX7404006000A060140	4	6	6	14	60	3,85
UFX7404006000A060160	4	6	6	16	60	3,85
UFX7404006000A060180	4	6	6	18	60	3,85
UFX7404006000A060200	4	6	6	20	60	3,85
UFX7404006000A060220	4	6	6	22	65	3,85
UFX7404006000A060250	4	6	6	25	65	3,85
UFX7404006000A060260	4	6	6	26	65	3,85
UFX7404006000A060300	4	6	6	30	70	3,85
UFX7404006000A060350	4	6	6	35	70	3,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX74

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S								H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LLU	OAL	DN
UFX7404006000A060400	4	6	6	40	80	3,85
UFX7404006000A060450	4	6	6	45	90	3,85
UFX7404006000A060500	4	6	6	50	100	3,85
UFX7404006000A060600	4	6	6	60	100	3,85
UFX7405006000A080160	5	6	8	16	60	4,85
UFX7405006000A080200	5	6	8	20	60	4,85
UFX7405006000A080260	5	6	8	26	65	4,85
UFX7405006000A080300	5	6	8	30	70	4,85
UFX7405006000A080350	5	6	8	35	75	4,85
UFX7405006000A080400	5	6	8	40	80	4,85
UFX7405006000A080500	5	6	8	50	90	4,85
UFX7405006000A080600	5	6	8	60	100	4,85
UFX7406006000A090150	6	6	9	15	60	5,85
UFX7406006000A090200	6	6	9	20	60	5,85
UFX7406006000A090300	6	6	9	30	70	5,85
UFX7406006000A090320	6	6	9	32	90	5,85
UFX7408008000A120250	8	8	12	25	70	7,7
UFX7408008000A120300	8	8	12	30	80	7,7
UFX7408008000A120420	8	8	12	42	100	7,7
UFX7410010000A150300	10	10	15	30	75	9,7
UFX7410010000A150350	10	10	15	35	80	9,7
UFX7410010000A150450	10	10	15	45	100	9,7
UFX7412012000A200350	12	12	20	35	80	11,7
UFX7412012000A200400	12	12	20	40	90	11,7
UFX7412012000A200500	12	12	20	50	110	11,7

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	DC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			LBS	2	3	4	5	6	7	8	10	12	14	16	18	20	22	26	30	40
P	1-5	1.0D	Vc m/min	69	69	69	69	62	62	62	62	55	55	41	41	41	21	21	21	7
			fz mm/tooth	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	21963	21963	21963	21963	19735	19735	19735	19735	17507	17507	13051	13051	13051	6685	6685	6685	2228
			feed posuw mm/min	351	351	351	351	237	237	237	237	210	210	104	104	104	53	53	53	18
			Ae mm	0.021	0.021	0.015	0.015	0.008	0.008	0.008	0.005	0.005	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
	6-8	1.0D	Vc m/min	69	69	69	69	62	62	62	62	55	55	41	41	41	21	21	21	7
			fz mm/tooth	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	21963	21963	21963	21963	19735	19735	19735	19735	17507	17507	13051	13051	13051	6685	6685	6685	2228
			feed posuw mm/min	351	351	351	351	237	237	237	237	210	210	104	104	104	53	53	53	18
			Ae mm	0.021	0.021	0.015	0.015	0.008	0.008	0.008	0.005	0.005	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
	9	1.0D	Vc m/min	42	42	42	42	38	38	38	38	34	34	25	25	25	13	13	13	4
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	13369	13369	13369	13369	12096	12096	12096	12096	10823	10823	7958	7958	7958	4138	4138	4138	1273
			feed posuw mm/min	160	160	160	160	145	145	145	145	130	130	64	64	64	33	33	33	10
			Ae mm	0.016	0.016	0.011	0.011	0.006	0.006	0.006	0.004	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	10-11.1	1.0D	Vc m/min	69	69	69	69	62	62	62	62	55	55	41	41	41	21	21	21	7
			fz mm/tooth	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	21963	21963	21963	21963	19735	19735	19735	19735	17507	17507	13051	13051	13051	6685	6685	6685	2228
			feed posuw mm/min	351	351	351	351	237	237	237	237	210	210	104	104	104	53	53	53	18
			Ae mm	0.021	0.021	0.015	0.015	0.008	0.008	0.008	0.005	0.005	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
	11.2	1.0D	Vc m/min	42	42	42	42	38	38	38	38	34	34	25	25	25	13	13	13	4
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	13369	13369	13369	13369	12096	12096	12096	12096	10823	10823	7958	7958	7958	4138	4138	4138	1273
			feed posuw mm/min	160	160	160	160	145	145	145	145	130	130	64	64	64	33	33	33	10
			Ae mm	0.016	0.016	0.011	0.011	0.006	0.006	0.006	0.004	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
K	15-20	1.0D	Vc m/min	69	69	69	69	62	62	62	62	55	55	41	41	41	21	21	21	7
			fz mm/tooth	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	21963	21963	21963	21963	19735	19735	19735	19735	17507	17507	13051	13051	13051	6685	6685	6685	2228
			feed posuw mm/min	351	351	351	351	237	237	237	237	210	210	104	104	104	53	53	53	18
			Ae mm	0.021	0.021	0.015	0.015	0.008	0.008	0.008	0.005	0.005	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
H	38.1 - 38.2	1.0D	Vc m/min	27	27	27	27	24	24	24	24	21	21	16	16	16	8	8	8	3
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
			rpm obr/min	8594	8594	8594	8594	7639	7639	7639	7639	6685	6685	5093	5093	5093	2546	2546	2546	955
			feed posuw mm/min	34	34	34	34	31	31	31	31	27	27	20	20	20	10	10	10	4
			Ae mm	0.013	0.013	0.009	0.009	0.005	0.005	0.005	0.003	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
	40	1.0D	Vc m/min	42	42	42	42	38	38	38	38	34	34	25	25	25	13	13	13	4
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
			rpm obr/min	13369	13369	13369	13369	12096	12096	12096	12096	10823	10823	7958	7958	7958	4138	4138	4138	1273
			feed posuw mm/min	160	160	160	160	145	145	145	145	130	130	64	64	64	33	33	33	10
			Ae mm	0.016	0.016	0.011	0.011	0.006	0.006	0.006	0.004	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	41	1.0D	Vc m/min	27	27	27	27	24	24	24	24	21	21	16	16	16	8	8	8	3
			fz mm/tooth	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
			rpm obr/min	8594	8594	8594	8594	7639	7639	7639	7639	6685	6685	5093	5093	5093	2546	2546	2546	955
			feed posuw mm/min	34	34	34	34	31	31	31	31	27	27	20	20	20	10	10	10	4
			Ae mm	0.013	0.013	0.009	0.009	0.005	0.005	0.005	0.003	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	DC	1.0	1.2	1.2	1.2	1.2	1.2	1.2	12	1.2	1.2	1.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	15	1.5
			LBS	50	4	6	8	10	12	14	16	20	26	30	4	5	6	7	8	10	12	14	16	18	20
P	1-5	1.0D	Vc m/min	7	74	74	66	66	66	59	59	44	22	22	80	80	80	80	72	72	72	72	64	64	64
			fz mm/tooth	0.002	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	2228	19629	19629	17507	17507	17507	15650	15650	11671	5836	5836	16977	16977	16977	16977	15279	15279	15279	15279	13581	13581	13581
			feed posuw mm/min	18	314	314	280	280	280	188	188	140	47	47	340	340	340	340	244	244	244	244	217	217	217
			Ae mm	0.002	0.018	0.018	0.01	0.006	0.006	0.006	0.004	0.003	0.003	0.003	0.032	0.022	0.022	0.022	0.013	0.013	0.013	0.008	0.008	0.008	0.005
	6-8	1.0D	Vc m/min	7	74	74	66	66	66	59	59	44	22	22	80	80	80	80	72	72	72	72	64	64	64
			fz mm/tooth	0.002	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	2228	19629	19629	17507	17507	17507	15650	15650	11671	5836	5836	16977	16977	16977	16977	15279	15279	15279	15279	13581	13581	13581
			feed posuw mm/min	18	314	314	280	280	280	188	188	140	47	47	340	340	340	340	244	244	244	244	217	217	217
			Ae mm	0.002	0.018	0.018	0.01	0.006	0.006	0.006	0.004	0.003	0.003	0.003	0.032	0.022	0.022	0.022	0.013	0.013	0.013	0.008	0.008	0.008	0.005
	9	1.0D	Vc m/min	4	46	46	41	41	41	36	36	27	14	14	50	50	50	50	45	45	45	45	40	40	40
			fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	1273	12202	12202	10876	10876	10876	9549	9549	7162	3714	3714	10610	10610	10610	10610	9549	9549	9549	9549	8488	8488	8488
			feed posuw mm/min	10	195	195	131	131	131	115	115	86	30	30	170	170	170	170	153	153	153	153	136	136	136
			Ae mm	0.002	0.013	0.013	0.008	0.005	0.005	0.005	0.003	0.002	0.002	0.002	0.024	0.017	0.017	0.017	0.009	0.009	0.009	0.006	0.006	0.006	0.004
	10-11.1	1.0D	Vc m/min	7	74	74	66	66	66	59	59	44	22	22	80	80	80	80	72	72	72	72	64	64	64
			fz mm/tooth	0.002	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	2228	19629	19629	17507	17507	17507	15650	15650	11671	5836	5836	16977	16977	16977	16977	15279	15279	15279	15279	13581	13581	13581
			feed posuw mm/min	18	314	314	280	280	280	188	188	140	47	47	340	340	340	340	244	244	244	244	217	217	217
			Ae mm	0.002	0.018	0.018	0.01	0.006	0.006	0.006	0.004	0.003	0.003	0.003	0.032	0.022	0.022	0.022	0.013	0.013	0.013	0.008	0.008	0.008	0.005
	11.2	1.0D	Vc m/min	4	46	46	41	41	41	36	36	27	14	14	50	50	50	50	45	45	45	45	40	40	40
			fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	1273	12202	12202	10876	10876	10876	9549	9549	7162	3714	3714	10610	10610	10610	10610	9549	9549	9549	9549	8488	8488	8488
			feed posuw mm/min	10	195	195	131	131	131	115	115	86	30	30	170	170	170	170	153	153	153	153	136	136	136
			Ae mm	0.002	0.013	0.013	0.008	0.005	0.005	0.005	0.003	0.002	0.002	0.002	0.024	0.017	0.017	0.017	0.009	0.009	0.009	0.006	0.006	0.006	0.004
K	15-20	1.0D	Vc m/min	7	74	74	66	66	66	59	59	44	22	22	80	80	80	80	72	72	72	72	64	64	64
			fz mm/tooth	0.002	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	2228	19629	19629	17507	17507	17507	15650	15650	11671	5836	5836	16977	16977	16977	16977	15279	15279	15279	15279	13581	13581	13581
			feed posuw mm/min	18	314	314	280	280	280	188	188	140	47	47	340	340	340	340	244	244	244	244	217	217	217
			Ae mm	0.002	0.018	0.018	0.01	0.006	0.006	0.006	0.004	0.003	0.003	0.003	0.032	0.022	0.022	0.022	0.013	0.013	0.013	0.008	0.008	0.008	0.005
H	38.1 - 38.2	1.0D	Vc m/min	3	28	28	25	25	25	23	23	17	8	8	31	31	31	31	28	28	28	28	25	25	25
			fz mm/tooth	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001
			rpm obr/min	955	7427	7427	6631	6631	6631	6101	6101	4509	2122	2122	6578	6578	6578	6578	5942	5942	5942	5942	5305	5305	5305
			feed posuw mm/min	4	59	59	27	27	27	24	24	18	8	8	53	53	53	53	48	48	48	48	21	21	21
			Ae mm	0.001	0.011	0.011	0.006	0.004	0.004	0.004	0.002	0.002	0.002	0.002	0.019	0.013	0.013	0.013	0.008	0.008	0.008	0.005	0.005	0.005	0.003
	40	1.0D	Vc m/min	4	46	46	41	41	41	36	36	27	14	14	50	50	50	50	45	45	45	45	40	40	40
			fz mm/tooth	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	1273	12202	12202	10876	10876	10876	9549	9549	7162	3714	3714	10610	10610	10610	10610	9549	9549	9549	9549	8488	8488	8488
			feed posuw mm/min	10	195	195	131	131	131	115	115	86	30	30	170	170	170	170	153	153	153	153	136	136	136
			Ae mm	0.002	0.013	0.013	0.008	0.005	0.005	0.005	0.003	0.002	0.002	0.002	0.024	0.017	0.017	0.017	0.009	0.009	0.009	0.006	0.006	0.006	0.004
	41	1.0D	Vc m/min	3	28	28	25	25	25	23	23	17	8	8	31	31	31	31	28	28	28	28	25	25	25
			fz mm/tooth	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001
			rpm obr/min	955	7427	7427	6631	6631	6631	6101	6101	4509	2122	2122	6578	6578	6578	6578	5942	5942	5942	5942	5305	5305	5305
			feed posuw mm/min	4	59	59	27	27	27	24	24	18	8	8	53	53	53	53	48	48	48	48	21	21	21
			Ae mm	0.001	0.011	0.011	0.006	0.004	0.004	0.004	0.002	0.002	0.002	0.002	0.019	0.013	0.013	0.013	0.008	0.008	0.008	0.005	0.005	0.005	0.003

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	DC	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.5
			LBS	22	26	30	6	8	10	12	16	18	20	22	26	30	35	40	45	50	60	8	10
P	1-5	1.0D	Vc m/min	64	48	48	87	87	87	79	79	79	79	70	70	70	52	52	26	26	26	94	94
			fz mm/tooth	0.004	0.003	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.007	0.007
			rpm obr/min	13581	10186	10186	13846	13846	13846	12573	12573	12573	12573	11141	11141	11141	8276	8276	4138	4138	4138	11968	11968
			feed posuw mm/min	217	122	122	332	332	332	251	251	251	251	223	223	223	132	132	66	66	66	335	335
			Ae mm	0.005	0.003	0.003	0.042	0.029	0.029	0.017	0.017	0.011	0.011	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.004	0.037	0.037
	6-8	1.0D	Vc m/min	64	48	48	87	87	87	79	79	79	79	70	70	70	52	52	26	26	26	94	94
			fz mm/tooth	0.004	0.003	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.007	0.007
			rpm obr/min	13581	10186	10186	13846	13846	13846	12573	12573	12573	12573	11141	11141	11141	8276	8276	4138	4138	4138	11968	11968
			feed posuw mm/min	217	122	122	332	332	332	251	251	251	251	223	223	223	132	132	66	66	66	335	335
			Ae mm	0.005	0.003	0.003	0.042	0.029	0.029	0.017	0.017	0.011	0.011	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.004	0.037	0.037
	9	1.0D	Vc m/min	40	30	30	57	57	57	51	51	51	51	46	46	46	34	34	17	17	17	60	60
			fz mm/tooth	0.004	0.003	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.007	0.007
			rpm obr/min	8488	6366	6366	9072	9072	9072	8117	8117	8117	8117	7321	7321	7321	5411	5411	2706	2706	2706	7639	7639
			feed posuw mm/min	136	76	76	218	218	218	162	162	162	162	117	117	117	87	87	32	32	32	214	214
			Ae mm	0.004	0.002	0.002	0.032	0.022	0.022	0.013	0.013	0.008	0.008	0.008	0.008	0.005	0.003	0.003	0.003	0.003	0.003	0.028	0.028
	10-11.1	1.0D	Vc m/min	64	48	48	87	87	87	79	79	79	79	70	70	70	52	52	26	26	26	94	94
			fz mm/tooth	0.004	0.003	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.007	0.007
			rpm obr/min	13581	10186	10186	13846	13846	13846	12573	12573	12573	12573	11141	11141	11141	8276	8276	4138	4138	4138	11968	11968
			feed posuw mm/min	217	122	122	332	332	332	251	251	251	251	223	223	223	132	132	66	66	66	335	335
			Ae mm	0.005	0.003	0.003	0.042	0.029	0.029	0.017	0.017	0.011	0.011	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.004	0.037	0.037
	11.2	1.0D	Vc m/min	40	30	30	57	57	57	51	51	51	51	46	46	46	34	34	17	17	17	60	60
			fz mm/tooth	0.004	0.003	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.007	0.007
			rpm obr/min	8488	6366	6366	9072	9072	9072	8117	8117	8117	8117	7321	7321	7321	5411	5411	2706	2706	2706	7639	7639
			feed posuw mm/min	136	76	76	218	218	218	162	162	162	162	117	117	117	87	87	32	32	32	214	214
			Ae mm	0.004	0.002	0.002	0.032	0.022	0.022	0.013	0.013	0.008	0.008	0.008	0.008	0.005	0.003	0.003	0.003	0.003	0.003	0.028	0.028
K	15-20	1.0D	Vc m/min	64	48	48	87	87	87	79	79	79	79	70	70	70	52	52	26	26	26	94	94
			fz mm/tooth	0.004	0.003	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.007	0.007
			rpm obr/min	13581	10186	10186	13846	13846	13846	12573	12573	12573	12573	11141	11141	11141	8276	8276	4138	4138	4138	11968	11968
			feed posuw mm/min	217	122	122	332	332	332	251	251	251	251	223	223	223	132	132	66	66	66	335	335
			Ae mm	0.005	0.003	0.003	0.042	0.029	0.029	0.017	0.017	0.011	0.011	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.004	0.037	0.037
H	38.1 - 38.2	1.0D	Vc m/min	25	18	18	38	38	38	34	34	34	34	30	30	30	23	23	11	11	11	35	35
			fz mm/tooth	0.001	0.001	0.001	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.003	0.003
			rpm obr/min	5305	3820	3820	6048	6048	6048	5411	5411	5411	5411	4775	4775	4775	3661	3661	1751	1751	1751	4456	4456
			feed posuw mm/min	21	15	15	73	73	73	43	43	43	43	38	38	38	29	29	7	7	7	53	53
			Ae mm	0.003	0.002	0.002	0.025	0.018	0.018	0.01	0.01	0.006	0.006	0.006	0.006	0.004	0.003	0.003	0.003	0.003	0.003	0.022	0.022
	40	1.0D	Vc m/min	40	30	30	57	57	57	51	51	51	51	46	46	46	34	34	17	17	17	60	60
			fz mm/tooth	0.004	0.003	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.007	0.007
			rpm obr/min	8488	6366	6366	9072	9072	9072	8117	8117	8117	8117	7321	7321	7321	5411	5411	2706	2706	2706	7639	7639
			feed posuw mm/min	136	76	76	218	218	218	162	162	162	162	117	117	117	87	87	32	32	32	214	214
			Ae mm	0.004	0.002	0.002	0.032	0.022	0.022	0.013	0.013	0.008	0.008	0.008	0.008	0.005	0.003	0.003	0.003	0.003	0.003	0.028	0.028
	41	1.0D	Vc m/min	25	18	18	38	38	38	34	34	34	34	30	30	30	23	23	11	11	11	35	35
			fz mm/tooth	0.001	0.001	0.001	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.003	0.003
			rpm obr/min	5305	3820	3820	6048	6048	6048	5411	5411	5411	5411	4775	4775	4775	3661	3661	1751	1751	1751	4456	4456
			feed posuw mm/min	21	15	15	73	73	73	43	43	43	43	38	38	38	29	29	7	7	7	53	53
			Ae mm	0.003	0.002	0.002	0.025	0.018	0.018	0.01	0.01	0.006	0.006	0.006	0.006	0.004	0.003	0.003	0.003	0.003	0.003	0.022	0.022

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	DC	2.5	2.5	2.5	2.5	2.5	2.5	2.5	25	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
			LBS	12	14	16	18	20	22	26	30	35	40	45	50	6	8	10	12	14	16	18	20	22	26
P	1-5	1.0D	Vc m/min	94	85	85	85	85	85	75	75	75	57	57	57	101	101	101	101	101	91	91	91	91	91
			fz mm/tooth	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008
			rpm obr/min	11968	10823	10823	10823	10823	10823	9549	9549	9549	7257	7257	7257	10716	10716	10716	10716	10716	9655	9655	9655	9655	9655
			feed posuw mm/min	335	303	303	303	303	303	229	229	229	145	145	145	386	386	386	386	386	309	309	309	309	309
			Ae mm	0.037	0.021	0.021	0.021	0.021	0.013	0.013	0.013	0.008	0.008	0.005	0.005	0.063	0.063	0.044	0.044	0.044	0.025	0.025	0.025	0.025	0.016
	6-8	1.0D	Vc m/min	94	85	85	85	85	85	75	75	75	57	57	57	101	101	101	101	101	91	91	91	91	91
			fz mm/tooth	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008
			rpm obr/min	11968	10823	10823	10823	10823	10823	9549	9549	9549	7257	7257	7257	10716	10716	10716	10716	10716	9655	9655	9655	9655	9655
			feed posuw mm/min	335	303	303	303	303	303	229	229	229	145	145	145	386	386	386	386	386	309	309	309	309	309
			Ae mm	0.037	0.021	0.021	0.021	0.021	0.013	0.013	0.013	0.008	0.008	0.005	0.005	0.063	0.063	0.044	0.044	0.044	0.025	0.025	0.025	0.025	0.016
	9	1.0D	Vc m/min	60	54	54	54	54	54	48	48	48	36	36	36	63	63	63	63	63	57	57	57	57	57
			fz mm/tooth	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008
			rpm obr/min	7639	6875	6875	6875	6875	6875	6112	6112	6112	4584	4584	4584	6685	6685	6685	6685	6685	6048	6048	6048	6048	6048
			feed posuw mm/min	214	193	193	193	193	193	147	147	147	92	92	92	241	241	241	241	241	194	194	194	194	194
			Ae mm	0.028	0.016	0.016	0.016	0.016	0.01	0.01	0.01	0.006	0.006	0.004	0.004	0.047	0.047	0.033	0.033	0.033	0.019	0.019	0.019	0.019	0.012
	10-11.1	1.0D	Vc m/min	94	85	85	85	85	85	75	75	75	57	57	57	101	101	101	101	101	91	91	91	91	91
			fz mm/tooth	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008
			rpm obr/min	11968	10823	10823	10823	10823	10823	9549	9549	9549	7257	7257	7257	10716	10716	10716	10716	10716	9655	9655	9655	9655	9655
			feed posuw mm/min	335	303	303	303	303	303	229	229	229	145	145	145	386	386	386	386	386	309	309	309	309	309
			Ae mm	0.037	0.021	0.021	0.021	0.021	0.013	0.013	0.013	0.008	0.008	0.005	0.005	0.063	0.063	0.044	0.044	0.044	0.025	0.025	0.025	0.025	0.016
	11.2	1.0D	Vc m/min	60	54	54	54	54	54	48	48	48	36	36	36	63	63	63	63	63	57	57	57	57	57
			fz mm/tooth	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008
			rpm obr/min	7639	6875	6875	6875	6875	6875	6112	6112	6112	4584	4584	4584	6685	6685	6685	6685	6685	6048	6048	6048	6048	6048
			feed posuw mm/min	214	193	193	193	193	193	147	147	147	92	92	92	241	241	241	241	241	194	194	194	194	194
			Ae mm	0.028	0.016	0.016	0.016	0.016	0.01	0.01	0.01	0.006	0.006	0.004	0.004	0.047	0.047	0.033	0.033	0.033	0.019	0.019	0.019	0.019	0.012
K	15-20	1.0D	Vc m/min	94	85	85	85	85	85	75	75	75	57	57	57	101	101	101	101	101	91	91	91	91	91
			fz mm/tooth	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008
			rpm obr/min	11968	10823	10823	10823	10823	10823	9549	9549	9549	7257	7257	7257	10716	10716	10716	10716	10716	9655	9655	9655	9655	9655
			feed posuw mm/min	335	303	303	303	303	303	229	229	229	145	145	145	386	386	386	386	386	309	309	309	309	309
			Ae mm	0.037	0.021	0.021	0.021	0.021	0.013	0.013	0.013	0.008	0.008	0.005	0.005	0.063	0.063	0.044	0.044	0.044	0.025	0.025	0.025	0.025	0.016
H	38.1 - 38.2	1.0D	Vc m/min	35	32	32	32	32	32	28	28	28	21	21	21	38	38	38	38	38	34	34	34	34	34
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	4456	4074	4074	4074	4074	4074	3565	3565	3565	2674	2674	2674	4032	4032	4032	4032	4032	3608	3608	3608	3608	3608
			feed posuw mm/min	53	49	49	49	49	49	43	43	43	21	21	21	65	65	65	65	65	58	58	58	58	58
			Ae mm	0.022	0.013	0.013	0.013	0.013	0.008	0.008	0.008	0.005	0.005	0.003	0.003	0.038	0.038	0.026	0.026	0.026	0.015	0.015	0.015	0.015	0.009
	40	1.0D	Vc m/min	60	54	54	54	54	54	48	48	48	36	36	36	63	63	63	63	63	57	57	57	57	57
			fz mm/tooth	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008
			rpm obr/min	7639	6875	6875	6875	6875	6875	6112	6112	6112	4584	4584	4584	6685	6685	6685	6685	6685	6048	6048	6048	6048	6048
			feed posuw mm/min	214	193	193	193	193	193	147	147	147	92	92	92	241	241	241	241	241	194	194	194	194	194
			Ae mm	0.028	0.016	0.016	0.016	0.016	0.01	0.01	0.01	0.006	0.006	0.004	0.004	0.047	0.047	0.033	0.033	0.033	0.019	0.019	0.019	0.019	0.012
	41	1.0D	Vc m/min	35	32	32	32	32	32	28	28	28	21	21	21	38	38	38	38	38	34	34	34	34	34
			fz mm/tooth	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	4456	4074	4074	4074	4074	4074	3565	3565	3565	2674	2674	2674	4032	4032	4032	4032	4032	3608	3608	3608	3608	3608
			feed posuw mm/min	53	49	49	49	49	49	43	43	43	21	21	21	65	65	65	65	65	58	58	58	58	58
			Ae mm	0.022	0.013	0.013	0.013	0.013	0.008	0.008	0.008	0.005	0.005	0.003	0.003	0.038	0.038	0.026	0.026	0.026	0.015	0.015	0.015	0.015	0.009

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	DC	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
			LBS	30	35	40	45	50	60	8	10	12	14	16	18	20	22	26	30	35	40	45	50
P	1-5	1.0D	Vc m/min	91	81	81	81	61	61	114	114	114	114	114	114	114	103	103	103	103	103	91	91
			fz mm/tooth	0.008	0.007	0.007	0.007	0.006	0.006	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015
			rpm obr/min	9655	8594	8594	8594	6472	6472	9072	9072	9072	9072	9072	9072	9072	8196	8196	8196	8196	8196	7242	7242
			feed posuw mm/min	309	241	241	241	155	155	689	689	689	689	689	689	689	557	557	557	557	557	434	434
			Ae mm	0.016	0.016	0.009	0.009	0.006	0.006	0.084	0.084	0.084	0.059	0.059	0.059	0.059	0.034	0.034	0.034	0.021	0.021	0.021	0.021
	6-8	1.0D	Vc m/min	91	81	81	81	61	61	114	114	114	114	114	114	114	103	103	103	103	103	91	91
			fz mm/tooth	0.008	0.007	0.007	0.007	0.006	0.006	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015
			rpm obr/min	9655	8594	8594	8594	6472	6472	9072	9072	9072	9072	9072	9072	9072	8196	8196	8196	8196	8196	7242	7242
			feed posuw mm/min	309	241	241	241	155	155	689	689	689	689	689	689	689	557	557	557	557	557	434	434
			Ae mm	0.016	0.016	0.009	0.009	0.006	0.006	0.084	0.084	0.084	0.059	0.059	0.059	0.059	0.034	0.034	0.034	0.021	0.021	0.021	0.021
	9	1.0D	Vc m/min	57	50	50	50	38	38	70	70	70	70	70	70	70	63	63	63	63	63	56	56
			fz mm/tooth	0.008	0.007	0.007	0.007	0.006	0.006	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015
			rpm obr/min	6048	5305	5305	5305	4032	4032	5570	5570	5570	5570	5570	5570	5570	5013	5013	5013	5013	5013	4456	4456
			feed posuw mm/min	194	149	149	149	97	97	423	423	423	423	423	423	423	341	341	341	341	341	267	267
			Ae mm	0.012	0.012	0.007	0.007	0.005	0.005	0.063	0.063	0.063	0.044	0.044	0.044	0.044	0.025	0.025	0.025	0.016	0.016	0.016	0.016
	10-11.1	1.0D	Vc m/min	91	81	81	81	61	61	114	114	114	114	114	114	114	103	103	103	103	103	91	91
			fz mm/tooth	0.008	0.007	0.007	0.007	0.006	0.006	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015
			rpm obr/min	9655	8594	8594	8594	6472	6472	9072	9072	9072	9072	9072	9072	9072	8196	8196	8196	8196	8196	7242	7242
			feed posuw mm/min	309	241	241	241	155	155	689	689	689	689	689	689	689	557	557	557	557	557	434	434
			Ae mm	0.016	0.016	0.009	0.009	0.006	0.006	0.084	0.084	0.084	0.059	0.059	0.059	0.059	0.034	0.034	0.034	0.021	0.021	0.021	0.021
	11.2	1.0D	Vc m/min	57	50	50	50	38	38	70	70	70	70	70	70	70	63	63	63	63	63	56	56
			fz mm/tooth	0.008	0.007	0.007	0.007	0.006	0.006	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015
			rpm obr/min	6048	5305	5305	5305	4032	4032	5570	5570	5570	5570	5570	5570	5570	5013	5013	5013	5013	5013	4456	4456
			feed posuw mm/min	194	149	149	149	97	97	423	423	423	423	423	423	423	341	341	341	341	341	267	267
			Ae mm	0.012	0.012	0.007	0.007	0.005	0.005	0.063	0.063	0.063	0.044	0.044	0.044	0.044	0.025	0.025	0.025	0.016	0.016	0.016	0.016
K	15-20	1.0D	Vc m/min	91	81	81	81	61	61	114	114	114	114	114	114	114	103	103	103	103	103	91	91
			fz mm/tooth	0.008	0.007	0.007	0.007	0.006	0.006	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015
			rpm obr/min	9655	8594	8594	8594	6472	6472	9072	9072	9072	9072	9072	9072	9072	8196	8196	8196	8196	8196	7242	7242
			feed posuw mm/min	309	241	241	241	155	155	689	689	689	689	689	689	689	557	557	557	557	557	434	434
			Ae mm	0.016	0.016	0.009	0.009	0.006	0.006	0.084	0.084	0.084	0.059	0.059	0.059	0.059	0.034	0.034	0.034	0.021	0.021	0.021	0.021
H	38.1 - 38.2	1.0D	Vc m/min	34	30	30	30	23	23	44	44	44	44	44	44	44	40	40	40	40	40	35	35
			fz mm/tooth	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	3608	3183	3183	3183	2440	2440	3501	3501	3501	3501	3501	3501	3501	3183	3183	3183	3183	3183	2785	2785
			feed posuw mm/min	58	38	38	38	29	29	70	70	70	70	70	70	70	51	51	51	51	51	45	45
			Ae mm	0.009	0.009	0.006	0.006	0.004	0.004	0.05	0.05	0.05	0.035	0.035	0.035	0.035	0.02	0.02	0.02	0.013	0.013	0.013	0.013
	40	1.0D	Vc m/min	57	50	50	50	38	38	70	70	70	70	70	70	70	63	63	63	63	63	56	56
			fz mm/tooth	0.008	0.007	0.007	0.007	0.006	0.006	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.017	0.015	0.015
			rpm obr/min	6048	5305	5305	5305	4032	4032	5570	5570	5570	5570	5570	5570	5570	5013	5013	5013	5013	5013	4456	4456
			feed posuw mm/min	194	149	149	149	97	97	423	423	423	423	423	423	423	341	341	341	341	341	267	267
			Ae mm	0.012	0.012	0.007	0.007	0.005	0.005	0.063	0.063	0.063	0.044	0.044	0.044	0.044	0.025	0.025	0.025	0.016	0.016	0.016	0.016
	41	1.0D	Vc m/min	34	30	30	30	23	23	44	44	44	44	44	44	44	40	40	40	40	40	35	35
			fz mm/tooth	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
			rpm obr/min	3608	3183	3183	3183	2440	2440	3501	3501	3501	3501	3501	3501	3501	3183	3183	3183	3183	3183	2785	2785
			feed posuw mm/min	58	38	38	38	29	29	70	70	70	70	70	70	70	51	51	51	51	51	45	45
			Ae mm	0.009	0.009	0.006	0.006	0.004	0.004	0.05	0.05	0.05	0.035	0.035	0.035	0.035	0.02	0.02	0.02	0.013	0.013	0.013	0.013

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	DC	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	10.0	10.0	10.0	12.0	12.0	12.0
			LBS	60	16	20	26	30	35	40	50	60	15	20	30	32	25	30	42	30	35	45	35	40	50
P	1-5	1.0D	Vc m/min	91	119	119	107	107	107	107	107	95	126	126	126	113	127	127	114	123	123	123	124	124	124
			fz mm/tooth	0.015	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.03	0.03	0.03	0.027	0.042	0.042	0.038	0.047	0.047	0.047	0.047	0.047	0.047
			rpm obr/min	7242	7576	7576	6812	6812	6812	6812	6812	6048	6685	6685	6685	5995	5053	5053	4536	3915	3915	3915	3289	3289	3289
			feed posuw mm/min	434	727	727	599	599	599	599	599	460	802	802	802	647	849	849	689	736	736	736	618	618	618
			Ae mm	0.013	0.074	0.074	0.042	0.042	0.042	0.042	0.026	0.026	0.126	0.088	0.088	0.05	0.118	0.118	0.067	0.21	0.147	0.147	0.252	0.176	0.176
	6-8	1.0D	Vc m/min	91	119	119	107	107	107	107	107	95	126	126	126	113	127	127	114	123	123	123	124	124	124
			fz mm/tooth	0.015	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.03	0.03	0.03	0.027	0.042	0.042	0.038	0.047	0.047	0.047	0.047	0.047	0.047
			rpm obr/min	7242	7576	7576	6812	6812	6812	6812	6812	6048	6685	6685	6685	5995	5053	5053	4536	3915	3915	3915	3289	3289	3289
			feed posuw mm/min	434	727	727	599	599	599	599	599	460	802	802	802	647	849	849	689	736	736	736	618	618	618
			Ae mm	0.013	0.074	0.074	0.042	0.042	0.042	0.042	0.026	0.026	0.126	0.088	0.088	0.05	0.118	0.118	0.067	0.21	0.147	0.147	0.252	0.176	0.176
	9	1.0D	Vc m/min	56	71	71	64	64	64	64	64	57	76	76	76	68	76	76	68	75	75	75	76	76	76
			fz mm/tooth	0.015	0.024	0.024	0.021	0.021	0.021	0.021	0.021	0.019	0.03	0.03	0.03	0.027	0.037	0.037	0.034	0.038	0.038	0.038	0.037	0.037	0.037
			rpm obr/min	4456	4520	4520	4074	4074	4074	4074	4074	3629	4032	4032	4032	3608	3024	3024	2706	2387	2387	2387	2016	2016	2016
			feed posuw mm/min	267	434	434	342	342	342	342	342	276	484	484	484	390	448	448	368	363	363	363	298	298	298
			Ae mm	0.009	0.055	0.055	0.032	0.032	0.032	0.032	0.02	0.02	0.095	0.066	0.066	0.038	0.088	0.088	0.05	0.158	0.11	0.11	0.189	0.132	0.132
	10-11.1	1.0D	Vc m/min	91	119	119	107	107	107	107	107	95	126	126	126	113	127	127	114	123	123	123	124	124	124
			fz mm/tooth	0.015	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.03	0.03	0.03	0.027	0.042	0.042	0.038	0.047	0.047	0.047	0.047	0.047	0.047
			rpm obr/min	7242	7576	7576	6812	6812	6812	6812	6812	6048	6685	6685	6685	5995	5053	5053	4536	3915	3915	3915	3289	3289	3289
			feed posuw mm/min	434	727	727	599	599	599	599	599	460	802	802	802	647	849	849	689	736	736	736	618	618	618
			Ae mm	0.013	0.074	0.074	0.042	0.042	0.042	0.042	0.026	0.026	0.126	0.088	0.088	0.05	0.118	0.118	0.067	0.21	0.147	0.147	0.252	0.176	0.176
	11.2	1.0D	Vc m/min	56	71	71	64	64	64	64	64	57	76	76	76	68	76	76	68	75	75	75	76	76	76
			fz mm/tooth	0.015	0.024	0.024	0.021	0.021	0.021	0.021	0.021	0.019	0.03	0.03	0.03	0.027	0.037	0.037	0.034	0.038	0.038	0.038	0.037	0.037	0.037
			rpm obr/min	4456	4520	4520	4074	4074	4074	4074	4074	3629	4032	4032	4032	3608	3024	3024	2706	2387	2387	2387	2016	2016	2016
			feed posuw mm/min	267	434	434	342	342	342	342	342	276	484	484	484	390	448	448	368	363	363	363	298	298	298
			Ae mm	0.009	0.055	0.055	0.032	0.032	0.032	0.032	0.02	0.02	0.095	0.066	0.066	0.038	0.088	0.088	0.05	0.158	0.11	0.11	0.189	0.132	0.132
K	15-20	1.0D	Vc m/min	91	119	119	107	107	107	107	107	95	126	126	126	113	127	127	114	123	123	123	124	124	124
			fz mm/tooth	0.015	0.024	0.024	0.022	0.022	0.022	0.022	0.022	0.019	0.03	0.03	0.03	0.027	0.042	0.042	0.038	0.047	0.047	0.047	0.047	0.047	0.047
			rpm obr/min	7242	7576	7576	6812	6812	6812	6812	6812	6048	6685	6685	6685	5995	5053	5053	4536	3915	3915	3915	3289	3289	3289
			feed posuw mm/min	434	727	727	599	599	599	599	599	460	802	802	802	647	849	849	689	736	736	736	618	618	618
			Ae mm	0.013	0.074	0.074	0.042	0.042	0.042	0.042	0.026	0.026	0.126	0.088	0.088	0.05	0.118	0.118	0.067	0.21	0.147	0.147	0.252	0.176	0.176
H	38.1 - 38.2	1.0D	Vc m/min	35	44	44	39	39	39	39	39	35	45	45	45	41	51	51	45	51	51	51	53	53	53
			fz mm/tooth	0.004	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006	0.01	0.01	0.01	0.009	0.016	0.016	0.015	0.016	0.016	0.016	0.017	0.017	0.017
			rpm obr/min	2785	2801	2801	2483	2483	2483	2483	2483	2228	2387	2387	2387	2175	2029	2029	1790	1623	1623	1623	1406	1406	1406
			feed posuw mm/min	45	90	90	70	70	70	70	70	53	95	95	95	78	130	130	107	104	104	104	96	96	96
			Ae mm	0.008	0.044	0.044	0.025	0.025	0.025	0.025	0.016	0.016	0.076	0.053	0.053	0.03	0.071	0.071	0.04	0.126	0.088	0.088	0.151	0.106	0.106
	40	1.0D	Vc m/min	56	71	71	64	64	64	64	64	57	76	76	76	68	76	76	68	75	75	75	76	76	76
			fz mm/tooth	0.015	0.024	0.024	0.021	0.021	0.021	0.021	0.021	0.019	0.03	0.03	0.03	0.027	0.037	0.037	0.034	0.038	0.038	0.038	0.037	0.037	0.037
			rpm obr/min	4456	4520	4520	4074	4074	4074	4074	4074	3629	4032	4032	4032	3608	3024	3024	2706	2387	2387	2387	2016	2016	2016
			feed posuw mm/min	267	434	434	342	342	342	342	342	276	484	484	484	390	448	448	368	363	363	363	298	298	298
			Ae mm	0.009	0.055	0.055	0.032	0.032	0.032	0.032	0.02	0.02	0.095	0.066	0.066	0.038	0.088	0.088	0.05	0.158	0.11	0.11	0.189	0.132	0.132
	41	1.0D	Vc m/min	35	44	44	39	39	39	39	39	35	45	45	45	41	51	51	45	51	51	51	53	53	53
			fz mm/tooth	0.004	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006	0.01	0.01	0.01	0.009	0.016	0.016	0.015	0.016	0.016	0.016	0.017	0.017	0.017
			rpm obr/min	2785	2801	2801	2483	2483	2483	2483	2483	2228	2387	2387	2387	2175	2029	2029	1790	1623	1623	1623	1406	1406	1406
			feed posuw mm/min	45	90	90	70	70	70	70	70	53	95	95	95	78	130	130	107	104	104	104	96	96	96
			Ae mm	0.008	0.044	0.044	0.025	0.025	0.025	0.025	0.016	0.016	0.076	0.053	0.053	0.03	0.071	0.071	0.04	0.126	0.088	0.088	0.151	0.106	0.106

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX77

6 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX7706006000A150060	6	6	15	60
UFX7706006000A200070	6	6	20	70
UFX7706006000A300080	6	6	30	80
UFX7706006000A300110	6	6	30	110
UFX7708008000A200070	8	8	20	70
UFX7708008000A300080	8	8	30	80
UFX7708008000A350090	8	8	35	90
UFX7708008000A400090	8	8	40	90
UFX7708008000A400130	8	8	40	130
UFX7710010000A250075	10	10	25	75
UFX7710010000A300080	10	10	30	80
UFX7710010000A400090	10	10	40	90
UFX7710010000A500100	10	10	50	100
UFX7710010000A500150	10	10	50	150
UFX7712012000A300080	12	12	30	80
UFX7712012000A400090	12	12	40	90
UFX7712012000A500100	12	12	50	100
UFX7712012000A600110	12	12	60	110
UFX7712012000A600150	12	12	60	150
UFX7716016000A400100	16	16	40	100
UFX7716016000A500110	16	16	50	110
UFX7716016000A600120	16	16	60	120
UFX7716016000A900150	16	16	90	150
UFX7716016000A11X200	16	16	110	200
UFX7716016000A11X250	16	16	110	250
UFX7720020000A450100	20	20	45	100
UFX7720020000A600120	20	20	60	120
UFX7720020000A700130	20	20	70	130
UFX7720020000A11X200	20	20	110	200
UFX7720020000A11X250	20	20	110	250
UFX7720020000A11X300	20	20	110	300

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX77

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING NORMAL SPEED / FREZ O 6 ZĘBACH FREZOWANIE BOKIEM PRĘDKOŚĆ NORMALNA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	6.0	6.0	8.0	8.0	8.0	8.0	10.0	10.0	10.0
				LOC	15	20	30	20	30	35	40	25	30	40
P	1-5	0.1D	1.5D	Vc m/min	110	110	110	111	111	111	111	111	111	111
				fz mm/tooth	0.06	0.06	0.051	0.079	0.079	0.079	0.067	0.099	0.099	0.099
				rpm obr/min	5836	5836	5836	4417	4417	4417	4417	3533	3533	3533
				feed posuw mm/min	2101	2101	1786	2093	2093	2093	1775	2099	2099	2099
	6-8	0.1D	1.5D	Vc m/min	110	110	110	111	111	111	111	111	111	111
				fz mm/tooth	0.06	0.06	0.051	0.079	0.079	0.079	0.067	0.099	0.099	0.099
				rpm obr/min	5836	5836	5836	4417	4417	4417	4417	3533	3533	3533
				feed posuw mm/min	2101	2101	1786	2093	2093	2093	1775	2099	2099	2099
	9	0.05D	1.5D	Vc m/min	77	77	77	78	78	78	78	76	76	76
				fz mm/tooth	0.059	0.059	0.05	0.078	0.078	0.078	0.066	0.099	0.099	0.099
				rpm obr/min	4085	4085	4085	3104	3104	3104	3104	2419	2419	2419
				feed posuw mm/min	1446	1446	1225	1452	1452	1452	1229	1437	1437	1437
	10-11.1	0.1D	1.5D	Vc m/min	110	110	110	111	111	111	111	111	111	111
				fz mm/tooth	0.06	0.06	0.051	0.079	0.079	0.079	0.067	0.099	0.099	0.099
				rpm obr/min	5836	5836	5836	4417	4417	4417	4417	3533	3533	3533
				feed posuw mm/min	2101	2101	1786	2093	2093	2093	1775	2099	2099	2099
	11.2	0.05D	1.5D	Vc m/min	77	77	77	78	78	78	78	76	76	76
				fz mm/tooth	0.059	0.059	0.05	0.078	0.078	0.078	0.066	0.099	0.099	0.099
				rpm obr/min	4085	4085	4085	3104	3104	3104	3104	2419	2419	2419
				feed posuw mm/min	1446	1446	1225	1452	1452	1452	1229	1437	1437	1437
K	15-20	0.1D	1.5D	Vc m/min	110	110	110	111	111	111	111	111	111	111
				fz mm/tooth	0.06	0.06	0.051	0.079	0.079	0.079	0.067	0.099	0.099	0.099
				rpm obr/min	5836	5836	5836	4417	4417	4417	4417	3533	3533	3533
				feed posuw mm/min	2101	2101	1786	2093	2093	2093	1775	2099	2099	2099
H	38.1 - 38.2	0.05D	1.0D	Vc m/min	31	31	31	31	31	31	31	33	33	33
				fz mm/tooth	0.022	0.022	0.019	0.03	0.03	0.03	0.026	0.035	0.035	0.035
				rpm obr/min	1645	1645	1645	1233	1233	1233	1233	1050	1050	1050
				feed posuw mm/min	217	217	187	222	222	222	192	221	221	221
	40	0.05D	1.5D	Vc m/min	77	77	77	78	78	78	78	76	76	76
				fz mm/tooth	0.059	0.059	0.05	0.078	0.078	0.078	0.066	0.099	0.099	0.099
				rpm obr/min	4085	4085	4085	3104	3104	3104	3104	2419	2419	2419
				feed posuw mm/min	1446	1446	1225	1452	1452	1452	1229	1437	1437	1437
	41	0.05D	1.0D	Vc m/min	31	31	31	31	31	31	31	33	33	33
				fz mm/tooth	0.022	0.022	0.019	0.03	0.03	0.03	0.026	0.035	0.035	0.035
				rpm obr/min	1645	1645	1645	1233	1233	1233	1233	1050	1050	1050
				feed posuw mm/min	217	217	187	222	222	222	192	221	221	221

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX77

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING HIGH SPEED / FREZ O 6 ZĘBACH FREZOWANIE BOKIEM WYSOKA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	6.0	6.0	8.0	8.0	8.0	8.0	10.0	10.0	10.0
				LOC	15	20	30	20	30	35	40	25	30	40
P	11.2	0.05D	1.5D	Vc m/min	333	333	333	333	333	333	333	329	329	329
				fz mm/tooth	0.06	0.06	0.051	0.081	0.081	0.081	0.068	0.1	0.1	0.1
				rpm obr/min	17666	17666	17666	13250	13250	13250	13250	10472	10472	10472
				feed posuw mm/min	6360	6360	5406	6439	6439	6439	5406	6283	6283	6283
H	38.1 - 38.2	0.05D	1.0D	Vc m/min	166	166	166	166	166	166	166	166	166	166
				fz mm/tooth	0.061	0.061	0.051	0.081	0.081	0.081	0.069	0.101	0.101	0.101
				rpm obr/min	8807	8807	8807	6605	6605	6605	6605	5284	5284	5284
				feed posuw mm/min	3223	3223	2695	3210	3210	3210	2734	3202	3202	3202
	40	0.05D	1.5D	Vc m/min	333	333	333	333	333	333	333	329	329	329
				fz mm/tooth	0.06	0.06	0.051	0.081	0.081	0.081	0.068	0.1	0.1	0.1
				rpm obr/min	17666	17666	17666	13250	13250	13250	13250	10472	10472	10472
				feed posuw mm/min	6360	6360	5406	6439	6439	6439	5406	6283	6283	6283
	41	0.05D	1.0D	Vc m/min	166	166	166	166	166	166	166	166	166	166
				fz mm/tooth	0.061	0.061	0.051	0.081	0.081	0.081	0.069	0.101	0.101	0.101
				rpm obr/min	8807	8807	8807	6605	6605	6605	6605	5284	5284	5284
				feed posuw mm/min	3223	3223	2695	3210	3210	3210	2734	3202	3202	3202

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX77

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING NORMAL SPEED / FREZ O 6 ZĘBACH FREZOWANIE BOKIEM PRĘDKOŚĆ NORMALNA

ISO	VDI 3323	Ae mm	Ap mm	DC	10.0	12.0	12.0	12.0	12.0	16.0	16.0	16.0	16.0	16.0	20.0	20.0	20.0	20.0
				LOC	50	30	40	50	60	40	50	60	90	110	45	60	70	110
P	1-5	0.1D	1.5D	Vc m/min	111	112	112	112	112	111	111	111	100	100	111	111	111	100
				fz mm/tooth	0.084	0.099	0.099	0.084	0.074	0.1	0.1	0.085	0.075	0.075	0.1	0.1	0.085	0.075
				rpm obr/min	3533	2971	2971	2971	2971	2208	2208	2208	1989	1989	1767	1767	1767	1592
				feed posuw mm/min	1781	1765	1765	1497	1319	1325	1325	1126	895	895	1060	1060	901	716
	6-8	0.1D	1.5D	Vc m/min	111	112	112	112	112	111	111	111	100	100	111	111	111	100
				fz mm/tooth	0.084	0.099	0.099	0.084	0.074	0.1	0.1	0.085	0.075	0.075	0.1	0.1	0.085	0.075
				rpm obr/min	3533	2971	2971	2971	2971	2208	2208	2208	1989	1989	1767	1767	1767	1592
				feed posuw mm/min	1781	1765	1765	1497	1319	1325	1325	1126	895	895	1060	1060	901	716
	9	0.05D	1.5D	Vc m/min	76	79	79	79	79	78	78	78	70	70	77	77	77	68
				fz mm/tooth	0.084	0.097	0.097	0.082	0.073	0.099	0.099	0.085	0.075	0.075	0.099	0.099	0.084	0.075
				rpm obr/min	2419	2096	2096	2096	2096	1552	1552	1552	1393	1393	1225	1225	1225	1082
				feed posuw mm/min	1219	1220	1220	1031	918	922	922	791	627	627	728	728	618	487
	10-11.1	0.1D	1.5D	Vc m/min	111	112	112	112	112	111	111	111	100	100	111	111	111	100
				fz mm/tooth	0.084	0.099	0.099	0.084	0.074	0.1	0.1	0.085	0.075	0.075	0.1	0.1	0.085	0.075
				rpm obr/min	3533	2971	2971	2971	2971	2208	2208	2208	1989	1989	1767	1767	1767	1592
				feed posuw mm/min	1781	1765	1765	1497	1319	1325	1325	1126	895	895	1060	1060	901	716
	11.2	0.05D	1.5D	Vc m/min	76	79	79	79	79	78	78	78	70	70	77	77	77	68
				fz mm/tooth	0.084	0.097	0.097	0.082	0.073	0.099	0.099	0.085	0.075	0.075	0.099	0.099	0.084	0.075
				rpm obr/min	2419	2096	2096	2096	2096	1552	1552	1552	1393	1393	1225	1225	1225	1082
				feed posuw mm/min	1219	1220	1220	1031	918	922	922	791	627	627	728	728	618	487
K	15-20	0.1D	1.5D	Vc m/min	111	112	112	112	112	111	111	111	100	100	111	111	111	100
				fz mm/tooth	0.084	0.099	0.099	0.084	0.074	0.1	0.1	0.085	0.075	0.075	0.1	0.1	0.085	0.075
				rpm obr/min	3533	2971	2971	2971	2971	2208	2208	2208	1989	1989	1767	1767	1767	1592
				feed posuw mm/min	1781	1765	1765	1497	1319	1325	1325	1126	895	895	1060	1060	901	716
H	38.1 - 38.2	0.05D	1.0D	Vc m/min	33	33	33	33	33	34	34	34	31	31	33	33	33	30
				fz mm/tooth	0.03	0.036	0.036	0.031	0.027	0.034	0.034	0.029	0.026	0.026	0.037	0.037	0.032	0.028
				rpm obr/min	1050	875	875	875	875	676	676	676	617	617	525	525	525	477
				feed posuw mm/min	189	189	189	163	142	138	138	118	96	96	117	117	101	80
	40	0.05D	1.5D	Vc m/min	76	79	79	79	79	78	78	78	70	70	77	77	77	68
				fz mm/tooth	0.084	0.097	0.097	0.082	0.073	0.099	0.099	0.085	0.075	0.075	0.099	0.099	0.084	0.075
				rpm obr/min	2419	2096	2096	2096	2096	1552	1552	1552	1393	1393	1225	1225	1225	1082
				feed posuw mm/min	1219	1220	1220	1031	918	922	922	791	627	627	728	728	618	487
	41	0.05D	1.0D	Vc m/min	33	33	33	33	33	34	34	34	31	31	33	33	33	30
				fz mm/tooth	0.03	0.036	0.036	0.031	0.027	0.034	0.034	0.029	0.026	0.026	0.037	0.037	0.032	0.028
				rpm obr/min	1050	875	875	875	875	676	676	676	617	617	525	525	525	477
				feed posuw mm/min	189	189	189	163	142	138	138	118	96	96	117	117	101	80

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX77

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING HIGH SPEED / FREZ O 6 ZĘBACH FREZOWANIE BOKIEM WYSOKA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	Ap mm	DC	10.0	12.0	12.0	12.0	12.0	16.0	16.0	16.0	16.0	16.0	20.0	20.0	20.0	20.0
				LOC	50	30	40	50	60	40	50	60	90	110	45	60	70	110
P	11.2	0.05D	1.5D	Vc m/min	329	333	333	333	333	333	333	333	299	299	332	332	332	299
				fz mm/tooth	0.085	0.1	0.1	0.085	0.075	0.1	0.1	0.085	0.075	0.075	0.101	0.101	0.086	0.076
				rpm obr/min	10472	8833	8833	8833	8833	6625	6625	6625	5948	5948	5284	5284	5284	4759
				feed posuw mm/min	5341	5300	5300	4505	3975	3975	3975	3379	2677	2677	3202	3202	2727	2170
H	38.1 - 38.2	0.05D	1.0D	Vc m/min	166	166	166	166	166	167	167	167	150	150	166	166	166	150
				fz mm/tooth	0.086	0.1	0.1	0.085	0.075	0.1	0.1	0.085	0.075	0.075	0.097	0.097	0.083	0.073
				rpm obr/min	5284	4403	4403	4403	4403	3322	3322	3322	2984	2984	2642	2642	2642	2387
				feed posuw mm/min	2727	2642	2642	2246	1981	1993	1993	1694	1343	1343	1538	1538	1316	1046
	40	0.05D	1.5D	Vc m/min	329	333	333	333	333	333	333	333	299	299	332	332	332	299
				fz mm/tooth	0.085	0.1	0.1	0.085	0.075	0.1	0.1	0.085	0.075	0.075	0.101	0.101	0.086	0.076
				rpm obr/min	10472	8833	8833	8833	8833	6625	6625	6625	5948	5948	5284	5284	5284	4759
				feed posuw mm/min	5341	5300	5300	4505	3975	3975	3975	3379	2677	2677	3202	3202	2727	2170
	41	0.05D	1.0D	Vc m/min	166	166	166	166	166	167	167	167	150	150	166	166	166	150
				fz mm/tooth	0.086	0.1	0.1	0.085	0.075	0.1	0.1	0.085	0.075	0.075	0.097	0.097	0.083	0.073
				rpm obr/min	5284	4403	4403	4403	4403	3322	3322	3322	2984	2984	2642	2642	2642	2387
				feed posuw mm/min	2727	2642	2642	2246	1981	1993	1993	1694	1343	1343	1538	1538	1316	1046

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX60

R 4-5 Finish Medium

HSM Vmax A B min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	○	○	●	●	●	○	●	●	●	○	●	○	○	○	●	●	●	●	●

| ISO | N | | | | | | | | | |

UFX60

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4&5 FLUTE CORNER RADIUS ROUGHING SLOTTING/ FREZ PROMIENIOWY O 4 I 5 ZĘBACH ROWKOWANIE ZGRUBNE

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	1-3	1.00D	1.00D	Vc m/min	225	225	225	225	225	225
				fz mm/tooth	0.032	0.046	0.057	0.064	0.067	0.074
				rpm obr/min	11937	8952	7162	5968	4476	3581
				feed posuw mm/min	1528	1647	1633	1528	1500	1325
	4-5	1.00D	0.80D	Vc m/min	200	205	200	205	205	200
				fz mm/tooth	0.026	0.036	0.046	0.053	0.051	0.056
				rpm obr/min	10610	8157	6366	5438	4078	3183
				feed posuw mm/min	1103	1175	1171	1153	1040	891
	6	1.00D	1.00D	Vc m/min	225	225	225	225	225	225
				fz mm/tooth	0.032	0.046	0.057	0.064	0.067	0.074
				rpm obr/min	11937	8952	7162	5968	4476	3581
				feed posuw mm/min	1528	1647	1633	1528	1500	1325
	7-9	1.00D	0.80D	Vc m/min	200	205	200	205	205	200
				fz mm/tooth	0.026	0.036	0.046	0.053	0.051	0.056
				rpm obr/min	10610	8157	6366	5438	4078	3183
				feed posuw mm/min	1103	1175	1171	1153	1040	891
	10	1.00D	1.00D	Vc m/min	225	225	225	225	225	225
				fz mm/tooth	0.032	0.046	0.057	0.064	0.067	0.074
				rpm obr/min	11937	8952	7162	5968	4476	3581
				feed posuw mm/min	1528	1647	1633	1528	1500	1325
	11.1	1.00D	0.80D	Vc m/min	200	205	200	205	205	200
				fz mm/tooth	0.026	0.036	0.046	0.053	0.051	0.056
				rpm obr/min	10610	8157	6366	5438	4078	3183
				feed posuw mm/min	1103	1175	1171	1153	1040	891
K	15-20	1.00D	1.00D	Vc m/min	225	225	225	225	225	225
				fz mm/tooth	0.032	0.046	0.057	0.064	0.067	0.074
				rpm obr/min	11937	8952	7162	5968	4476	3581
				feed posuw mm/min	1528	1647	1633	1528	1500	1325

4&5 FLUTE CORNER RADIUS ROUGHING SIDE CUTTING/ FREZ PROMIENIOWY O 4 I 5 ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	1-3	1.00D	1.00D	Vc m/min	300	300	300	300	300	300
				fz mm/tooth	0.041	0.057	0.071	0.08	0.082	0.089
				rpm obr/min	15915	11937	9549	7958	5968	4775
				feed posuw mm/min	2610	2722	2712	2546	2447	2125
	4-5	1.00D	0.80D	Vc m/min	270	270	265	270	270	270
				fz mm/tooth	0.032	0.046	0.057	0.065	0.065	0.07
				rpm obr/min	14324	10743	8435	7162	5371	4297
				feed posuw mm/min	1833	1977	1923	1862	1746	1504
	6	1.00D	1.00D	Vc m/min	300	300	300	300	300	300
				fz mm/tooth	0.041	0.057	0.071	0.08	0.082	0.089
				rpm obr/min	15915	11937	9549	7958	5968	4775
				feed posuw mm/min	2610	2722	2712	2546	2447	2125
	7-9	1.00D	0.80D	Vc m/min	270	270	265	270	270	270
				fz mm/tooth	0.032	0.046	0.057	0.065	0.065	0.07
				rpm obr/min	14324	10743	8435	7162	5371	4297
				feed posuw mm/min	1833	1977	1923	1862	1746	1504
	10	1.00D	1.00D	Vc m/min	300	300	300	300	300	300
				fz mm/tooth	0.041	0.057	0.071	0.08	0.082	0.089
				rpm obr/min	15915	11937	9549	7958	5968	4775
				feed posuw mm/min	2610	2722	2712	2546	2447	2125
	11.1	1.00D	0.80D	Vc m/min	270	270	265	270	270	270
				fz mm/tooth	0.032	0.046	0.057	0.065	0.065	0.07
				rpm obr/min	14324	10743	8435	7162	5371	4297
				feed posuw mm/min	1833	1977	1923	1862	1746	1504
K	15-20	1.00D	1.00D	Vc m/min	300	300	300	300	300	300
				fz mm/tooth	0.041	0.057	0.071	0.08	0.082	0.089
				rpm obr/min	15915	11937	9549	7958	5968	4775
				feed posuw mm/min	2610	2722	2712	2546	2447	2125

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX21

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○

ISO	N															S								H			
HRc																15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100								200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37		38	39	40	41				
																				○	○	●	○				

CODE	RE	DC	DCON	APMX	OAL
UFX21010005A03003038	0,5	1	3	3	38
UFX21020010A06003050	1	2	6	3	50
UFX21030015A06004050	1,5	3	6	4	50
UFX21040020A06005054	2	4	6	5	54
UFX21060030A06007054	3	6	6	7	54
UFX21080040A08009058	4	8	8	9	58
UFX21100050A10011066	5	10	10	11	66
UFX21120060A12012073	6	12	12	12	73
UFX21160080A16016082	8	16	16	16	82

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX21

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE NORMAL SPEED / FREZ KULOWY 2 ZĘBACH NORMALNA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	0.2D	Vc m/min	55	85	100	125	140	150	160	180	200	225	245	270	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			rpm obr/min	17507	18038	15915	15915	14854	11937	10186	9549	7958	7162	6499	5371	4615
			feed posuw mm/min	280	397	828	828	772	836	917	1146	1432	1719	1950	1934	1846
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	5	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	6-7	0.2D	Vc m/min	55	85	100	125	140	150	160	180	200	225	245	270	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			rpm obr/min	17507	18038	15915	15915	14854	11937	10186	9549	7958	7162	6499	5371	4615
			feed posuw mm/min	280	397	828	828	772	836	917	1146	1432	1719	1950	1934	1846
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	8-9	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	10	0.2D	Vc m/min	55	85	100	125	140	150	160	180	200	225	245	270	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			rpm obr/min	17507	18038	15915	15915	14854	11937	10186	9549	7958	7162	6499	5371	4615
			feed posuw mm/min	280	397	828	828	772	836	917	1146	1432	1719	1950	1934	1846
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
K	15-20	0.2D	Vc m/min	55	80	100	125	135	145	160	180	200	220	245	265	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.181	0.201
			rpm obr/min	17507	16977	15915	15915	14324	11539	10186	9549	7958	7003	6499	5272	4615
			feed posuw mm/min	280	373	828	828	745	808	917	1146	1432	1681	1950	1908	1855
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
H	38.1 - 38.2	0.1D	Vc m/min	20	30	35	40	50	60	65	65	70	70	75	75	80
			fz mm/tooth	0.008	0.011	0.016	0.016	0.017	0.021	0.024	0.030	0.044	0.055	0.070	0.091	0.113
			rpm obr/min	6366	6366	5570	5093	5305	4775	4138	3448	2785	2228	1989	1492	1273
			feed posuw mm/min	102	140	178	163	180	201	199	207	245	245	279	272	288
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	40	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	41	0.1D	Vc m/min	20	30	35	40	50	60	65	65	70	70	75	75	80
			fz mm/tooth	0.008	0.011	0.016	0.016	0.017	0.021	0.024	0.030	0.044	0.055	0.070	0.091	0.113
			rpm obr/min	6366	6366	5570	5093	5305	4775	4138	3448	2785	2228	1989	1492	1273
			feed posuw mm/min	102	140	178	163	180	201	199	207	245	245	279	272	288
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX21

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE HIGH SPEED / FREZ KULOWY 2 ZĘBACH WYSOKA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.03	0.035	0.042	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	6-9	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.030	0.035	0.042	0.048	0.070	0.086	0.095	0.120	0.139	0.160	0.181	0.200
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	10 - 11.2	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.03	0.035	0.042	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
K	15-20	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.03	0.035	0.042	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
H	38.1 - 38.2	0.05D	Vc m/min	90	120	150	165	180	190	210	220	235	245	255	270	280
			fz mm/tooth	0.016	0.019	0.022	0.026	0.031	0.042	0.050	0.060	0.075	0.086	0.095	0.105	0.115
			rpm obr/min	28648	25465	23873	21008	19099	15120	13369	11671	9350	7799	6764	5371	4456
			feed posuw mm/min	917	968	1050	1092	1184	1270	1337	1401	1403	1341	1285	1128	1025
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	40	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.030	0.035	0.042	0.048	0.070	0.086	0.095	0.120	0.139	0.160	0.181	0.200
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	41	0.05D	Vc m/min	90	120	150	165	180	190	210	220	235	245	255	270	280
			fz mm/tooth	0.016	0.019	0.022	0.026	0.031	0.042	0.050	0.060	0.075	0.086	0.095	0.105	0.115
			rpm obr/min	28648	25465	23873	21008	19099	15120	13369	11671	9350	7799	6764	5371	4456
			feed posuw mm/min	917	968	1050	1092	1184	1270	1337	1401	1403	1341	1285	1128	1025
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX13

2 Finish Medium

HSM Vmax A min AIR

ISO	P											M			K							N											S								H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21													15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100				200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX13010005A04003050	0,5	1	4	2,5	50
UFX13020010A06005050	1	2	6	5	50
UFX13030015A06008060	1,5	3	6	8	60
UFX13040020A06008070	2	4	6	8	70
UFX13050025A06010080	2,5	5	6	10	80
UFX13060030A06012090	3	6	6	12	90
UFX13080040A08014100	4	8	8	14	100
UFX13100050A10018100	5	10	10	18	100
UFX13120060A12022110	6	12	12	22	110
UFX13160080A16030140	8	16	16	30	140
UFX13200100A20038160	10	20	20	38	160

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE NORMAL SPEED / FREZ KULOWY 2 ZĘBACH NORMALNA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	0.2D	Vc m/min	55	85	100	125	140	150	160	180	200	225	245	270	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			rpm obr/min	17507	18038	15915	15915	14854	11937	10186	9549	7958	7162	6499	5371	4615
			feed posuw mm/min	280	397	828	828	772	836	917	1146	1432	1719	1950	1934	1846
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	5	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	6-7	0.2D	Vc m/min	55	85	100	125	140	150	160	180	200	225	245	270	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			rpm obr/min	17507	18038	15915	15915	14854	11937	10186	9549	7958	7162	6499	5371	4615
			feed posuw mm/min	280	397	828	828	772	836	917	1146	1432	1719	1950	1934	1846
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	8-9	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	10	0.2D	Vc m/min	55	85	100	125	140	150	160	180	200	225	245	270	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			rpm obr/min	17507	18038	15915	15915	14854	11937	10186	9549	7958	7162	6499	5371	4615
			feed posuw mm/min	280	397	828	828	772	836	917	1146	1432	1719	1950	1934	1846
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
K	15-20	0.2D	Vc m/min	55	80	100	125	135	145	160	180	200	220	245	265	290
			fz mm/tooth	0.008	0.011	0.026	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.181	0.201
			rpm obr/min	17507	16977	15915	15915	14324	11539	10186	9549	7958	7003	6499	5272	4615
			feed posuw mm/min	280	373	828	828	745	808	917	1146	1432	1681	1950	1908	1855
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
H	38.1 - 38.2	0.1D	Vc m/min	20	30	35	40	50	60	65	65	70	70	75	75	80
			fz mm/tooth	0.008	0.011	0.016	0.016	0.017	0.021	0.024	0.030	0.044	0.055	0.070	0.091	0.113
			rpm obr/min	6366	6366	5570	5093	5305	4775	4138	3448	2785	2228	1989	1492	1273
			feed posuw mm/min	102	140	178	163	180	201	199	207	245	245	279	272	288
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	40	0.2D	Vc m/min	45	65	75	95	105	120	130	145	160	180	195	215	230
			fz mm/tooth	0.008	0.011	0.023	0.023	0.023	0.032	0.040	0.060	0.080	0.100	0.120	0.140	0.160
			rpm obr/min	14324	13793	11937	12096	11141	9549	8276	7692	6366	5730	5173	4277	3661
			feed posuw mm/min	229	303	549	556	512	611	662	923	1019	1146	1241	1198	1171
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	41	0.1D	Vc m/min	20	30	35	40	50	60	65	65	70	70	75	75	80
			fz mm/tooth	0.008	0.011	0.016	0.016	0.017	0.021	0.024	0.030	0.044	0.055	0.070	0.091	0.113
			rpm obr/min	6366	6366	5570	5093	5305	4775	4138	3448	2785	2228	1989	1492	1273
			feed posuw mm/min	102	140	178	163	180	201	199	207	245	245	279	272	288
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE HIGH SPEED / FREZ KULOWY 2 ZĘBACH WYSOKA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.03	0.035	0.042	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	6-9	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.030	0.035	0.042	0.048	0.070	0.086	0.095	0.120	0.139	0.160	0.181	0.200
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	10 - 11.2	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.03	0.035	0.042	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
K	15-20	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.03	0.035	0.042	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
H	38.1 - 38.2	0.05D	Vc m/min	90	120	150	165	180	190	210	220	235	245	255	270	280
			fz mm/tooth	0.016	0.019	0.022	0.026	0.031	0.042	0.050	0.060	0.075	0.086	0.095	0.105	0.115
			rpm obr/min	28648	25465	23873	21008	19099	15120	13369	11671	9350	7799	6764	5371	4456
			feed posuw mm/min	917	968	1050	1092	1184	1270	1337	1401	1403	1341	1285	1128	1025
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	40	0.05D	Vc m/min	90	120	150	185	220	295	370	445	470	495	515	540	560
			fz mm/tooth	0.026	0.030	0.035	0.042	0.048	0.070	0.086	0.095	0.120	0.139	0.160	0.181	0.200
			rpm obr/min	28648	25465	23873	23555	23343	23475	23555	23608	18701	15756	13661	10743	8913
			feed posuw mm/min	1490	1528	1671	1979	2241	3287	4051	4486	4488	4380	4371	3889	3565
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	41	0.05D	Vc m/min	90	120	150	165	180	190	210	220	235	245	255	270	280
			fz mm/tooth	0.016	0.019	0.022	0.026	0.031	0.042	0.050	0.060	0.075	0.086	0.095	0.105	0.115
			rpm obr/min	28648	25465	23873	21008	19099	15120	13369	11671	9350	7799	6764	5371	4456
			feed posuw mm/min	917	968	1050	1092	1184	1270	1337	1401	1403	1341	1285	1128	1025
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX24

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	LU	APMX	OAL	DN
UFX24005003A04002045	0,25	0,5	4	0,7	2	45	0,45
UFX24005003A04004045	0,25	0,5	4	0,7	4	45	0,45
UFX24006003A04002045	0,3	0,6	4	0,9	2	45	0,55
UFX24006003A04004045	0,3	0,6	4	0,9	4	45	0,55
UFX24006003A04006045	0,3	0,6	4	0,9	6	45	0,55
UFX24008004A04004045	0,4	0,8	4	1,2	4	45	0,75
UFX24008004A04006045	0,4	0,8	4	1,2	6	45	0,75
UFX24010005A04004045	0,5	1	4	1,5	4	45	0,95
UFX24010005A04005045	0,5	1	4	1,5	5	45	0,95
UFX24010005A04006045	0,5	1	4	1,5	6	45	0,95
UFX24010005A04008045	0,5	1	4	1,5	8	45	0,95
UFX24010005A04010045	0,5	1	4	1,5	10	45	0,95
UFX24010005A04012045	0,5	1	4	1,5	12	45	0,95
UFX24010005A04016050	0,5	1	4	1,5	16	50	0,95
UFX24012006A04008045	0,6	1,2	4	1,8	8	45	1,15
UFX24015008A04006045	0,75	1,5	4	2,3	6	45	1,45
UFX24015008A04008045	0,75	1,5	4	2,3	8	45	1,45
UFX24015008A04010045	0,75	1,5	4	2,3	10	45	1,45
UFX24015008A04012045	0,75	1,5	4	2,3	12	45	1,45
UFX24020010A04006045	1	2	4	3	6	45	1,95
UFX24020010A04008045	1	2	4	3	8	45	1,95
UFX24020010A04010045	1	2	4	3	10	45	1,95
UFX24020010A04012050	1	2	4	3	12	50	1,95
UFX24020010A04016050	1	2	4	3	16	50	1,95
UFX24020010A04020055	1	2	4	3	20	55	1,95
UFX24020010A04025060	1	2	4	3	25	60	1,95
UFX24020010A04030070	1	2	4	3	30	70	1,95
UFX24030015A06010050	1,5	3	6	4,5	10	50	2,85
UFX24030015A06012050	1,5	3	6	4,5	12	50	2,85
UFX24030015A06016055	1,5	3	6	4,5	16	55	2,85
UFX24030015A06020060	1,5	3	6	4,5	20	60	2,85
UFX24030015A06025065	1,5	3	6	4,5	25	65	2,85
UFX24040020A06016060	2	4	6	6	16	60	3,85
UFX24040020A06020065	2	4	6	6	20	65	3,85
UFX24040020A06025070	2	4	6	6	25	70	3,85
UFX24040020A06030070	2	4	6	6	30	70	3,85
UFX24040020A06035080	2	4	6	6	35	80	3,85
UFX24050025A06016060	2,5	5	6	7,5	16	60	4,85
UFX24060030A06020080	3	6	6	9	20	80	5,85
UFX24060030A06030090	3	6	6	9	30	90	5,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX24

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE RIB PROCESSING / FREZ KULOWY 2 ZĘBACH OBRÓBKA ŻEBER

ISO	VDI 3323	Ae mm	DC	0.5	0.6	0.8	1.0	1.2	1.4
P	1-4	0.2D	Vc m/min	49~63	58~75	78~101	91~115	90~115	92~114
			fz mm/tooth	0.003~0.006	0.004~0.008	0.004~0.008	0.004~0.010	0.005~0.013	0.006~0.015
			rpm obr/min	32550~42000	32550~42000	32550~42000	30450~38330	25200~32030	22050~27300
			feed posuw mm/min	185~515	235~660	235~660	265~735	265~820	265~820
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
	5	0.2D	Vc m/min	35~45	42~54	57~72	64~82	64~81	66~79
			fz mm/tooth	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.004~0.011
			rpm obr/min	23630~29930	23630~29930	23630~29930	21530~27300	17850~22580	15750~18900
			feed posuw mm/min	90~285	115~370	115~370	130~410	130~410	130~410
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
	6-7	0.2D	Vc m/min	49~63	58~75	78~101	91~115	90~115	92~114
			fz mm/tooth	0.003~0.006	0.004~0.008	0.004~0.008	0.004~0.010	0.005~0.013	0.006~0.015
			rpm obr/min	32550~42000	32550~42000	32550~42000	30450~38330	25200~32030	22050~27300
			feed posuw mm/min	185~515	235~660	235~660	265~735	265~820	265~820
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
	8-9	0.2D	Vc m/min	35~45	42~54	57~72	64~82	64~81	66~79
			fz mm/tooth	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.004~0.011
			rpm obr/min	23630~29930	23630~29930	23630~29930	21530~27300	17850~22580	15750~18900
			feed posuw mm/min	90~285	115~370	115~370	130~410	130~410	130~410
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
	10	0.2D	Vc m/min	49~63	58~75	78~101	91~115	90~115	92~114
			fz mm/tooth	0.003~0.006	0.004~0.008	0.004~0.008	0.004~0.010	0.005~0.013	0.006~0.015
			rpm obr/min	32550~42000	32550~42000	32550~42000	30450~38330	25200~32030	22050~27300
			feed posuw mm/min	185~515	235~660	235~660	265~735	265~820	265~820
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
	11.1 - 11.2	0.2D	Vc m/min	35~45	42~54	57~72	64~82	64~81	66~79
			fz mm/tooth	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.004~0.011
			rpm obr/min	23630~29930	23630~29930	23630~29930	21530~27300	17850~22580	15750~18900
			feed posuw mm/min	90~285	115~370	115~370	130~410	130~410	130~410
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
K	15-20	0.2D	Vc m/min	49~63	58~75	78~101	91~115	90~115	92~114
			fz mm/tooth	0.003~0.006	0.004~0.008	0.004~0.008	0.004~0.010	0.005~0.013	0.006~0.015
			rpm obr/min	32550~42000	32550~42000	32550~42000	30450~38330	25200~32030	22050~27300
			feed posuw mm/min	185~515	235~660	235~660	265~735	265~820	265~820
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
H	38.1 - 38.2	0.1D	Vc m/min	22~28	27~34	36~45	41~51	41~52	41~51
			fz mm/tooth	0.003~0.005	0.004~0.006	0.004~0.006	0.005~0.008	0.006~0.009	0.007~0.011
			rpm obr/min	15020~18900	15020~18900	15020~18900	13650~17120	11340~14390	9870~12290
			feed posuw mm/min	90~185	115~235	115~235	130~265	130~265	130~265
			Ap mm	0.005~0.009	0.005~0.011	0.007~0.014	0.009~0.018	0.010~0.022	0.012~0.025
	40	0.2D	Vc m/min	35~45	42~54	57~72	64~82	64~81	66~79
			fz mm/tooth	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.004~0.011
			rpm obr/min	23630~29930	23630~29930	23630~29930	21530~27300	17850~22580	15750~18900
			feed posuw mm/min	90~285	115~370	115~370	130~410	130~410	130~410
			Ap mm	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.062~0.125
	41	0.1D	Vc m/min	22~28	27~34	36~45	41~51	41~52	41~51
			fz mm/tooth	0.003~0.005	0.004~0.006	0.004~0.006	0.005~0.008	0.006~0.009	0.007~0.011
			rpm obr/min	15020~18900	15020~18900	15020~18900	13650~17120	11340~14390	9870~12290
			feed posuw mm/min	90~185	115~235	115~235	130~265	130~265	130~265
			Ap mm	0.005~0.009	0.005~0.011	0.007~0.014	0.009~0.018	0.010~0.022	0.012~0.025

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX24

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE RIB PROCESSING / FREZ KULOWY 2 ZĘBACH OBRÓBKA ŻEBER

ISO	VDI 3323	Ae mm	DC	1.5	1.6	1.8	2.0	3.0	4.0	5.0	6.0
P	1-4	0.2D	Vc m/min	90~113	90~118	96~122	97~119	99~123	107~138	107~138	107~138
			fz mm/tooth	0.007~0.016	0.007~0.017	0.007~0.018	0.008~0.021	0.012~0.030	0.015~0.035	0.018~0.044	0.022~0.053
			rpm obr/min	19950~25200	18900~24680	17850~22580	16280~19950	11030~13650	8930~11550	7140~9240	5990~7670
			feed posuw mm/min	265~820	265~820	265~820	265~820	265~820	265~820	265~820	265~820
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	5	0.2D	Vc m/min	64~82	66~83	68~85	69~85	66~85	73~98	72~97	74~98
			fz mm/tooth	0.005~0.011	0.005~0.012	0.005~0.013	0.006~0.014	0.009~0.022	0.011~0.025	0.014~0.031	0.016~0.038
			rpm obr/min	14180~18380	13860~17330	12600~15750	11550~14180	7350~9450	6090~8190	4830~6510	4100~5460
			feed posuw mm/min	130~410	130~410	130~410	130~410	130~410	130~410	130~410	130~410
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	6-7	0.2D	Vc m/min	90~113	90~118	96~122	97~119	99~123	107~138	107~138	107~138
			fz mm/tooth	0.007~0.016	0.007~0.017	0.007~0.018	0.008~0.021	0.012~0.030	0.015~0.035	0.018~0.044	0.022~0.053
			rpm obr/min	19950~25200	18900~24680	17850~22580	16280~19950	11030~13650	8930~11550	7140~9240	5990~7670
			feed posuw mm/min	265~820	265~820	265~820	265~820	265~820	265~820	265~820	265~820
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	8-9	0.2D	Vc m/min	64~82	66~83	68~85	69~85	66~85	73~98	72~97	74~98
			fz mm/tooth	0.005~0.011	0.005~0.012	0.005~0.013	0.006~0.014	0.009~0.022	0.011~0.025	0.014~0.031	0.016~0.038
			rpm obr/min	14180~18380	13860~17330	12600~15750	11550~14180	7350~9450	6090~8190	4830~6510	4100~5460
			feed posuw mm/min	130~410	130~410	130~410	130~410	130~410	130~410	130~410	130~410
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	10	0.2D	Vc m/min	90~113	90~118	96~122	97~119	99~123	107~138	107~138	107~138
			fz mm/tooth	0.007~0.016	0.007~0.017	0.007~0.018	0.008~0.021	0.012~0.030	0.015~0.035	0.018~0.044	0.022~0.053
			rpm obr/min	19950~25200	18900~24680	17850~22580	16280~19950	11030~13650	8930~11550	7140~9240	5990~7670
			feed posuw mm/min	265~820	265~820	265~820	265~820	265~820	265~820	265~820	265~820
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	11.1 - 11.2	0.2D	Vc m/min	64~82	66~83	68~85	69~85	66~85	73~98	72~97	74~98
			fz mm/tooth	0.005~0.011	0.005~0.012	0.005~0.013	0.006~0.014	0.009~0.022	0.011~0.025	0.014~0.031	0.016~0.038
			rpm obr/min	14180~18380	13860~17330	12600~15750	11550~14180	7350~9450	6090~8190	4830~6510	4100~5460
			feed posuw mm/min	130~410	130~410	130~410	130~410	130~410	130~410	130~410	130~410
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
K	15-20	0.2D	Vc m/min	90~113	90~118	96~122	97~119	99~123	107~138	107~138	107~138
			fz mm/tooth	0.007~0.016	0.007~0.017	0.007~0.018	0.008~0.021	0.012~0.030	0.015~0.035	0.018~0.044	0.022~0.053
			rpm obr/min	19950~25200	18900~24680	17850~22580	16280~19950	11030~13650	8930~11550	7140~9240	5990~7670
			feed posuw mm/min	265~820	265~820	265~820	265~820	265~820	265~820	265~820	265~820
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
H	38.1 - 38.2	0.1D	Vc m/min	41~50	42~52	42~53	43~54	43~54	49~62	49~61	49~62
			fz mm/tooth	0.007~0.012	0.008~0.012	0.008~0.013	0.009~0.015	0.014~0.022	0.016~0.026	0.020~0.032	0.024~0.038
			rpm obr/min	9140~11240	8720~10920	7770~9870	7250~9030	4830~5990	4100~5150	3260~4100	2730~3470
			feed posuw mm/min	130~265	130~265	130~265	130~265	130~265	130~265	130~265	130~265
			Ap mm	0.014~0.028	0.015~0.030	0.016~0.032	0.018~0.035	0.028~0.055	0.035~0.070	0.044~0.088	0.053~0.105
	40	0.2D	Vc m/min	64~82	66~83	68~85	69~85	66~85	73~98	72~97	74~98
			fz mm/tooth	0.005~0.011	0.005~0.012	0.005~0.013	0.006~0.014	0.009~0.022	0.011~0.025	0.014~0.031	0.016~0.038
			rpm obr/min	14180~18380	13860~17330	12600~15750	11550~14180	7350~9450	6090~8190	4830~6510	4100~5460
			feed posuw mm/min	130~410	130~410	130~410	130~410	130~410	130~410	130~410	130~410
			Ap mm	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	41	0.1D	Vc m/min	41~50	42~52	42~53	43~54	43~54	49~62	49~61	49~62
			fz mm/tooth	0.007~0.012	0.008~0.012	0.008~0.013	0.009~0.015	0.014~0.022	0.016~0.026	0.020~0.032	0.024~0.038
			rpm obr/min	9140~11240	8720~10920	7770~9870	7250~9030	4830~5990	4100~5150	3260~4100	2730~3470
			feed posuw mm/min	130~265	130~265	130~265	130~265	130~265	130~265	130~265	130~265
			Ap mm	0.014~0.028	0.015~0.030	0.016~0.032	0.018~0.035	0.028~0.055	0.035~0.070	0.044~0.088	0.053~0.105

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX02

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
		○	○	○	○	○	○	●	●	○	●																											○		●	○

CODE	RE	DC	DCON	LU	OAL	APMX	LB	DC1	θ
UFX02010005A06023060	0,5	1	6	23	60	2	4	2	1° 30'
UFX020100X5A06023060	0,5	1	6	23	60	2	4	4,3	5°
UFX02010005A06042080	0,5	1	6	42	80	2	4	5	3°
UFX02020010A06023060	1	2	6	23	60	4	6	2,9	1° 30'
UFX02020X10A06023060	1	2	6	23	60	4	6	5	5°
UFX02020010A06041080	1	2	6	41	80	4	6	5,7	3°
UFX02030015A06032070	1,5	3	6	32	70	6	8	5,6	3°
UFX02030015A06052090	1,5	3	6	52	90	6	8	5,3	1° 30'
UFX02040020A06028070	2	4	6	28	70	8	10	5,9	3°
UFX02040020A06049090	2	4	6	49	90	8	10	6	1° 30'
UFX02060030A08034090	3	6	8	34	90	12	15	8	3°
UFX02060030A08053110	3	6	8	53	110	12	15	8	1° 30'
UFX02080040A10036100	4	8	10	36	100	14	17	10	3°
UFX02080040A10055120	4	8	10	55	120	14	17	10	1° 30'

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX02

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE WITH TAPER NECK NORMAL SPEED

FREZ KULOWY O 2 ZĘBACH ZE STOŻKOWĄ SZYJKĄ NORMALNA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0
P	5	0.2D	Vc m/min	35	60	80	90	95	110	120
			fz mm/tooth	0.008	0.014	0.023	0.031	0.040	0.060	0.080
			rpm obr/min	11141	9549	8488	7162	6048	5836	4775
			feed posuw mm/min	178	267	390	444	484	700	764
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
	8-9	0.2D	Vc m/min	35	60	80	90	95	110	120
			fz mm/tooth	0.008	0.014	0.023	0.031	0.040	0.060	0.080
			rpm obr/min	11141	9549	8488	7162	6048	5836	4775
			feed posuw mm/min	178	267	390	444	484	700	764
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
	11.1	0.2D	Vc m/min	35	60	80	90	95	110	120
			fz mm/tooth	0.008	0.014	0.023	0.031	0.040	0.060	0.080
			rpm obr/min	11141	9549	8488	7162	6048	5836	4775
			feed posuw mm/min	178	267	390	444	484	700	764
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
	11.2	0.2D	Vc m/min	55	75	100	110	125	135	150
			fz mm/tooth	0.012	0.028	0.043	0.052	0.059	0.067	0.075
			rpm obr/min	17507	11937	10610	8754	7958	7162	5968
			feed posuw mm/min	420	668	912	910	939	960	895
			Ap mm	0.05	0.1	0.15	0.2	0.25	0.25	0.25
H	38.1	0.1D	Vc m/min	55	75	100	110	125	135	150
			fz mm/tooth	0.012	0.028	0.043	0.052	0.059	0.067	0.075
			rpm obr/min	17507	11937	10610	8754	7958	7162	5968
			feed posuw mm/min	420	668	912	910	939	960	895
			Ap mm	0.05	0.1	0.15	0.2	0.25	0.25	0.25
	38.2	0.1D	Vc m/min	55	75	95	110	125	130	140
			fz mm/tooth	0.012	0.026	0.043	0.052	0.059	0.068	0.075
			rpm obr/min	17507	11937	10080	8754	7958	6897	5570
			feed posuw mm/min	420	621	867	910	939	938	836
			Ap mm	0.05	0.1	0.15	0.2	0.25	0.25	0.25
	40	0.1D	Vc m/min	55	75	100	110	125	135	150
			fz mm/tooth	0.012	0.028	0.043	0.052	0.059	0.067	0.075
			rpm obr/min	17507	11937	10610	8754	7958	7162	5968
			feed posuw mm/min	420	668	912	910	939	960	895
			Ap mm	0.05	0.1	0.15	0.2	0.25	0.25	0.25
	41	0.1D	Vc m/min	55	75	95	110	125	130	140
			fz mm/tooth	0.012	0.026	0.043	0.052	0.059	0.068	0.075
			rpm obr/min	17507	11937	10080	8754	7958	6897	5570
			feed posuw mm/min	420	621	867	910	939	938	836
			Ap mm	0.05	0.1	0.15	0.2	0.25	0.25	0.25

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX02

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE WITH TAPER NECK HIGH SPEED

FREZ KULOWY O 2 ZĘBACH ZE STOŻKOWĄ SZYJKĄ WYSOKA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0
P	1-5	0.05D	Vc m/min	65	110	165	220	275	335	355
			fz mm/tooth	0.026	0.036	0.048	0.07	0.086	0.095	0.119
			rpm obr/min	20690	17507	17507	17507	17507	17772	14125
			feed posuw mm/min	1076	1261	1681	2451	3011	3377	3362
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
	6-9	0.05D	Vc m/min	65	110	165	220	275	335	355
			fz mm/tooth	0.026	0.036	0.048	0.070	0.086	0.095	0.119
			rpm obr/min	20690	17507	17507	17507	17507	17772	14125
			feed posuw mm/min	1076	1261	1681	2451	3011	3377	3362
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
	10 - 11.2	0.05D	Vc m/min	65	110	165	220	275	335	355
			fz mm/tooth	0.026	0.036	0.048	0.07	0.086	0.095	0.119
			rpm obr/min	20690	17507	17507	17507	17507	17772	14125
			feed posuw mm/min	1076	1261	1681	2451	3011	3377	3362
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
K	15-20	0.05D	Vc m/min	65	110	165	220	275	335	355
			fz mm/tooth	0.026	0.036	0.048	0.07	0.086	0.095	0.119
			rpm obr/min	20690	17507	17507	17507	17507	17772	14125
			feed posuw mm/min	1076	1261	1681	2451	3011	3377	3362
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
H	38	0.05D	Vc m/min	55	75	100	110	125	135	150
			fz mm/tooth	0.019	0.037	0.069	0.080	0.088	0.101	0.112
			rpm obr/min	17507	11937	10610	8754	7958	7162	5968
			feed posuw mm/min	665	883	1464	1401	1401	1447	1337
			Ap mm	0.05	0.10	0.15	0.2	0.25	0.25	0.25
	38.2	0.05D	Vc m/min	55	75	95	110	120	130	140
			fz mm/tooth	0.017	0.043	0.066	0.079	0.087	0.102	0.109
			rpm obr/min	17507	11937	10080	8754	7639	6897	5570
			feed posuw mm/min	595	1027	1331	1383	1329	1407	1214
			Ap mm	0.05	0.10	0.15	0.2	0.25	0.25	0.25
	40	0.05D	Vc m/min	65	110	165	220	275	335	355
			fz mm/tooth	0.026	0.036	0.048	0.07	0.086	0.095	0.119
			rpm obr/min	20690	17507	17507	17507	17507	17772	14125
			feed posuw mm/min	1076	1261	1681	2451	3011	3377	3362
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.2	0.3
	41	0.05D	Vc m/min	55	75	95	110	120	130	140
			fz mm/tooth	0.017	0.043	0.066	0.079	0.087	0.102	0.109
			rpm obr/min	17507	11937	10080	8754	7639	6897	5570
			feed posuw mm/min	595	1027	1331	1383	1329	1407	1214
			Ap mm	0.05	0.10	0.15	0.2	0.25	0.25	0.25

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX15

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○

ISO	N											S							H			
HRc												15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100				200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37	38	39	40	41
																			○	○	●	○

CODE	RE	DC	DCON	APMX	OAL
UFX15020010A06005050	1	2	6	5	50
UFX15030015A06008060	1,5	3	6	8	60
UFX15040020A06008070	2	4	6	8	70
UFX15050025A06010080	2,5	5	6	10	80
UFX15060030A06012090	3	6	6	12	90
UFX15080040A08014100	4	8	8	14	100
UFX15100050A10018100	5	10	10	18	100
UFX15120060A12022110	6	12	12	22	110
UFX15160080A16030140	8	16	16	30	140

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX15

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE BALL NOSE NORMAL SPEED / FREZ KULOWY 4 ZĘBACH NORMALNA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-4	0.2D	Vc m/min	105	130	140	150	170	190	210	230	250
			fz mm/tooth	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136
			rpm obr/min	16711	13793	11141	9549	9019	7560	6685	6101	4974
			feed posuw mm/min	869	1048	1159	1299	1623	2056	2406	2709	2706
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	5	0.2D	Vc m/min	75	100	110	120	135	150	170	185	200
			fz mm/tooth	0.010	0.017	0.024	0.030	0.045	0.060	0.075	0.089	0.106
			rpm obr/min	11937	10610	8754	7639	7162	5968	5411	4907	3979
			feed posuw mm/min	477	722	840	917	1289	1432	1623	1747	1687
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	6-7	0.2D	Vc m/min	105	130	140	150	170	190	210	230	250
			fz mm/tooth	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136
			rpm obr/min	16711	13793	11141	9549	9019	7560	6685	6101	4974
			feed posuw mm/min	869	1048	1159	1299	1623	2056	2406	2709	2706
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	8-9	0.2D	Vc m/min	75	100	110	120	135	150	170	185	200
			fz mm/tooth	0.010	0.017	0.024	0.030	0.045	0.060	0.075	0.089	0.106
			rpm obr/min	11937	10610	8754	7639	7162	5968	5411	4907	3979
			feed posuw mm/min	477	722	840	917	1289	1432	1623	1747	1687
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	10	0.2D	Vc m/min	105	130	140	150	170	190	210	230	250
			fz mm/tooth	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136
			rpm obr/min	16711	13793	11141	9549	9019	7560	6685	6101	4974
			feed posuw mm/min	869	1048	1159	1299	1623	2056	2406	2709	2706
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.2D	Vc m/min	75	100	110	120	135	150	170	185	200
			fz mm/tooth	0.010	0.017	0.024	0.030	0.045	0.060	0.075	0.089	0.106
			rpm obr/min	11937	10610	8754	7639	7162	5968	5411	4907	3979
			feed posuw mm/min	477	722	840	917	1289	1432	1623	1747	1687
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
K	15-20	0.2D	Vc m/min	105	130	140	150	170	190	210	230	250
			fz mm/tooth	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136
			rpm obr/min	16711	13793	11141	9549	9019	7560	6685	6101	4974
			feed posuw mm/min	869	1048	1159	1299	1623	2056	2406	2709	2706
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
H	38.1 - 38.2	0.1D	Vc m/min	30	45	55	60	65	65	65	70	70
			fz mm/tooth	0.008	0.012	0.016	0.018	0.022	0.033	0.041	0.053	0.069
			rpm obr/min	4775	4775	4377	3820	3448	2586	2069	1857	1393
			feed posuw mm/min	153	229	280	275	303	341	339	394	384
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	40	0.2D	Vc m/min	75	100	110	120	135	150	170	185	200
			fz mm/tooth	0.01	0.017	0.024	0.03	0.045	0.06	0.075	0.089	0.106
			rpm obr/min	11937	10610	8754	7639	7162	5968	5411	4907	3979
			feed posuw mm/min	477	722	840	917	1289	1432	1623	1747	1687
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	41	0.1D	Vc m/min	30	45	55	60	65	65	65	70	70
			fz mm/tooth	0.008	0.012	0.016	0.018	0.022	0.033	0.041	0.053	0.069
			rpm obr/min	4775	4775	4377	3820	3448	2586	2069	1857	1393
			feed posuw mm/min	153	229	280	275	303	341	339	394	384
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX15

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE BALL NOSE NORMAL SPEED / FREZ KULOWY 4 ZĘBACH NORMALNA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-5	0.05D	Vc m/min	140	210	275	345	415	440	460	485	505
			fz mm/tooth	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136
			rpm obr/min	22282	22282	21884	21963	22016	17507	14642	12865	10047
			feed posuw mm/min	2317	3209	4552	5623	6253	6303	6150	6175	5465
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	6-9	0.05D	Vc m/min	140	210	275	345	415	440	460	485	505
			fz mm/tooth	0.026	0.036	0.052	0.064	0.071	0.090	0.105	0.120	0.136
			rpm obr/min	22282	22282	21884	21963	22016	17507	14642	12865	10047
			feed posuw mm/min	2317	3209	4552	5623	6253	6303	6150	6175	5465
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	10 - 11.2	0.05D	Vc m/min	140	210	275	345	415	440	460	485	505
			fz mm/tooth	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136
			rpm obr/min	22282	22282	21884	21963	22016	17507	14642	12865	10047
			feed posuw mm/min	2317	3209	4552	5623	6253	6303	6150	6175	5465
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
K	15-20	0.05D	Vc m/min	140	210	275	345	415	440	460	485	505
			fz mm/tooth	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136
			rpm obr/min	22282	22282	21884	21963	22016	17507	14642	12865	10047
			feed posuw mm/min	2317	3209	4552	5623	6253	6303	6150	6175	5465
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
H	38.1 - 38.2	0.05D	Vc m/min	140	170	180	200	210	220	230	240	250
			fz mm/tooth	0.017	0.023	0.032	0.038	0.045	0.056	0.064	0.071	0.079
			rpm obr/min	22282	18038	14324	12732	11141	8754	7321	6366	4974
			feed posuw mm/min	1515	1659	1833	1935	2005	1961	1874	1808	1572
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	40	0.05D	Vc m/min	140	210	275	345	415	440	460	485	505
			fz mm/tooth	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136
			rpm obr/min	22282	22282	21884	21963	22016	17507	14642	12865	10047
			feed posuw mm/min	2317	3209	4552	5623	6253	6303	6150	6175	5465
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
	41	0.05D	Vc m/min	140	170	180	200	210	220	230	240	250
			fz mm/tooth	0.017	0.023	0.032	0.038	0.045	0.056	0.064	0.071	0.079
			rpm obr/min	22282	18038	14324	12732	11141	8754	7321	6366	4974
			feed posuw mm/min	1515	1659	1833	1935	2005	1961	1874	1808	1572
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX27

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX27040005A06015050	0,5	4	6	15	50
UFX27060005A06020060	0,5	6	6	20	60
UFX27060010A06020060	1	6	6	20	60
UFX27080005A08025070	0,5	8	8	25	70
UFX27080010A08025070	1	8	8	25	70
UFX27100005A10030090	0,5	10	10	30	90
UFX27100010A10030090	1	10	10	30	90
UFX27120010A12030090	1	12	12	30	90

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX27

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	4.0	5.0	6.0	8.0	10.0	12.0
P	1-4	1.0D	0.3D	Vc m/min	75	80	80	85	85	85
				fz mm/tooth	0.016	0.023	0.032	0.045	0.053	0.051
				rpm obr/min	5968	5093	4244	3382	2706	2255
				feed posuw mm/min	191	234	272	304	287	230
	5	1.0D	0.3D	Vc m/min	45	50	50	55	55	60
				fz mm/tooth	0.013	0.017	0.025	0.033	0.039	0.041
				rpm obr/min	3581	3183	2653	2188	1751	1592
				feed posuw mm/min	93	108	133	144	137	131
	6-7	1.0D	0.3D	Vc m/min	75	80	80	85	85	85
				fz mm/tooth	0.016	0.023	0.032	0.045	0.053	0.051
				rpm obr/min	5968	5093	4244	3382	2706	2255
				feed posuw mm/min	191	234	272	304	287	230
	8-9	1.0D	0.3D	Vc m/min	45	50	50	55	55	60
				fz mm/tooth	0.013	0.017	0.025	0.033	0.039	0.041
				rpm obr/min	3581	3183	2653	2188	1751	1592
				feed posuw mm/min	93	108	133	144	137	131
	10	1.0D	0.3D	Vc m/min	75	80	80	85	85	85
				fz mm/tooth	0.016	0.023	0.032	0.045	0.053	0.051
				rpm obr/min	5968	5093	4244	3382	2706	2255
				feed posuw mm/min	191	234	272	304	287	230
	11.1 - 11.2	1.0D	0.3D	Vc m/min	45	50	50	55	55	60
				fz mm/tooth	0.013	0.017	0.025	0.033	0.039	0.041
				rpm obr/min	3581	3183	2653	2188	1751	1592
				feed posuw mm/min	93	108	133	144	137	131
K	15-20	1.0D	0.3D	Vc m/min	75	80	80	85	85	85
				fz mm/tooth	0.016	0.023	0.032	0.045	0.053	0.051
				rpm obr/min	5968	5093	4244	3382	2706	2255
				feed posuw mm/min	191	234	272	304	287	230
H	38.1 - 38.2	1.0D	0.3D	Vc m/min	30	35	35	35	35	35
				fz mm/tooth	0.006	0.008	0.010	0.013	0.016	0.019
				rpm obr/min	2387	2228	1857	1393	1114	928
				feed posuw mm/min	29	36	37	36	36	35
	40	1.0D	0.3D	Vc m/min	45	50	50	55	55	60
				fz mm/tooth	0.013	0.017	0.025	0.033	0.039	0.041
				rpm obr/min	3581	3183	2653	2188	1751	1592
				feed posuw mm/min	93	108	133	144	137	131
	41	1.0D	0.3D	Vc m/min	30	35	35	35	35	35
				fz mm/tooth	0.006	0.008	0.01	0.013	0.016	0.019
				rpm obr/min	2387	2228	1857	1393	1114	928
				feed posuw mm/min	29	36	37	36	36	35

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX28

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P											M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	LU	APMX	OAL	DN
UFX28010001A04006045	0,1	1	4	6	1,5	45	0,95
UFX28010001A04008045	0,1	1	4	8	1,5	45	0,95
UFX28010001A04010045	0,1	1	4	10	1,5	45	0,95
UFX28012002A04006045	0,2	1,2	4	6	1,8	45	1,15
UFX28015002A04006045	0,2	1,5	4	6	2,3	45	1,45
UFX28015002A04008045	0,2	1,5	4	8	2,3	45	1,45
UFX28015002A04010045	0,2	1,5	4	10	2,3	45	1,45
UFX28015002A04012045	0,2	1,5	4	12	2,3	45	1,45
UFX28015002A04016050	0,2	1,5	4	16	2,3	50	1,45
UFX28018002A04006045	0,2	1,8	4	6	2,7	45	1,75
UFX28020002A04006045	0,2	2	4	6	3	45	1,95
UFX28020002A04008045	0,2	2	4	8	3	45	1,95
UFX28020002A04012045	0,2	2	4	12	3	45	1,95
UFX28020002A04010045	0,2	2	4	10	3	45	1,95
UFX28020002A04016050	0,2	2	4	16	3	50	1,95
UFX28020002A04020055	0,2	2	4	20	3	55	1,95
UFX28020002A04025060	0,2	2	4	25	3	60	1,95
UFX28025002A04012045	0,2	2,5	4	12	3,7	45	2,4
UFX28030003A06016055	0,3	3	6	16	4,5	55	2,85
UFX28030003A06020060	0,3	3	6	20	4,5	60	2,85
UFX28030003A06025065	0,3	3	6	25	4,5	65	2,85
UFX28030003A06030070	0,3	3	6	30	4,5	70	2,85
UFX28030003A06040090	0,3	3	6	40	4,5	90	2,85
UFX28040003A06012050	0,3	4	6	12	6	50	3,85
UFX28040003A06016060	0,3	4	6	16	6	60	3,85
UFX28040003A06020060	0,3	4	6	20	6	60	3,85
UFX28060005A06020080	0,5	6	6	20	9	80	5,85
UFX28060005A06040100	0,5	6	6	40	9	100	5,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX28

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS RIB PROCESSING / FREZ PROMIENIOWY O 2 ZĘBACH DO OBRÓBKI ŻEBER

ISO	VDI 3323	DC	1.0	1.2	1.4	1.5	1.6	1.8
P	1-4	Vc m/min	71~88	70~85	70~88	68~87	70~90	74~93
		fz mm/tooth	0.006~0.014	0.008~0.020	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027
		rpm obr/min	23630~29400	19430~23630	16800~21000	15230~19430	14700~18900	13650~17330
		feed posuw mm/min	295~850	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
	5	Vc m/min	49~63	49~62	51~62	49~64	51~64	52~65
		fz mm/tooth	0.006~0.015	0.007~0.018	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026
		rpm obr/min	16490~21000	13650~17330	12080~14700	11030~14180	10710~13440	9660~12080
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
	6-7	Vc m/min	71~88	70~85	70~88	68~87	70~90	74~93
		fz mm/tooth	0.006~0.014	0.008~0.020	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027
		rpm obr/min	23630~29400	19430~23630	16800~21000	15230~19430	14700~18900	13650~17330
		feed posuw mm/min	295~850	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
	8-9	Vc m/min	49~63	49~62	51~62	49~64	51~64	52~65
		fz mm/tooth	0.006~0.015	0.007~0.018	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026
		rpm obr/min	16490~21000	13650~17330	12080~14700	11030~14180	10710~13440	9660~12080
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
	10	Vc m/min	71~88	70~85	70~88	68~87	70~90	74~93
		fz mm/tooth	0.006~0.014	0.008~0.020	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027
		rpm obr/min	23630~29400	19430~23630	16800~21000	15230~19430	14700~18900	13650~17330
		feed posuw mm/min	295~850	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
	11.1 - 11.2	Vc m/min	49~63	49~62	51~62	49~64	51~64	52~65
		fz mm/tooth	0.006~0.015	0.007~0.018	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026
		rpm obr/min	16490~21000	13650~17330	12080~14700	11030~14180	10710~13440	9660~12080
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
K	15-20	Vc m/min	71~88	70~85	70~88	68~87	70~90	74~93
		fz mm/tooth	0.006~0.014	0.008~0.020	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027
		rpm obr/min	23630~29400	19430~23630	16800~21000	15230~19430	14700~18900	13650~17330
		feed posuw mm/min	295~850	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
H	38.1 - 38.2	Vc m/min	31~39	31~40	32~40	32~39	32~40	32~41
		fz mm/tooth	0.003~0.005	0.004~0.006	0.005~0.007	0.005~0.008	0.005~0.008	0.006~0.009
		rpm obr/min	10500~13130	8720~11030	7560~9450	7040~8610	6720~8400	5990~7560
		feed posuw mm/min	70~135	70~135	70~135	70~135	70~135	70~135
		Ap mm	0.009~0.018	0.010~0.022	0.012~0.025	0.014~0.028	0.015~0.030	0.016~0.032
	40	Vc m/min	49~63	49~62	51~62	49~64	51~64	52~65
		fz mm/tooth	0.006~0.015	0.007~0.018	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026
		rpm obr/min	16490~21000	13650~17330	12080~14700	11030~14180	10710~13440	9660~12080
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.045~0.090	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160
	41	Vc m/min	31~39	31~40	32~40	32~39	32~40	32~41
		fz mm/tooth	0.003~0.005	0.004~0.006	0.005~0.007	0.005~0.008	0.005~0.008	0.006~0.009
		rpm obr/min	10500~13130	8720~11030	7560~9450	7040~8610	6720~8400	5990~7560
		feed posuw mm/min	70~135	70~135	70~135	70~135	70~135	70~135
		Ap mm	0.009~0.018	0.010~0.022	0.012~0.025	0.014~0.028	0.015~0.030	0.016~0.032

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX28

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS RIB PROCESSING / FREZ PROMIENIOWY O 2 ZĘBACH DO OBRÓBKI ŻEBER

ISO	VDI 3323	DC	2.0	2.5	3.0	4.0	5.0	6.0
P	1-4	Vc m/min	75~91	75~94	75~94	75~94	75~94	75~94
		fz mm/tooth	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
		rpm obr/min	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
		feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	5	Vc m/min	52~66	53~67	52~66	52~67	52~66	53~66
		fz mm/tooth	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
		rpm obr/min	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	6-7	Vc m/min	75~91	75~94	75~94	75~94	75~94	75~94
		fz mm/tooth	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
		rpm obr/min	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
		feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	8-9	Vc m/min	52~66	53~67	52~66	52~67	52~66	53~66
		fz mm/tooth	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
		rpm obr/min	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	10	Vc m/min	75~91	75~94	75~94	75~94	75~94	75~94
		fz mm/tooth	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
		rpm obr/min	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
		feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	11.1 - 11.2	Vc m/min	52~66	53~67	52~66	52~67	52~66	53~66
		fz mm/tooth	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
		rpm obr/min	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
K	15-20	Vc m/min	75~91	75~94	75~94	75~94	75~94	75~94
		fz mm/tooth	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
		rpm obr/min	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
		feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
H	38.1 - 38.2	Vc m/min	33~41	34~42	33~41	33~41	33~41	33~49
		fz mm/tooth	0.006~0.010	0.008~0.012	0.009~0.015	0.013~0.020	0.015~0.025	0.019~0.025
		rpm obr/min	5570~6930	4520~5570	3680~4620	2730~3470	2210~2730	1840~2730
		feed posuw mm/min	70~135	70~135	70~135	70~135	70~135	70~135
		Ap mm	0.018~0.035	0.022~0.045	0.028~0.055	0.036~0.072	0.045~0.090	0.054~0.108
	40	Vc m/min	52~66	53~67	52~66	52~67	52~66	53~66
		fz mm/tooth	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
		rpm obr/min	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
		feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630
		Ap mm	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	41	Vc m/min	33~41	34~42	33~41	33~41	33~41	33~49
		fz mm/tooth	0.006~0.010	0.008~0.012	0.009~0.015	0.013~0.020	0.015~0.025	0.019~0.025
		rpm obr/min	5570~6930	4520~5570	3680~4620	2730~3470	2210~2730	1840~2730
		feed posuw mm/min	70~135	70~135	70~135	70~135	70~135	70~135
		Ap mm	0.018~0.035	0.022~0.045	0.028~0.055	0.036~0.072	0.045~0.090	0.054~0.108

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX29

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○

| ISO | N | | | | | | | | | |

UFX29

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH OBRÓBKA BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	6.0	8.0	10.0	12.0
P	1-4	0.05D	1.0D	Vc m/min	95	110	125	140	140	135	135
				fz mm/tooth	0.006	0.009	0.019	0.03	0.042	0.047	0.048
				rpm obr/min	15120	11671	9947	7427	5570	4297	3581
				feed posuw mm/min	363	420	756	891	936	808	688
	5	0.05D	1.0D	Vc m/min	65	70	75	85	85	85	85
				fz mm/tooth	0.006	0.009	0.019	0.030	0.038	0.037	0.037
				rpm obr/min	10345	7427	5968	4509	3382	2706	2255
				feed posuw mm/min	248	267	454	541	514	400	334
	6-7	0.05D	1.0D	Vc m/min	95	110	125	140	140	135	135
				fz mm/tooth	0.006	0.009	0.019	0.03	0.042	0.047	0.048
				rpm obr/min	15120	11671	9947	7427	5570	4297	3581
				feed posuw mm/min	363	420	756	891	936	808	688
	8-9	0.05D	1.0D	Vc m/min	65	70	75	85	85	85	85
				fz mm/tooth	0.006	0.009	0.019	0.030	0.038	0.037	0.037
				rpm obr/min	10345	7427	5968	4509	3382	2706	2255
				feed posuw mm/min	248	267	454	541	514	400	334
	10	0.05D	1.0D	Vc m/min	95	110	125	140	140	135	135
				fz mm/tooth	0.006	0.009	0.019	0.03	0.042	0.047	0.048
				rpm obr/min	15120	11671	9947	7427	5570	4297	3581
				feed posuw mm/min	363	420	756	891	936	808	688
	11.1 - 11.2	0.05D	1.0D	Vc m/min	65	70	75	85	85	85	85
				fz mm/tooth	0.006	0.009	0.019	0.030	0.038	0.037	0.037
				rpm obr/min	10345	7427	5968	4509	3382	2706	2255
				feed posuw mm/min	248	267	454	541	514	400	334
K	15-20	0.05D	1.0D	Vc m/min	95	110	125	140	140	135	135
				fz mm/tooth	0.006	0.009	0.019	0.03	0.042	0.047	0.048
				rpm obr/min	15120	11671	9947	7427	5570	4297	3581
				feed posuw mm/min	363	420	756	891	936	808	688
H	38.1 - 38.2	0.05D	1.0D	Vc m/min	40	40	50	50	55	55	60
				fz mm/tooth	0.002	0.004	0.005	0.010	0.016	0.017	0.017
				rpm obr/min	6366	4244	3979	2653	2188	1751	1592
				feed posuw mm/min	51	68	80	106	140	119	108
	40	0.05D	1.0D	Vc m/min	65	70	75	85	85	85	85
				fz mm/tooth	0.006	0.009	0.019	0.030	0.038	0.037	0.037
				rpm obr/min	10345	7427	5968	4509	3382	2706	2255
				feed posuw mm/min	248	267	454	541	514	400	334
	41	0.05D	1.0D	Vc m/min	40	40	50	50	55	55	60
				fz mm/tooth	0.002	0.004	0.005	0.010	0.016	0.017	0.017
				rpm obr/min	6366	4244	3979	2653	2188	1751	1592
				feed posuw mm/min	51	68	80	106	140	119	108

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX41

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	RE	DC	DCON	APMX	OAL
UFX41030003A06012050	0,3	3	6	12	50
UFX41040003A06015050	0,3	4	6	15	50
UFX41040005A06015050	0,5	4	6	15	50
UFX41050005A06020060	0,5	5	6	20	60
UFX41060005A06020060	0,5	6	6	20	60
UFX41060010A06020060	1	6	6	20	60
UFX41080005A08025070	0,5	8	8	25	70
UFX41080010A08025070	1	8	8	25	70
UFX41080020A08025070	2	8	8	25	70
UFX41100005A10030090	0,5	10	10	30	90
UFX41100010A10030090	1	10	10	30	90
UFX41100015A10030090	1,5	10	10	30	90
UFX41100020A10030090	2	10	10	30	90
UFX41120005A12030090	0,5	12	12	30	90
UFX41120010A12030090	1	12	12	30	90
UFX41120015A12030090	1,5	12	12	30	90
UFX41120020A12030090	2	12	12	30	90
UFX41160005A16050110	0,5	16	16	50	110
UFX41160010A16050110	1	16	16	50	110
UFX41160020A16050110	2	16	16	50	110
UFX41200020A20055110	2	20	20	55	110

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX41

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH OBRÓBKA BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	0.05D	1.0D	Vc m/min	70	75	80	80	85	85	85	95	85
				fz mm/tooth	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023	0.022
				rpm obr/min	7427	5968	5093	4244	3382	2706	2255	1890	1353
				feed posuw mm/min	178	239	244	238	257	249	198	174	119
	5	0.05D	1.0D	Vc m/min	45	45	50	50	55	55	60	60	55
				fz mm/tooth	0.008	0.011	0.016	0.018	0.024	0.028	0.029	0.030	0.028
				rpm obr/min	4775	3581	3183	2653	2188	1751	1592	1194	875
				feed posuw mm/min	153	158	204	191	210	196	185	143	98
	6-7	0.05D	1.0D	Vc m/min	70	75	80	80	85	85	85	95	85
				fz mm/tooth	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023	0.022
				rpm obr/min	7427	5968	5093	4244	3382	2706	2255	1890	1353
				feed posuw mm/min	178	239	244	238	257	249	198	174	119
	8-9	0.05D	1.0D	Vc m/min	45	45	50	50	55	55	60	60	55
				fz mm/tooth	0.008	0.011	0.016	0.018	0.024	0.028	0.029	0.030	0.028
				rpm obr/min	4775	3581	3183	2653	2188	1751	1592	1194	875
				feed posuw mm/min	153	158	204	191	210	196	185	143	98
	10	0.05D	1.0D	Vc m/min	70	75	80	80	85	85	85	95	85
				fz mm/tooth	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023	0.022
				rpm obr/min	7427	5968	5093	4244	3382	2706	2255	1890	1353
				feed posuw mm/min	178	239	244	238	257	249	198	174	119
	11.1 - 11.2	0.05D	1.0D	Vc m/min	45	45	50	50	55	55	60	60	55
				fz mm/tooth	0.008	0.011	0.016	0.018	0.024	0.028	0.029	0.030	0.028
				rpm obr/min	4775	3581	3183	2653	2188	1751	1592	1194	875
				feed posuw mm/min	153	158	204	191	210	196	185	143	98
K	15-20	0.05D	1.0D	Vc m/min	70	75	80	80	85	85	85	95	85
				fz mm/tooth	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023	0.022
				rpm obr/min	7427	5968	5093	4244	3382	2706	2255	1890	1353
				feed posuw mm/min	178	239	244	238	257	249	198	174	119
H	38.1 - 38.2	0.05D	1.0D	Vc m/min	25	30	35	35	35	35	35	35	35
				fz mm/tooth	0.006	0.008	0.011	0.013	0.017	0.021	0.020	0.022	0.023
				rpm obr/min	2653	2387	2228	1857	1393	1114	928	696	557
				feed posuw mm/min	64	76	98	97	95	94	74	61	51
	40	0.05D	1.0D	Vc m/min	45	45	50	50	55	55	60	60	55
				fz mm/tooth	0.008	0.011	0.016	0.018	0.024	0.028	0.029	0.030	0.028
				rpm obr/min	4775	3581	3183	2653	2188	1751	1592	1194	875
				feed posuw mm/min	153	158	204	191	210	196	185	143	98
	41	0.05D	1.0D	Vc m/min	25	30	35	35	35	35	35	35	35
				fz mm/tooth	0.006	0.008	0.011	0.013	0.017	0.021	0.020	0.022	0.023
				rpm obr/min	2653	2387	2228	1857	1393	1114	928	696	557
				feed posuw mm/min	64	76	98	97	95	94	74	61	51

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX42

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
		○	○	○	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX42004000A03001040	0,4	3	0,8	40
UFX42005000A03001040	0,5	3	1	40
UFX42006000A03001040	0,6	3	1,2	40
UFX42007000A03001040	0,7	3	1,4	40
UFX42008000A03002040	0,8	3	1,6	40
UFX42009000A03002040	0,9	3	2	40
UFX42010000A04003040	1	4	2,5	40
UFX42010000A06003040	1	6	2,5	40
UFX42012000A04004040	1,2	4	4	40
UFX42014000A04004040	1,4	4	4	40
UFX42015000A04004040	1,5	4	4	40

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX42

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX42015000A06004040	1,5	6	4	40
UFX42020000A04006040	2	4	6	40
UFX42020000A06006040	2	6	6	40
UFX42025000A04008040	2,5	4	8	40
UFX42030000A06008045	3	6	8	45
UFX42035000A06010045	3,5	6	10	45
UFX42040000A06011045	4	6	11	45
UFX42050000A06013050	5	6	13	50
UFX42060000A06013050	6	6	13	50
UFX42070000A08016060	7	8	16	60
UFX42080000A08019060	8	8	19	60
UFX42090000A10019070	9	10	19	70
UFX42100000A10022070	10	10	22	70
UFX42110000A12022075	11	12	22	75
UFX42120000A12026075	12	12	26	75
UFX42140000A14026085	14	14	26	85
UFX42160000A16032100	16	16	32	100
UFX42180000A18032100	18	18	32	100
UFX42200000A20038105	20	20	38	105

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX42

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.8	1.0	1.2	1.5
P	5	1.0D	D<1 : 0.15D D>1 : 0.25D	Vc m/min	40	65	70	65	60
				fz mm/tooth	0.002	0.003	0.004	0.005	0.006
				rpm obr/min	31831	25863	22282	17242	12732
				feed posuw mm/min	127	155	178	172	153
	8-9	1.0D	D<1 : 0.15D D>1 : 0.25D	Vc m/min	40	65	70	65	60
				fz mm/tooth	0.002	0.003	0.004	0.005	0.006
				rpm obr/min	31831	25863	22282	17242	12732
				feed posuw mm/min	127	155	178	172	153
	11.1 - 11.2	1.0D	D<1 : 0.15D D>1 : 0.25D	Vc m/min	40	65	70	65	60
				fz mm/tooth	0.002	0.003	0.004	0.005	0.006
				rpm obr/min	31831	25863	22282	17242	12732
				feed posuw mm/min	127	155	178	172	153
H	38.1 - 38.2	1.0D	D<1 : 0.15D D>1 : 0.25D	Vc m/min	30	50	50	50	45
				fz mm/tooth	0.001	0.002	0.003	0.003	0.004
				rpm obr/min	23873	19894	15915	13263	9549
				feed posuw mm/min	48	80	95	80	76
	40	1.0D	D<1 : 0.15D D>1 : 0.25D	Vc m/min	40	65	70	65	60
				fz mm/tooth	0.002	0.003	0.004	0.005	0.006
				rpm obr/min	31831	25863	22282	17242	12732
				feed posuw mm/min	127	155	178	172	153
	41	1.0D	D<1 : 0.15D D>1 : 0.25D	Vc m/min	30	50	50	50	45
				fz mm/tooth	0.001	0.002	0.003	0.003	0.004
				rpm obr/min	23873	19894	15915	13263	9549
				feed posuw mm/min	48	80	95	80	76

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX42

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	100	12.0	16.0	20.0
P	1-4	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	65	75	85	90	95	95	90	95	100	95
				fz mm/tooth	0.01	0.015	0.025	0.032	0.039	0.057	0.064	0.064	0.062	0.063
				rpm obr/min	10345	7958	6764	5730	5040	3780	2865	2520	1989	1512
				feed posuw mm/min	207	239	338	367	393	431	367	323	247	191
	5	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	45	45	50	55	55	55	55	55	60	60
				fz mm/tooth	0.010	0.016	0.024	0.032	0.041	0.050	0.050	0.048	0.051	0.047
				rpm obr/min	7162	4775	3979	3501	2918	2188	1751	1459	1194	955
				feed posuw mm/min	143	153	191	224	239	219	175	140	122	90
	6-7	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	65	75	85	90	95	95	90	95	100	95
				fz mm/tooth	0.01	0.015	0.025	0.032	0.039	0.057	0.064	0.064	0.062	0.063
				rpm obr/min	10345	7958	6764	5730	5040	3780	2865	2520	1989	1512
				feed posuw mm/min	207	239	338	367	393	431	367	323	247	191
	8-9	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	45	45	50	55	55	55	55	55	60	60
				fz mm/tooth	0.010	0.016	0.024	0.032	0.041	0.050	0.050	0.048	0.051	0.047
				rpm obr/min	7162	4775	3979	3501	2918	2188	1751	1459	1194	955
				feed posuw mm/min	143	153	191	224	239	219	175	140	122	90
	10	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	65	75	85	90	95	95	90	95	100	95
				fz mm/tooth	0.01	0.015	0.025	0.032	0.039	0.057	0.064	0.064	0.062	0.063
				rpm obr/min	10345	7958	6764	5730	5040	3780	2865	2520	1989	1512
				feed posuw mm/min	207	239	338	367	393	431	367	323	247	191
	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	45	45	50	55	55	55	55	55	60	60
				fz mm/tooth	0.010	0.016	0.024	0.032	0.041	0.050	0.050	0.048	0.051	0.047
				rpm obr/min	7162	4775	3979	3501	2918	2188	1751	1459	1194	955
				feed posuw mm/min	143	153	191	224	239	219	175	140	122	90
M	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	35	40	45	45	50	45	45	45	50	45
				fz mm/tooth	0.009	0.016	0.024	0.032	0.039	0.053	0.06	0.059	0.066	0.06
				rpm obr/min	5570	4244	3581	2865	2653	1790	1432	1194	995	716
				feed posuw mm/min	100	136	172	183	207	190	172	141	131	86
K	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	65	75	85	90	95	95	90	95	100	95
				fz mm/tooth	0.01	0.015	0.025	0.032	0.039	0.057	0.064	0.064	0.062	0.063
				rpm obr/min	10345	7958	6764	5730	5040	3780	2865	2520	1989	1512
				feed posuw mm/min	207	239	338	367	393	431	367	323	247	191
H	38.1 - 38.2	1.0D	0.5D	Vc m/min	30	30	35	35	35	40	40	40	40	40
				fz mm/tooth	0.004	0.007	0.009	0.013	0.017	0.028	0.027	0.029	0.028	0.028
				rpm obr/min	4775	3183	2785	2228	1857	1592	1273	1061	796	637
				feed posuw mm/min	38	45	50	58	63	89	69	62	45	36
	40	1.0D	D<3 : 0.2D D>3: 0.25D	Vc m/min	45	45	50	55	55	55	55	55	60	60
				fz mm/tooth	0.01	0.016	0.024	0.032	0.041	0.05	0.05	0.048	0.051	0.047
				rpm obr/min	7162	4775	3979	3501	2918	2188	1751	1459	1194	955
				feed posuw mm/min	143	153	191	224	239	219	175	140	122	90
	41	1.0D	0.5D	Vc m/min	30	30	35	35	35	40	40	40	40	40
				fz mm/tooth	0.004	0.007	0.009	0.013	0.017	0.028	0.027	0.029	0.028	0.028
				rpm obr/min	4775	3183	2785	2228	1857	1592	1273	1061	796	637
				feed posuw mm/min	38	45	50	58	63	89	69	62	45	36

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX44

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX44004000A04002045	0,4	4	0,6	2	45	0,37
UFX44005000A04002045	0,5	4	0,7	2	45	0,45
UFX44005000A04004045	0,5	4	0,7	4	45	0,45
UFX44007000A04003045	0,7	4	1	3	45	0,65
UFX44008000A04004045	0,8	4	1,2	4	45	0,75
UFX44008000A04006045	0,8	4	1,2	6	45	0,75
UFX44010000A04004045	1	4	1,5	4	45	0,95
UFX44010000A04006045	1	4	1,5	6	45	0,95
UFX44010000A04008045	1	4	1,5	8	45	0,95
UFX44010000A04010045	1	4	1,5	10	45	0,95
UFX44010000A04012045	1	4	1,5	12	45	0,95
UFX44010000A04016050	1	4	1,5	16	50	0,95
UFX44010000A04020055	1	4	1,5	20	55	0,95
UFX44012000A04006045	1,2	4	1,8	6	45	1,15
UFX44015000A04006045	1,5	4	2,3	6	45	1,45
UFX44015000A04008045	1,5	4	2,3	8	45	1,45
UFX44015000A04010045	1,5	4	2,3	10	45	1,45
UFX44015000A04012045	1,5	4	2,3	12	45	1,45
UFX44015000A04016050	1,5	4	2,3	16	50	1,45
UFX44015000A04020055	1,5	4	2,3	20	55	1,45
UFX44018000A04012045	1,8	4	2,7	12	45	1,75
UFX44020000A04006045	2	4	3	6	45	1,95
UFX44020000A04008045	2	4	3	8	45	1,95
UFX44020000A04010045	2	4	3	10	45	1,95
UFX44020000A04012045	2	4	3	12	45	1,95
UFX44020000A04014050	2	4	3	14	50	1,95
UFX44020000A04016050	2	4	3	16	50	1,95
UFX44020000A04020055	2	4	3	20	55	1,95
UFX44020000A04025060	2	4	3	25	60	1,95
UFX44020000A04030070	2	4	3	30	70	1,95
UFX44025000A04016055	2,5	4	3,7	16	55	2,4
UFX44030000A06010045	3	6	4,5	10	45	2,85
UFX44030000A06012045	3	6	4,5	12	45	2,85
UFX44030000A06016055	3	6	4,5	16	55	2,85
UFX44030000A06018055	3	6	4,5	18	55	2,85
UFX44030000A06020060	3	6	4,5	20	60	2,85
UFX44030000A06025065	3	6	4,5	25	65	2,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.015	h5

UFX44

2 Finish Medium

HSM Vmax A min AIR

ISO	P											M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	LU	OAL	DN
UFX44030000A06030070	3	6	4,5	30	70	2,85
UFX44030000A06040090	3	6	4,5	40	90	2,85
UFX44040000A06016060	4	6	6	16	60	3,85
UFX44040000A06020060	4	6	6	20	60	3,85
UFX44040000A06025070	4	6	6	25	70	3,85
UFX44040000A06030070	4	6	6	30	70	3,85
UFX44040000A06040090	4	6	6	40	90	3,85
UFX44040000A06050100	4	6	6	50	100	3,85
UFX44060000A06030090	6	6	9	30	90	5,85
UFX44060000A06050110	6	6	9	50	110	5,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.015	h5

UFX44

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE RIB PROCESSING / FREZ O 2 ZĘBACH DO OBRÓBKI ŻEBER

ISO	VDI 3323	Ae mm	DC	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2
P	1-4	0.2D	Vc m/min	39~50	49~63	58~75	68~88	68~88	71~89	71~88	70~85
			fz mm/tooth	0.003~0.006	0.003~0.006	0.004~0.007	0.004~0.007	0.005~0.009	0.006~0.011	0.006~0.014	0.008~0.020
			rpm obr/min	32550~42000	32550~42000	32550~42000	32550~42000	28350~36750	26250~33080	23630~29400	19430~23630
			feed posuw mm/min	210~460	210~460	265~600	265~600	295~660	295~755	295~850	295~945
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
	5	0.2D	Vc m/min	28~35	35~44	42~53	49~62	49~62	49~64	49~63	49~62
			fz mm/tooth	0.002~0.006	0.002~0.006	0.002~0.008	0.002~0.008	0.003~0.010	0.005~0.012	0.006~0.015	0.007~0.018
			rpm obr/min	23630~29400	23630~29400	23630~29400	23630~29400	20480~25730	18380~23630	16490~21000	13650~17330
			feed posuw mm/min	90~355	90~355	115~450	115~450	125~505	170~565	200~630	200~630
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
	6-7	0.2D	Vc m/min	39~50	49~63	58~75	68~88	68~88	71~89	71~88	70~85
			fz mm/tooth	0.003~0.006	0.003~0.006	0.004~0.007	0.004~0.007	0.005~0.009	0.006~0.011	0.006~0.014	0.008~0.020
			rpm obr/min	32550~42000	32550~42000	32550~42000	32550~42000	28350~36750	26250~33080	23630~29400	19430~23630
			feed posuw mm/min	210~460	210~460	265~600	265~600	295~660	295~755	295~850	295~945
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
	8-9	0.2D	Vc m/min	28~35	35~44	42~53	49~62	49~62	49~64	49~63	49~62
			fz mm/tooth	0.002~0.006	0.002~0.006	0.002~0.008	0.002~0.008	0.003~0.010	0.005~0.012	0.006~0.015	0.007~0.018
			rpm obr/min	23630~29400	23630~29400	23630~29400	23630~29400	20480~25730	18380~23630	16490~21000	13650~17330
			feed posuw mm/min	90~355	90~355	115~450	115~450	125~505	170~565	200~630	200~630
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
	10	0.2D	Vc m/min	39~50	49~63	58~75	68~88	68~88	71~89	71~88	70~85
			fz mm/tooth	0.003~0.006	0.003~0.006	0.004~0.007	0.004~0.007	0.005~0.009	0.006~0.011	0.006~0.014	0.008~0.020
			rpm obr/min	32550~42000	32550~42000	32550~42000	32550~42000	28350~36750	26250~33080	23630~29400	19430~23630
			feed posuw mm/min	210~460	210~460	265~600	265~600	295~660	295~755	295~850	295~945
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
	11.1 - 11.2	0.2D	Vc m/min	28~35	35~44	42~53	49~62	49~62	49~64	49~63	49~62
			fz mm/tooth	0.002~0.006	0.002~0.006	0.002~0.008	0.002~0.008	0.003~0.010	0.005~0.012	0.006~0.015	0.007~0.018
			rpm obr/min	23630~29400	23630~29400	23630~29400	23630~29400	20480~25730	18380~23630	16490~21000	13650~17330
			feed posuw mm/min	90~355	90~355	115~450	115~450	125~505	170~565	200~630	200~630
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
K	15-20	0.2D	Vc m/min	39~50	49~63	58~75	68~88	68~88	71~89	71~88	70~85
			fz mm/tooth	0.003~0.006	0.003~0.006	0.004~0.007	0.004~0.007	0.005~0.009	0.006~0.011	0.006~0.014	0.008~0.020
			rpm obr/min	32550~42000	32550~42000	32550~42000	32550~42000	28350~36750	26250~33080	23630~29400	19430~23630
			feed posuw mm/min	210~460	210~460	265~600	265~600	295~660	295~755	295~850	295~945
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
H	38.1 - 38.2	0.1D	Vc m/min	18~21	22~27	27~32	31~37	31~37	31~35	31~39	31~40
			fz mm/tooth	0.001~0.003	0.001~0.003	0.001~0.003	0.001~0.003	0.002~0.004	0.003~0.005	0.003~0.005	0.004~0.006
			rpm obr/min	15020~17850	15020~17850	15020~17850	15020~17850	13130~15540	11550~13130	10500~13130	8720~11030
			feed posuw mm/min	30~95	30~95	40~115	40~115	45~130	60~135	70~135	70~135
			Ap mm	0.004~0.008	0.004~0.009	0.005~0.011	0.006~0.013	0.007~0.015	0.008~0.016	0.009~0.018	0.010~0.022
	40	0.2D	Vc m/min	28~35	35~44	42~53	49~62	49~62	49~64	49~63	49~62
			fz mm/tooth	0.002~0.006	0.002~0.006	0.002~0.008	0.002~0.008	0.003~0.010	0.005~0.012	0.006~0.015	0.007~0.018
			rpm obr/min	23630~29400	23630~29400	23630~29400	23630~29400	20480~25730	18380~23630	16490~21000	13650~17330
			feed posuw mm/min	90~355	90~355	115~450	115~450	125~505	170~565	200~630	200~630
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090	0.055~0.100
	41	0.1D	Vc m/min	18~21	22~27	27~32	31~37	31~37	31~35	31~39	31~40
			fz mm/tooth	0.001~0.003	0.001~0.003	0.001~0.003	0.001~0.003	0.002~0.004	0.003~0.005	0.003~0.005	0.004~0.006
			rpm obr/min	15020~17850	15020~17850	15020~17850	15020~17850	13130~15540	11550~13130	10500~13130	8720~11030
			feed posuw mm/min	30~95	30~95	40~115	40~115	45~130	60~135	70~135	70~135
			Ap mm	0.004~0.008	0.004~0.009	0.005~0.011	0.006~0.013	0.007~0.015	0.008~0.016	0.009~0.018	0.010~0.022

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX44

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE RIB PROCESSING / FREZ O 2 ZĘBACH DO OBRÓBKI ŻEBER

ISO	VDI 3323	Ae mm	DC	1.4	1.5	1.6	1.8	2.0	2.5	3.0	4.0	5.0	6.0
P	1-4	0.2D	Vc m/min	70~88	68~87	70~90	74~93	75~91	75~94	75~94	75~94	75~94	75~94
			fz mm/tooth	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
			rpm obr/min	16800~21000	15230~19430	14700~18900	13650~17330	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
			feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	5	0.2D	Vc m/min	51~62	49~64	51~64	52~65	52~66	53~67	52~66	52~67	52~66	53~66
			fz mm/tooth	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
			rpm obr/min	12080~14700	11030~14180	10710~13440	9660~12080	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
			feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	6-7	0.2D	Vc m/min	70~88	68~87	70~90	74~93	75~91	75~94	75~94	75~94	75~94	75~94
			fz mm/tooth	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
			rpm obr/min	16800~21000	15230~19430	14700~18900	13650~17330	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
			feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	8-9	0.2D	Vc m/min	51~62	49~64	51~64	52~65	52~66	53~67	52~66	52~67	52~66	53~66
			fz mm/tooth	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
			rpm obr/min	12080~14700	11030~14180	10710~13440	9660~12080	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
			feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	10	0.2D	Vc m/min	70~88	68~87	70~90	74~93	75~91	75~94	75~94	75~94	75~94	75~94
			fz mm/tooth	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
			rpm obr/min	16800~21000	15230~19430	14700~18900	13650~17330	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
			feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	11.1 - 11.2	0.2D	Vc m/min	51~62	49~64	51~64	52~65	52~66	53~67	52~66	52~67	52~66	53~66
			fz mm/tooth	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
			rpm obr/min	12080~14700	11030~14180	10710~13440	9660~12080	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
			feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
K	15-20	0.2D	Vc m/min	70~88	68~87	70~90	74~93	75~91	75~94	75~94	75~94	75~94	75~94
			fz mm/tooth	0.009~0.023	0.010~0.024	0.010~0.025	0.011~0.027	0.012~0.031	0.015~0.038	0.018~0.045	0.023~0.060	0.029~0.075	0.035~0.090
			rpm obr/min	16800~21000	15230~19430	14700~18900	13650~17330	12600~15230	9980~12600	8400~10500	6300~7880	5040~6300	4200~5250
			feed posuw mm/min	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945	295~945
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
H	38.1 - 38.2	0.1D	Vc m/min	32~40	32~39	32~40	32~41	33~41	34~42	33~41	33~41	33~41	33~49
			fz mm/tooth	0.005~0.007	0.005~0.008	0.005~0.008	0.006~0.009	0.006~0.010	0.008~0.012	0.009~0.015	0.013~0.020	0.015~0.025	0.019~0.025
			rpm obr/min	7560~9450	7040~8610	6720~8400	5990~7560	5570~6930	4520~5570	3680~4620	2730~3470	2210~2730	1840~2730
			feed posuw mm/min	70~135	70~135	70~135	70~135	70~135	70~135	70~135	70~135	70~135	70~135
			Ap mm	0.012~0.025	0.014~0.028	0.015~0.030	0.016~0.032	0.018~0.035	0.022~0.045	0.028~0.055	0.036~0.072	0.045~0.090	0.054~0.108
	40	0.2D	Vc m/min	51~62	49~64	51~64	52~65	52~66	53~67	52~66	52~67	52~66	53~66
			fz mm/tooth	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026	0.011~0.029	0.014~0.035	0.017~0.043	0.023~0.057	0.029~0.071	0.034~0.086
			rpm obr/min	12080~14700	11030~14180	10710~13440	9660~12080	8720~11030	7040~8930	5780~7350	4310~5570	3470~4410	2940~3680
			feed posuw mm/min	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630	200~630
			Ap mm	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360	0.225~0.450	0.270~0.540
	41	0.1D	Vc m/min	32~40	32~39	32~40	32~41	33~41	34~42	33~41	33~41	33~41	33~49
			fz mm/tooth	0.005~0.007	0.005~0.008	0.005~0.008	0.006~0.009	0.006~0.010	0.008~0.012	0.009~0.015	0.013~0.020	0.015~0.025	0.019~0.025
			rpm obr/min	7560~9450	7040~8610	6720~8400	5990~7560	5570~6930	4520~5570	3680~4620	2730~3470	2210~2730	1840~2730
			feed posuw mm/min	70~135	70~135	70~135	70~135	70~135	70~135	70~135	70~135	70~135	70~135
			Ap mm	0.012~0.025	0.014~0.028	0.015~0.030	0.016~0.032	0.018~0.035	0.022~0.045	0.028~0.055	0.036~0.072	0.045~0.090	0.054~0.108

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX46

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX46010000A03003038	1	3	2,5	38
UFX46015000A04005050	1,5	4	5	50
UFX46025000A03007038	2,5	3	7	38
UFX46030000A03010038	3	3	10	38
UFX46030000A06010050	3	6	10	50
UFX46040000A04012050	4	4	12	50
UFX46040000A06012050	4	6	12	50
UFX46050000A05014050	5	5	14	50
UFX46050000A06014057	5	6	14	57
UFX46060000A06016057	6	6	16	57
UFX46080000A08020063	8	8	20	63
UFX46100000A10022072	10	10	22	72
UFX46120000A12025073	12	12	25	73
UFX46160000A16032082	16	16	32	82

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX46

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-4	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.005	0.007	0.012	0.015	0.019	0.027	0.031	0.03	0.03
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	191	201	301	315	348	371	340	275	215
	5	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.005	0.008	0.011	0.015	0.020	0.024	0.023	0.023	0.024
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	119	153	171	186	223	201	154	128	107
	6-7	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.005	0.007	0.012	0.015	0.019	0.027	0.031	0.03	0.03
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	191	201	301	315	348	371	340	275	215
	8-9	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.005	0.008	0.011	0.015	0.020	0.024	0.023	0.023	0.024
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	119	153	171	186	223	201	154	128	107
	10	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.005	0.007	0.012	0.015	0.019	0.027	0.031	0.03	0.03
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	191	201	301	315	348	371	340	275	215
	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.005	0.008	0.011	0.015	0.020	0.024	0.023	0.023	0.024
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	119	153	171	186	223	201	154	128	107
M	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	45	50	55	55	60	60	60	55	60
				fz mm/tooth	0.004	0.008	0.011	0.015	0.019	0.025	0.029	0.029	0.031
				rpm obr/min	7162	5305	4377	3501	3183	2387	1910	1459	1194
				feed posuw mm/min	86	127	144	158	181	179	166	127	111
K	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.005	0.007	0.012	0.015	0.019	0.027	0.031	0.03	0.03
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	191	201	301	315	348	371	340	275	215
H	38.1 - 38.2	1.0D	0.50D	Vc m/min	35	35	40	40	40	45	45	50	50
				fz mm/tooth	0.002	0.004	0.004	0.007	0.008	0.013	0.013	0.014	0.013
				rpm obr/min	5570	3714	3183	2546	2122	1790	1432	1326	995
				feed posuw mm/min	33	45	38	53	51	70	56	56	39
	40	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.005	0.008	0.011	0.015	0.020	0.024	0.023	0.023	0.024
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	119	153	171	186	223	201	154	128	107
	41	1.0D	0.05D	Vc m/min	35	35	40	40	40	45	45	50	50
				fz mm/tooth	0.002	0.004	0.004	0.007	0.008	0.013	0.013	0.014	0.013
				rpm obr/min	5570	3714	3183	2546	2122	1790	1432	1326	995
				feed posuw mm/min	33	45	38	53	51	70	56	56	39

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX46

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-4	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.048	0.047
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	229	258	476	504	549	577	516	439	337
	5	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.039	0.039	0.038	0.037
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	143	172	295	298	345	326	261	212	166
	6-7	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.048	0.047
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	229	258	476	504	549	577	516	439	337
	8-9	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.039	0.039	0.038	0.037
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	143	172	295	298	345	326	261	212	166
	10	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.048	0.047
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	229	258	476	504	549	577	516	439	337
	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.039	0.039	0.038	0.037
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	143	172	295	298	345	326	261	212	166
M	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	45	50	55	55	60	60	60	55	60
				fz mm/tooth	0.006	0.009	0.018	0.024	0.029	0.042	0.046	0.044	0.047
				rpm obr/min	7162	5305	4377	3501	3183	2387	1910	1459	1194
				feed posuw mm/min	129	143	236	252	277	301	264	193	168
K	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	90	105	110	115	115	115	115	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.048	0.047
				rpm obr/min	12732	9549	8356	7003	6101	4576	3661	3050	2387
				feed posuw mm/min	229	258	476	504	549	577	516	439	337
H	38.1 - 38.2	1.0D	0.50D	Vc m/min	35	35	40	40	40	45	45	50	50
				fz mm/tooth	0.002	0.004	0.005	0.008	0.010	0.016	0.017	0.017	0.017
				rpm obr/min	5570	3714	3183	2546	2122	1790	1432	1326	995
				feed posuw mm/min	33	45	48	61	64	86	73	68	51
	40	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	50	60	65	65	70	70	70	70	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.039	0.039	0.038	0.037
				rpm obr/min	7958	6366	5173	4138	3714	2785	2228	1857	1492
				feed posuw mm/min	143	172	295	298	345	326	261	212	166
	41	1.0D	0.05D	Vc m/min	35	35	40	40	40	45	45	50	50
				fz mm/tooth	0.002	0.004	0.005	0.008	0.010	0.016	0.017	0.017	0.017
				rpm obr/min	5570	3714	3183	2546	2122	1790	1432	1326	995
				feed posuw mm/min	33	45	48	61	64	86	73	68	51

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX11

4 Finish Medium

HSM Vmax A min AIR

ISO	P											M			K							N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21												15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX11020000A04006040	2	4	6	40
UFX11020000A06006040	2	6	6	40
UFX11025000A04008040	2,5	4	8	40
UFX11025000A06008040	2,5	6	8	40
UFX11030000A06008045	3	6	8	45
UFX11035000A06010045	3,5	6	10	45
UFX11040000A06011045	4	6	11	45
UFX11045000A06011045	4,5	6	11	45
UFX11050000A06013050	5	6	13	50
UFX11060000A06013050	6	6	13	50
UFX11080000A08019060	8	8	19	60
UFX11100000A10022070	10	10	22	70
UFX11120000A12026075	12	12	26	75
UFX11140000A14026085	14	14	26	85
UFX11160000A16032100	16	16	32	100
UFX11200000A20038105	20	20	38	105
UFX11250000A25045120	25	25	45	120

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	95	105	110	115	120	115	115	125	120	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
				rpm obr/min	12732	10080	8356	7003	6101	4775	3661	3050	2487	1910	1528
				feed posuw mm/min	306	363	635	672	732	802	688	573	468	367	281
	5	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	55	60	65	65	70	70	70	70	75	75	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.037	0.037	0.037	0.038	0.039
				rpm obr/min	8754	6366	5173	4138	3714	2785	2228	1857	1492	1194	955
				feed posuw mm/min	210	229	393	397	460	423	330	275	221	181	149
	6-7	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	95	105	110	115	120	115	115	125	120	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
				rpm obr/min	12732	10080	8356	7003	6101	4775	3661	3050	2487	1910	1528
				feed posuw mm/min	306	363	635	672	732	802	688	573	468	367	281
	8-9	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	55	60	65	65	70	70	70	70	75	75	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.037	0.037	0.037	0.038	0.039
				rpm obr/min	8754	6366	5173	4138	3714	2785	2228	1857	1492	1194	955
				feed posuw mm/min	210	229	393	397	460	423	330	275	221	181	149
	10	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	95	105	110	115	120	115	115	125	120	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
				rpm obr/min	12732	10080	8356	7003	6101	4775	3661	3050	2487	1910	1528
				feed posuw mm/min	306	363	635	672	732	802	688	573	468	367	281
	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	55	60	65	65	70	70	70	70	75	75	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.037	0.037	0.037	0.038	0.039
				rpm obr/min	8754	6366	5173	4138	3714	2785	2228	1857	1492	1194	955
				feed posuw mm/min	210	229	393	397	460	423	330	275	221	181	149
M	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	45	50	55	55	60	60	60	55	60	60	60
				fz mm/tooth	0.005	0.009	0.018	0.024	0.029	0.041	0.045	0.044	0.046	0.045	0.044
				rpm obr/min	7162	5305	4377	3501	3183	2387	1910	1459	1194	955	764
				feed posuw mm/min	143	191	315	336	369	392	344	257	220	172	134
K	11.1 - 11.2	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	80	95	105	110	115	120	115	115	125	120	120
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
				rpm obr/min	12732	10080	8356	7003	6101	4775	3661	3050	2487	1910	1528
				feed posuw mm/min	306	363	635	672	732	802	688	573	468	367	281
H	38.1 - 38.2	1.0D	0.50D	Vc m/min	35	35	40	40	40	45	50	50	50	50	45
				fz mm/tooth	0.002	0.004	0.005	0.008	0.010	0.017	0.016	0.017	0.016	0.015	0.015
				rpm obr/min	5570	3714	3183	2546	2122	1790	1592	1326	995	796	573
				feed posuw mm/min	45	59	64	81	85	122	102	90	64	48	34
	40	1.0D	D<3 : 0.2D D>3: 0.5D	Vc m/min	55	60	65	65	70	70	70	70	75	75	75
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.037	0.037	0.037	0.038	0.039
				rpm obr/min	8754	6366	5173	4138	3714	2785	2228	1857	1492	1194	955
				feed posuw mm/min	210	229	393	397	460	423	330	275	221	181	149
	41	1.0D	0.05D	Vc m/min	35	35	40	40	40	45	50	50	50	50	45
				fz mm/tooth	0.002	0.004	0.005	0.008	0.010	0.017	0.016	0.017	0.016	0.015	0.015
				rpm obr/min	5570	3714	3183	2546	2122	1790	1592	1326	995	796	573
				feed posuw mm/min	45	59	64	81	85	122	102	90	64	48	34

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX17

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX17020000A04008040	2	4	8	40
UFX17030000A06012050	3	6	12	50
UFX17040000A06015050	4	6	15	50
UFX17050000A06020060	5	6	20	60
UFX17060000A06020060	6	6	20	60
UFX17080000A08025070	8	8	25	70
UFX17100000A10030090	10	10	30	90
UFX17120000A12030090	12	12	30	90
UFX17140000A16040110	14	16	40	110
UFX17160000A16050110	16	16	50	110
UFX17200000A20055110	20	20	55	110

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX17

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	0.05D	2.5D	Vc m/min	60	65	70	75	80	80	85	80	90	85
				fz mm/tooth	0.006	0.009	0.014	0.021	0.029	0.041	0.049	0.047	0.05	0.049
				rpm obr/min	9549	6897	5570	4775	4244	3183	2706	2122	1790	1353
				feed posuw mm/min	229	248	312	401	492	522	530	399	358	265
	5	0.05D	2.5D	Vc m/min	35	40	40	45	45	45	50	50	50	50
				fz mm/tooth	0.004	0.007	0.010	0.014	0.021	0.028	0.033	0.035	0.035	0.033
				rpm obr/min	5570	4244	3183	2865	2387	1790	1592	1326	995	796
				feed posuw mm/min	89	119	127	160	201	201	210	186	139	105
	6-7	0.05D	2.5D	Vc m/min	60	65	70	75	80	80	85	80	90	85
				fz mm/tooth	0.006	0.009	0.014	0.021	0.029	0.041	0.049	0.047	0.05	0.049
				rpm obr/min	9549	6897	5570	4775	4244	3183	2706	2122	1790	1353
				feed posuw mm/min	229	248	312	401	492	522	530	399	358	265
	8-9	0.05D	2.5D	Vc m/min	35	40	40	45	45	45	50	50	50	50
				fz mm/tooth	0.004	0.007	0.010	0.014	0.021	0.028	0.033	0.035	0.035	0.033
				rpm obr/min	5570	4244	3183	2865	2387	1790	1592	1326	995	796
				feed posuw mm/min	89	119	127	160	201	201	210	186	139	105
	10	0.05D	2.5D	Vc m/min	60	65	70	75	80	80	85	80	90	85
				fz mm/tooth	0.006	0.009	0.014	0.021	0.029	0.041	0.049	0.047	0.05	0.049
				rpm obr/min	9549	6897	5570	4775	4244	3183	2706	2122	1790	1353
				feed posuw mm/min	229	248	312	401	492	522	530	399	358	265
	11.1 - 11.2	0.05D	2.5D	Vc m/min	35	40	40	45	45	45	50	50	50	50
				fz mm/tooth	0.004	0.007	0.010	0.014	0.021	0.028	0.033	0.035	0.035	0.033
				rpm obr/min	5570	4244	3183	2865	2387	1790	1592	1326	995	796
				feed posuw mm/min	89	119	127	160	201	201	210	186	139	105
M	11.1 - 11.2	0.05D	2.5D	Vc m/min	60	65	70	75	80	80	85	80	90	85
				fz mm/tooth	0.006	0.009	0.014	0.021	0.029	0.041	0.049	0.047	0.05	0.049
				rpm obr/min	9549	6897	5570	4775	4244	3183	2706	2122	1790	1353
				feed posuw mm/min	229	248	312	401	492	522	530	399	358	265
H	38.1 - 38.2	0.02D	2.0D	Vc m/min	20	25	25	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.006	0.008	0.011	0.016	0.021	0.027	0.026	0.026	0.027
				rpm obr/min	3183	2653	1989	1910	1592	1194	955	796	597	477
				feed posuw mm/min	51	64	64	84	102	100	103	83	62	52
	40	0.05D	2.5D	Vc m/min	35	40	40	45	45	45	50	50	50	50
				fz mm/tooth	0.004	0.007	0.010	0.014	0.021	0.028	0.033	0.035	0.035	0.033
				rpm obr/min	5570	4244	3183	2865	2387	1790	1592	1326	995	796
				feed posuw mm/min	89	119	127	160	201	201	210	186	139	105
	41	0.02D	2.0D	Vc m/min	20	25	25	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.006	0.008	0.011	0.016	0.021	0.027	0.026	0.026	0.027
				rpm obr/min	3183	2653	1989	1910	1592	1194	955	796	597	477
				feed posuw mm/min	51	64	64	84	102	100	103	83	62	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX59

6-8 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL	#FLUTE
UFX59060000A06013057	6	6	13	57	6
UFX59080000A08019063	8	8	19	63	6
UFX59100000A10022072	10	10	22	72	6
UFX59120000A12026083	12	12	26	83	6
UFX59160000A16032092	16	16	32	92	6
UFX59200000A20038104	20	20	38	104	8

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX59

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6&8 FLUTE SIDE CUTTING NORMAL SPEED / FREZ O 6 I 8 ZĘBACH FREZOWANIE BOKIEM PRĘDKOŚĆ NORMALNA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	0.05D	2.5D	Vc m/min	105	110	110	110	110	105
				fz mm/tooth	0.06	0.079	0.099	0.099	0.1	0.075
				rpm obr/min	5570	4377	3501	2918	2188	1671
				feed posuw mm/min	2005	2075	2080	1733	1313	1003
	5	0.05D	2.5D	Vc m/min	75	75	75	75	75	75
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.075
				rpm obr/min	3979	2984	2387	1989	1492	1194
				feed posuw mm/min	1409	1397	1404	1158	886	716
	6-7	0.05D	2.5D	Vc m/min	105	110	110	110	110	105
				fz mm/tooth	0.06	0.079	0.099	0.099	0.1	0.075
				rpm obr/min	5570	4377	3501	2918	2188	1671
				feed posuw mm/min	2005	2075	2080	1733	1313	1003
	8-9	0.05D	2.5D	Vc m/min	75	75	75	75	75	75
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.075
				rpm obr/min	3979	2984	2387	1989	1492	1194
				feed posuw mm/min	1409	1397	1404	1158	886	716
	10	0.05D	2.5D	Vc m/min	105	110	110	110	110	105
				fz mm/tooth	0.06	0.079	0.099	0.099	0.1	0.075
				rpm obr/min	5570	4377	3501	2918	2188	1671
				feed posuw mm/min	2005	2075	2080	1733	1313	1003
	11.1 - 11.2	0.05D	2.5D	Vc m/min	75	75	75	75	75	75
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.075
				rpm obr/min	3979	2984	2387	1989	1492	1194
				feed posuw mm/min	1409	1397	1404	1158	886	716
H	38.1	0.02D	2.0D	Vc m/min	75	75	75	75	75	75
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.075
				rpm obr/min	3979	2984	2387	1989	1492	1194
				feed posuw mm/min	1409	1397	1404	1158	886	716
	38.2	0.05D	2.5D	Vc m/min	30	30	30	30	35	30
				fz mm/tooth	0.022	0.030	0.035	0.036	0.035	0.027
				rpm obr/min	1592	1194	955	796	696	477
				feed posuw mm/min	210	215	201	172	146	103
	40	0.02D	2.0D	Vc m/min	75	75	75	75	75	75
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.075
				rpm obr/min	3979	2984	2387	1989	1492	1194
				feed posuw mm/min	1409	1397	1404	1158	886	716
	41	0.02D	2.0D	Vc m/min	30	30	30	30	35	30
				fz mm/tooth	0.022	0.030	0.035	0.036	0.035	0.027
				rpm obr/min	1592	1194	955	796	696	477
				feed posuw mm/min	210	215	201	172	146	103

6&8 FLUTE SIDE CUTTING HIGH SPEED / FREZ O 6 I 8 ZĘBACH FREZOWANIE BOKIEM PRĘDKOŚĆ WYSOKA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	0.05D	2.5D	Vc m/min	325	325	320	325	325	325
				fz mm/tooth	0.06	0.081	0.1	0.1	0.1	0.076
				rpm obr/min	17242	12931	10186	8621	6466	5173
				feed posuw mm/min	6207	6285	6112	5173	3879	3145
	6-9	0.05D	2.5D	Vc m/min	325	325	320	325	325	325
				fz mm/tooth	0.06	0.081	0.1	0.1	0.1	0.076
				rpm obr/min	17242	12931	10186	8621	6466	5173
				feed posuw mm/min	6207	6285	6112	5173	3879	3145
	10 - 11.2	0.05D	2.5D	Vc m/min	325	325	320	325	325	325
				fz mm/tooth	0.06	0.081	0.1	0.1	0.1	0.076
				rpm obr/min	17242	12931	10186	8621	6466	5173
				feed posuw mm/min	6207	6285	6112	5173	3879	3145
H	38.1	0.02D	2.0D	Vc m/min	325	325	320	325	325	325
				fz mm/tooth	0.060	0.081	0.100	0.100	0.100	0.076
				rpm obr/min	17242	12931	10186	8621	6466	5173
				feed posuw mm/min	6207	6285	6112	5173	3879	3145
	38.2	0.02D	2.0D	Vc m/min	160	160	160	160	160	160
				fz mm/tooth	0.060	0.081	0.101	0.100	0.100	0.073
				rpm obr/min	8488	6366	5093	4244	3183	2546
				feed posuw mm/min	3056	3094	3086	2546	1910	1487
	40	0.05D	2.5D	Vc m/min	325	325	320	325	325	325
				fz mm/tooth	0.060	0.081	0.100	0.100	0.100	0.076
				rpm obr/min	17242	12931	10186	8621	6466	5173
				feed posuw mm/min	6207	6285	6112	5173	3879	3145
	41	0.02D	2.0D	Vc m/min	160	160	160	160	160	160
				fz mm/tooth	0.060	0.081	0.101	0.100	0.100	0.073
				rpm obr/min	8488	6366	5093	4244	3183	2546
				feed posuw mm/min	3056	3094	3086	2546	1910	1487

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX81

6 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●				○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL
UFX81060000A06026070	6	6	26	70
UFX81080000A08036090	8	8	36	90
UFX81100000A10046100	10	10	46	100
UFX81120000A12056110	12	12	56	110
UFX81160000A16066130	16	16	66	130
UFX81200000A20076140	20	20	76	140
UFX81250000A25092180	25	25	92	180

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFX81

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING / FREZ O 6 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.01D	3.0D	Vc m/min	45	45	45	45	45	45	45
				fz mm/tooth	0.035	0.045	0.055	0.06	0.065	0.07	0.074
				rpm obr/min	2387	1790	1432	1194	895	716	573
				feed posuw mm/min	501	483	473	430	349	301	254
	5	0.01D	3.0D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.035	0.044	0.050	0.053	0.061	0.067	0.071
				rpm obr/min	1592	1194	955	796	597	477	382
				feed posuw mm/min	334	315	286	253	218	192	163
	6-7	0.01D	3.0D	Vc m/min	45	45	45	45	45	45	45
				fz mm/tooth	0.035	0.045	0.055	0.06	0.065	0.07	0.074
				rpm obr/min	2387	1790	1432	1194	895	716	573
				feed posuw mm/min	501	483	473	430	349	301	254
	8-9	0.01D	3.0D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.035	0.044	0.050	0.053	0.061	0.067	0.071
				rpm obr/min	1592	1194	955	796	597	477	382
				feed posuw mm/min	334	315	286	253	218	192	163
	10	0.01D	3.0D	Vc m/min	45	45	45	45	45	45	45
				fz mm/tooth	0.035	0.045	0.055	0.06	0.065	0.07	0.074
				rpm obr/min	2387	1790	1432	1194	895	716	573
				feed posuw mm/min	501	483	473	430	349	301	254
	11.1 - 11.2	0.01D	3.0D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.035	0.044	0.050	0.053	0.061	0.067	0.071
				rpm obr/min	1592	1194	955	796	597	477	382
				feed posuw mm/min	334	315	286	253	218	192	163
M	11.1 - 11.2	0.01D	3.0D	Vc m/min	45	45	45	45	45	45	45
				fz mm/tooth	0.035	0.045	0.055	0.06	0.065	0.07	0.074
				rpm obr/min	2387	1790	1432	1194	895	716	573
				feed posuw mm/min	501	483	473	430	349	301	254
H	38.1 - 38.2	0.005D	3.0D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.030	0.038	0.046	0.051	0.054	0.060	0.064
				rpm obr/min	1326	995	796	663	497	398	318
				feed posuw mm/min	239	227	220	203	161	143	122
	40	0.01D	3.0D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.035	0.044	0.050	0.053	0.061	0.067	0.071
				rpm obr/min	1592	1194	955	796	597	477	382
				feed posuw mm/min	334	315	286	253	218	192	163
	41	0.005D	3.0D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.030	0.038	0.046	0.051	0.054	0.060	0.064
				rpm obr/min	1326	995	796	663	497	398	318
				feed posuw mm/min	239	227	220	203	161	143	122

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFX91

3-4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○																		○		●	○

CODE	DC	DCON	APMX	OAL	#FLUTE	CHAMFER
UFX91060000A06016057	6	6	16	57	3	0,38
UFX91080000A08016063	8	8	16	63	3	0,38
UFX91100000A10022072	10	10	22	72	4	0,6
UFX91120000A12026083	12	12	26	83	4	0,6
UFX91160000A16032092	16	16	32	92	4	0,6
UFX91200000A20038104	20	20	38	104	4	0,6

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM

	1-3	3-6	6-10	10-18	18-30
h10	0	0	0	0	0
	-40	-48	-58	-70	-84
h5	0	0	0	0	0
	-4	-5	-6	-8	-9

UFX91

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3&4 FLUTE ROUGHING SIDE CUTTING / FREZ O 3 LUB 4 ZĘBACH ZGRUBNE FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	0.01D	3.0D	Vc m/min	310	305	305	315	315	315
				fz mm/tooth	0.05	0.067	0.063	0.075	0.1	0.113
				rpm obr/min	16446	12136	9708	8356	6267	5013
				feed posuw mm/min	2467	2439	2447	2507	2507	2266
	5	0.01D	3.0D	Vc m/min	245	245	250	240	255	240
				fz mm/tooth	0.023	0.030	0.028	0.033	0.040	0.039
				rpm obr/min	12998	9748	7958	6366	5073	3820
				feed posuw mm/min	897	877	891	840	812	596
	6-7	0.01D	3.0D	Vc m/min	310	305	305	315	315	315
				fz mm/tooth	0.05	0.067	0.063	0.075	0.1	0.113
				rpm obr/min	16446	12136	9708	8356	6267	5013
				feed posuw mm/min	2467	2439	2447	2507	2507	2266
	8-9	0.01D	3.0D	Vc m/min	245	245	250	240	255	240
				fz mm/tooth	0.023	0.030	0.028	0.033	0.040	0.039
				rpm obr/min	12998	9748	7958	6366	5073	3820
				feed posuw mm/min	897	877	891	840	812	596
	10	0.01D	3.0D	Vc m/min	310	305	305	315	315	315
				fz mm/tooth	0.05	0.067	0.063	0.075	0.1	0.113
				rpm obr/min	16446	12136	9708	8356	6267	5013
				feed posuw mm/min	2467	2439	2447	2507	2507	2266
	11.1 - 11.2	0.01D	3.0D	Vc m/min	245	245	250	240	255	240
				fz mm/tooth	0.023	0.030	0.028	0.033	0.040	0.039
				rpm obr/min	12998	9748	7958	6366	5073	3820
				feed posuw mm/min	897	877	891	840	812	596
M	11.1 - 11.2	0.01D	3.0D	Vc m/min	165	165	170	165	175	160
				fz mm/tooth	0.023	0.03	0.028	0.034	0.039	0.038
				rpm obr/min	8754	6565	5411	4377	3482	2546
				feed posuw mm/min	604	591	606	595	543	387
K	15 - 20	0.01D	3.0D	Vc m/min	310	305	305	315	315	315
				fz mm/tooth	0.05	0.067	0.063	0.075	0.1	0.113
				rpm obr/min	16446	12136	9708	8356	6267	5013
				feed posuw mm/min	2467	2439	2447	2507	2507	2266
H	38.1 - 38.2	0.005D	3.0D	Vc m/min	65	65	65	65	65	65
				fz mm/tooth	0.026	0.033	0.036	0.039	0.034	0.038
				rpm obr/min	3448	2586	2069	1724	1293	1035
				feed posuw mm/min	269	256	298	269	176	157
	40	0.01D	3.0D	Vc m/min	245	245	250	240	255	240
				fz mm/tooth	0.023	0.030	0.028	0.033	0.040	0.039
				rpm obr/min	12998	9748	7958	6366	5073	3820
				feed posuw mm/min	897	877	891	840	812	596
	41	0.005D	3.0D	Vc m/min	65	65	65	65	65	65
				fz mm/tooth	0.026	0.033	0.036	0.039	0.034	0.038
				rpm obr/min	3448	2586	2069	1724	1293	1035
				feed posuw mm/min	269	256	298	269	176	157

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

P M K N S H

UFI END MILLS are designed to machine hardened steel 30-40 HRC, carbon steel and HB225-HB325 alloy steel, stainless steel, titanium, heat-resistant alloys.

FREZY WALCOWO-CZOŁOWE UFI przeznaczone są do obróbki stali wstępnie utwardzanej 30-40 HRC, stali węglowej oraz stali stopowej HB225-HB325, stali nierdzewnej, tytanu, stopów żaroodpornych.

UFI END MILLS
FREZY UFI

Group					ISO	PAGE
UFI40		R	4		P M K N S H	289
UFI28		R	5		P M K N S H	293
UFI30		R	5		P M K N S H	295
UFI20		R	5		P M K N S H	299
UFI25		R	5		P M K N S H	301
UFI60		R	6		P M K N S H	303
UFI80		R	6		P M K N S H	305
UFI12			6		P M K N S H	307
UFI14			6		P M K N S H	309

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

UFI40

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○

ISO	N																				S										H			
HRc																					15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100													200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
											○	○	○	○	○	●	●				

PLAIN	FLAT	RE	DC	DCON	APMX	LU	OAL	DN
UFI40060005A06013057	UFI40060005B06013057	R0,5	6	6	13	20	57	5,5
UFI40060010A06013057	UFI40060010B06013057	R1,0	6	6	13	20	57	5,5
UFI40080005A08019063	UFI40080005B08019063	R0,5	8	8	19	25	63	7,5
UFI40080010A08019063	UFI40080010B08019063	R1,0	8	8	19	25	63	7,5
UFI40080015A08019063	UFI40080015B08019063	R1,5	8	8	19	25	63	7,5
UFI40080020A08019063	UFI40080020B08019063	R2,0	8	8	19	25	63	7,5
UFI40100005A10022072	UFI40100005B10022072	R0,5	10	10	22	30	72	9,2
UFI40100010A10022072	UFI40100010B10022072	R1,0	10	10	22	30	72	9,2
UFI40100015A10022072	UFI40100015B10022072	R1,5	10	10	22	30	72	9,2
UFI40100020A10022072	UFI40100020B10022072	R2,0	10	10	22	30	72	9,2
UFI40120005A12026083	UFI40120005B12026083	R0,5	12	12	26	35	83	11
UFI40120010A12026083	UFI40120010B12026083	R1,0	12	12	26	35	83	11
UFI40120015A12026083	UFI40120015B12026083	R1,5	12	12	26	35	83	11
UFI40120020A12026083	UFI40120020B12026083	R2,0	12	12	26	35	83	11
UFI40120030A12026083	UFI40120030B12026083	R3,0	12	12	26	35	83	11
UFI40140010A14026083	UFI40140010B14026083	R1,0	14	14	26	35	83	13
UFI40140020A14026083	UFI40140020B14026083	R2,0	14	14	26	35	83	13
UFI40160010A16035092	UFI40160010B16035092	R1,0	16	16	35	43	92	15

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI40

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○											○	○	○	○	○	●	●				

PLAIN	FLAT	RE	DC	DCON	APMX	LU	OAL	DN
UFI40160015A16035092	UFI40160015B16035092	R1,5	16	16	35	43	92	15
UFI40160020A16035092	UFI40160020B16035092	R2,0	16	16	35	43	92	15
UFI40160030A16035092	UFI40160030B16035092	R3,0	16	16	35	43	92	15
UFI40160040A16035092	UFI40160040B16035092	R4,0	16	16	35	43	92	15
UFI40200010A20044110	UFI40200010B20044110	R1,0	20	20	44	56	110	19
UFI40200015A20044110	UFI40200015B20044110	R1,5	20	20	44	56	110	19
UFI40200020A20044110	UFI40200020B20044110	R2,0	20	20	44	56	110	19
UFI40200030A20044110	UFI40200030B20044110	R3,0	20	20	44	56	110	19
UFI40200035A20044110	UFI40200035B20044110	R3,5	20	20	44	56	110	19
UFI40200040A20044110	UFI40200040B20044110	R4,0	20	20	44	56	110	19
UFI40250010A25055130	UFI40250010B25055130	R1,0	25	25	55	70	130	24
UFI40250015A25055130	UFI40250015B25055130	R1,5	25	25	55	70	130	24
UFI40250020A25055130	UFI40250020B25055130	R2,0	25	25	55	70	130	24
UFI40250030A25055130	UFI40250030B25055130	R3,0	25	25	55	70	130	24
UFI40250040A25055130	UFI40250040B25055130	R4,0	25	25	55	70	130	24

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI40

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-4	0.4D	1.0D	Vc m/min	160	160	160	160	160	160	160	160
				fz mm/tooth	0.027	0.035	0.042	0.053	0.058	0.063	0.077	0.084
				rpm obr/min	8488	6366	5093	4244	3638	3183	2546	2037
				feed posuw mm/min	917	891	856	900	844	802	784	684
	5	0.4D	1.0D	Vc m/min	150	150	150	150	150	150	150	150
				fz mm/tooth	0.025	0.035	0.042	0.049	0.056	0.063	0.070	0.084
				rpm obr/min	7958	5968	4775	3979	3410	2984	2387	1910
				feed posuw mm/min	796	836	802	780	764	752	668	642
	6-7	0.4D	1.0D	Vc m/min	160	160	160	160	160	160	160	160
				fz mm/tooth	0.027	0.035	0.042	0.053	0.058	0.063	0.077	0.084
				rpm obr/min	8488	6366	5093	4244	3638	3183	2546	2037
				feed posuw mm/min	917	891	856	900	844	802	784	684
	8	0.4D	1.0D	Vc m/min	150	150	150	150	150	150	150	150
				fz mm/tooth	0.025	0.035	0.042	0.049	0.056	0.063	0.070	0.084
				rpm obr/min	7958	5968	4775	3979	3410	2984	2387	1910
				feed posuw mm/min	796	836	802	780	764	752	668	642
	9	0.4D	1.0D	Vc m/min	150	150	150	150	150	150	150	150
				fz mm/tooth	0.027	0.035	0.046	0.053	0.060	0.067	0.077	0.084
				rpm obr/min	7958	5968	4775	3979	3410	2984	2387	1910
				feed posuw mm/min	859	836	879	844	819	800	735	642
	10 - 11.1	0.4D	1.0D	Vc m/min	150	150	150	150	150	150	150	150
				fz mm/tooth	0.027	0.035	0.046	0.053	0.060	0.067	0.077	0.084
				rpm obr/min	7958	5968	4775	3979	3410	2984	2387	1910
				feed posuw mm/min	859	836	879	844	819	800	735	642
M	12 - 13	0.4D	1.0D	Vc m/min	155	155	155	155	155	155	155	155
				fz mm/tooth	0.034	0.046	0.057	0.067	0.076	0.086	0.095	0.114
				rpm obr/min	8223	6167	4934	4112	3524	3084	2467	1974
				feed posuw mm/min	1118	1135	1125	1102	1071	1061	937	900
	14.1	0.4D	1.0D	Vc m/min	105	105	105	105	105	105	105	105
				fz mm/tooth	0.025	0.034	0.042	0.048	0.055	0.062	0.071	0.081
				rpm obr/min	5570	4178	3342	2785	2387	2089	1671	1337
				feed posuw mm/min	557	568	561	535	525	518	475	433
	14.2	0.4D	0.6D	Vc m/min	44	44	44	44	44	44	44	44
				fz mm/tooth	0.016	0.021	0.027	0.032	0.036	0.040	0.046	0.052
				rpm obr/min	2334	1751	1401	1167	1000	875	700	560
				feed posuw mm/min	149	147	151	149	144	140	129	117
K	15-20	0.4D	1.0D	Vc m/min	175	175	175	175	175	175	175	175
				fz mm/tooth	0.021	0.028	0.035	0.042	0.048	0.053	0.060	0.070
				rpm obr/min	9284	6963	5570	4642	3979	3482	2785	2228
				feed posuw mm/min	780	780	780	780	764	738	668	624
S	31-35	0.3D	0.6D	Vc m/min	32	32	32	32	32	32	32	32
				fz mm/tooth	0.020	0.026	0.032	0.038	0.044	0.048	0.055	0.065
				rpm obr/min	1698	1273	1019	849	728	637	509	407
				feed posuw mm/min	136	132	130	129	128	122	112	106
	36-37	0.4D	1.0D	Vc m/min	70	70	70	70	70	70	70	70
				fz mm/tooth	0.034	0.048	0.057	0.067	0.076	0.086	0.095	0.114
				rpm obr/min	3714	2785	2228	1857	1592	1393	1114	891
				feed posuw mm/min	505	535	508	498	484	479	423	406

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI40

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-4	0.4D	1.0D	Vc m/min	125	125	125	125	125	125	125	125
				fz mm/tooth	0.025	0.034	0.042	0.049	0.056	0.063	0.070	0.084
				rpm obr/min	6631	4974	3979	3316	2842	2487	1989	1592
				feed posuw mm/min	663	676	668	650	637	627	557	535
	5	0.4D	1.0D	Vc m/min	120	120	120	120	120	120	120	120
				fz mm/tooth	0.025	0.034	0.042	0.049	0.056	0.063	0.070	0.077
				rpm obr/min	6366	4775	3820	3183	2728	2387	1910	1528
				feed posuw mm/min	637	649	642	624	611	602	535	471
	6-7	0.4D	1.0D	Vc m/min	125	125	125	125	125	125	125	125
				fz mm/tooth	0.025	0.034	0.042	0.049	0.056	0.063	0.070	0.084
				rpm obr/min	6631	4974	3979	3316	2842	2487	1989	1592
				feed posuw mm/min	663	676	668	650	637	627	557	535
	8-9	0.4D	1.0D	Vc m/min	120	120	120	120	120	120	120	120
				fz mm/tooth	0.025	0.034	0.042	0.049	0.056	0.063	0.070	0.077
				rpm obr/min	6366	4775	3820	3183	2728	2387	1910	1528
				feed posuw mm/min	637	649	642	624	611	602	535	471
	10 - 11.1	0.4D	1.0D	Vc m/min	120	120	120	120	120	120	120	120
				fz mm/tooth	0.027	0.035	0.042	0.053	0.058	0.063	0.077	0.084
				rpm obr/min	6366	4775	3820	3183	2728	2387	1910	1528
				feed posuw mm/min	688	668	642	675	633	602	588	513
M	12 - 13	0.4D	1.0D	Vc m/min	125	125	125	125	125	125	125	125
				fz mm/tooth	0.034	0.046	0.057	0.067	0.074	0.081	0.095	0.105
				rpm obr/min	6631	4974	3979	3316	2842	2487	1989	1592
				feed posuw mm/min	902	915	907	889	841	806	756	668
	14.1	0.4D	1.0D	Vc m/min	85	85	85	85	85	85	85	85
				fz mm/tooth	0.025	0.034	0.042	0.048	0.055	0.062	0.071	0.081
				rpm obr/min	4509	3382	2706	2255	1933	1691	1353	1082
				feed posuw mm/min	451	460	455	433	425	419	384	351
	14.2	0.4D	0.6D	Vc m/min	36	36	36	36	36	36	36	36
				fz mm/tooth	0.016	0.021	0.027	0.032	0.036	0.040	0.046	0.052
				rpm obr/min	1910	1432	1146	955	819	716	573	458
				feed posuw mm/min	122	120	124	122	118	115	105	95
K	15-20	0.4D	1.0D	Vc m/min	140	140	140	140	140	140	140	140
				fz mm/tooth	0.021	0.028	0.035	0.042	0.048	0.053	0.060	0.067
				rpm obr/min	7427	5570	4456	3714	3183	2785	2228	1783
				feed posuw mm/min	624	624	624	624	611	590	535	478
S	31-35	0.3D	0.6D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.018	0.024	0.030	0.036	0.040	0.044	0.050	0.055
				rpm obr/min	1326	995	796	663	568	497	398	318
				feed posuw mm/min	95	95	95	95	91	88	80	70
	36-37	0.4D	1.0D	Vc m/min	55	55	55	55	55	55	55	55
				fz mm/tooth	0.034	0.046	0.057	0.067	0.076	0.086	0.095	0.105
				rpm obr/min	2918	2188	1751	1459	1251	1094	875	700
				feed posuw mm/min	397	403	399	391	380	376	333	294

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI28

R 5 Finish Medium

HSM Vmax A B min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○

ISO	N												S								H			
HRc													15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100					200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30			31	32	33	34	35	36	37		38	39	40	41
													○	○	○	○	○	●	●					

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFI28060005A06010054	UFI28060005B06010054	R0,5	6	6	10	54
UFI28080005A08012058	UFI28080005B08012058	R0,5	8	8	12	58
UFI28100005A10014066	UFI28100005B10014066	R0,5	10	10	14	66
UFI28120005A12016073	UFI28120005B12016073	R0,5	12	12	16	73
UFI28160010A16022082	UFI28160010B16022082	R1,0	16	16	22	82
UFI28200010A20026092	UFI28200010B20026092	R1,0	20	20	26	92
UFI28250010A25029100	UFI28250010B25029100	R1,0	25	25	29	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI28

CUTTING CONDITIONS PARAMETRY SKRAWANIA

5 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 5 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	5	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	6-7	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	8-9	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	10 - 11.1	0.3D	1.5D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.024	0.027	0.035	0.044	0.049	0.054	0.058	0.062	0.071
				rpm obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				feed posuw mm/min	382	322	334	350	334	322	308	296	271
M	12 - 13	0.3D	1.5D	Vc m/min	117	117	117	117	117	117	117	117	117
				fz mm/tooth	0.024	0.025	0.030	0.046	0.051	0.054	0.057	0.061	0.071
				rpm obr/min	6207	4655	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	745	582	559	714	678	628	590	568	529
	14.1	0.3D	1.5D	Vc m/min	82	82	82	82	82	82	82	82	82
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	4350	3263	2610	2175	1864	1631	1450	1305	1044
				feed posuw mm/min	653	522	496	685	606	563	508	496	459
	14.2	0.3D	1.5D	Vc m/min	59	59	59	59	59	59	59	59	59
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	3130	2348	1878	1565	1341	1174	1043	939	751
				feed posuw mm/min	470	376	357	493	436	405	365	357	331
K	15-20	0.3D	1.5D	Vc m/min	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.043	0.048	0.063	0.079	0.087	0.096	0.103	0.111	0.126
				rpm obr/min	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	1209	1012	1063	1111	1048	1012	965	936	850
S	31-35	0.1D	1.5D	Vc m/min	31	31	31	31	31	31	31	31	31
				fz mm/tooth	0.021	0.022	0.027	0.044	0.046	0.048	0.049	0.053	0.062
				rpm obr/min	1645	1233	987	822	705	617	548	493	395
				feed posuw mm/min	173	136	133	181	162	148	134	131	122
	36-37	0.3D	1.5D	Vc m/min	69	69	69	69	69	69	69	69	69
				fz mm/tooth	0.027	0.029	0.034	0.057	0.059	0.062	0.063	0.069	0.079
				rpm obr/min	3661	2745	2196	1830	1569	1373	1220	1098	879
				feed posuw mm/min	494	398	373	522	463	426	384	379	347

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI30

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○											○	○	○	○	○	●	●				

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFI30060003A06013057	UFI30060003B06013057	R0,3	6	6	13	57
UFI30060005A06013057	UFI30060005B06013057	R0,5	6	6	13	57
UFI30060010A06013057	UFI30060010B06013057	R1,0	6	6	13	57
UFI30080005A08019063	UFI30080005B08019063	R0,5	8	8	19	63
UFI30080010A08019063	UFI30080010B08019063	R1,0	8	8	19	63
UFI30080015A08019063	UFI30080015B08019063	R1,5	8	8	19	63
UFI30080020A08019063	UFI30080020B08019063	R2,0	8	8	19	63
UFI30100005A10022072	UFI30100005B10022072	R0,5	10	10	22	72
UFI30100010A10022072	UFI30100010B10022072	R1,0	10	10	22	72
UFI30100015A10022072	UFI30100015B10022072	R1,5	10	10	22	72
UFI30100020A10022072	UFI30100020B10022072	R2,0	10	10	22	72
UFI30120005A12026083	UFI30120005B12026083	R0,5	12	12	26	83
UFI30120010A12026083	UFI30120010B12026083	R1,0	12	12	26	83
UFI30120015A12026083	UFI30120015B12026083	R1,5	12	12	26	83
UFI30120020A12026083	UFI30120020B12026083	R2,0	12	12	26	83
UFI30120025A12026083	UFI30120025B12026083	R2,5	12	12	26	83
UFI30120030A12026083	UFI30120030B12026083	R3,0	12	12	26	83
UFI30160010A16036092	UFI30160010B16036092	R1,0	16	16	36	92
UFI30160015A16036092	UFI30160015B16036092	R1,5	16	16	36	92
UFI30160020A16036092	UFI30160020B16036092	R2,0	16	16	36	92
UFI30160025A16036092	UFI30160025B16036092	R2,5	16	16	36	92
UFI30160030A16036092	UFI30160030B16036092	R3,0	16	16	36	92

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI30

CUTTING CONDITIONS PARAMETRY SKRAWANIA

5 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 5 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	5	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	6-7	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	8-9	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	10 - 11.1	0.3D	1.5D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.024	0.027	0.035	0.044	0.049	0.054	0.058	0.062	0.071
				rpm obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				feed posuw mm/min	382	322	334	350	334	322	308	296	271
M	12 - 13	0.3D	1.5D	Vc m/min	117	117	117	117	117	117	117	117	117
				fz mm/tooth	0.024	0.025	0.030	0.046	0.051	0.054	0.057	0.061	0.071
				rpm obr/min	6207	4655	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	745	582	559	714	678	628	590	568	529
	14.1	0.3D	1.5D	Vc m/min	82	82	82	82	82	82	82	82	82
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	4350	3263	2610	2175	1864	1631	1450	1305	1044
				feed posuw mm/min	653	522	496	685	606	563	508	496	459
	14.2	0.3D	1.5D	Vc m/min	59	59	59	59	59	59	59	59	59
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	3130	2348	1878	1565	1341	1174	1043	939	751
				feed posuw mm/min	470	376	357	493	436	405	365	357	331
K	15-20	0.3D	1.5D	Vc m/min	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.043	0.048	0.063	0.079	0.087	0.096	0.103	0.111	0.126
				rpm obr/min	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	1209	1012	1063	1111	1048	1012	965	936	850
S	31-35	0.1D	1.5D	Vc m/min	31	31	31	31	31	31	31	31	31
				fz mm/tooth	0.021	0.022	0.027	0.044	0.046	0.048	0.049	0.053	0.062
				rpm obr/min	1645	1233	987	822	705	617	548	493	395
				feed posuw mm/min	173	136	133	181	162	148	134	131	122
	36-37	0.3D	1.5D	Vc m/min	69	69	69	69	69	69	69	69	69
				fz mm/tooth	0.027	0.029	0.034	0.057	0.059	0.062	0.063	0.069	0.079
				rpm obr/min	3661	2745	2196	1830	1569	1373	1220	1098	879
				feed posuw mm/min	494	398	373	522	463	426	384	379	347

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI30

R 5 Finish Medium

HSM Vmax A B min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○

ISO	N													S								H			
HRc														15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100						200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30				31	32	33	34	35	36	37		38	39	40	41
														○	○	○	○	○	●	●					

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFI30160040A16036092	UFI30160040B16036092	R4,0	16	16	36	92
UFI30200010A20044104	UFI30200010B20044104	R1,0	20	20	44	104
UFI30200015A20044104	UFI30200015B20044104	R1,5	20	20	44	104
UFI30200020A20044104	UFI30200020B20044104	R2,0	20	20	44	104
UFI30200025A20044104	UFI30200025B20044104	R2,5	20	20	44	104
UFI30200030A20044104	UFI30200030B20044104	R3,0	20	20	44	104
UFI30200040A20044104	UFI30200040B20044104	R4,0	20	20	44	104
UFI30200050A20044104	UFI30200050B20044104	R5,0	20	20	44	104
UFI30250010A25054121	UFI30250010B25054121	R1,0	25	25	54	121
UFI30250015A25054121	UFI30250015B25054121	R1,5	25	25	54	121
UFI30250020A25054121	UFI30250020B25054121	R2,0	25	25	54	121
UFI30250025A25054121	UFI30250025B25054121	R2,5	25	25	54	121
UFI30250030A25054121	UFI30250030B25054121	R3,0	25	25	54	121
UFI30250040A25054121	UFI30250040B25054121	R4,0	25	25	54	121
UFI30250050A25054121	UFI30250050B25054121	R5,0	25	25	54	121

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI30

CUTTING CONDITIONS PARAMETRY SKRAWANIA

5 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 5 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	5	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	6-7	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	8-9	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	10 - 11.1	0.3D	1.5D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.024	0.027	0.035	0.044	0.049	0.054	0.058	0.062	0.071
				rpm obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				feed posuw mm/min	382	322	334	350	334	322	308	296	271
M	12 - 13	0.3D	1.5D	Vc m/min	117	117	117	117	117	117	117	117	117
				fz mm/tooth	0.024	0.025	0.030	0.046	0.051	0.054	0.057	0.061	0.071
				rpm obr/min	6207	4655	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	745	582	559	714	678	628	590	568	529
	14.1	0.3D	1.5D	Vc m/min	82	82	82	82	82	82	82	82	82
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	4350	3263	2610	2175	1864	1631	1450	1305	1044
				feed posuw mm/min	653	522	496	685	606	563	508	496	459
	14.2	0.3D	1.5D	Vc m/min	59	59	59	59	59	59	59	59	59
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	3130	2348	1878	1565	1341	1174	1043	939	751
				feed posuw mm/min	470	376	357	493	436	405	365	357	331
K	15-20	0.3D	1.5D	Vc m/min	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.043	0.048	0.063	0.079	0.087	0.096	0.103	0.111	0.126
				rpm obr/min	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	1209	1012	1063	1111	1048	1012	965	936	850
S	31-35	0.1D	1.5D	Vc m/min	31	31	31	31	31	31	31	31	31
				fz mm/tooth	0.021	0.022	0.027	0.044	0.046	0.048	0.049	0.053	0.062
				rpm obr/min	1645	1233	987	822	705	617	548	493	395
				feed posuw mm/min	173	136	133	181	162	148	134	131	122
	36-37	0.3D	1.5D	Vc m/min	69	69	69	69	69	69	69	69	69
				fz mm/tooth	0.027	0.029	0.034	0.057	0.059	0.062	0.063	0.069	0.079
				rpm obr/min	3661	2745	2196	1830	1569	1373	1220	1098	879
				feed posuw mm/min	494	398	373	522	463	426	384	379	347

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI20

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○											○	○	○	○	○	●	●				

PLAIN	FLAT	DC	DCON	APMX	OAL	CHAMFER
UFI20060000A06010054	UFI20060000B06010054	6	6	10	54	0,2
UFI20080000A08012058	UFI20080000B08012058	8	8	12	58	0,2
UFI20100000A10014066	UFI20100000B10014066	10	10	14	66	0,3
UFI20120000A12016073	UFI20120000B12016073	12	12	16	73	0,35
UFI20160000A16022082	UFI20160000B16022082	16	16	22	82	0,4
UFI20200000A20026092	UFI20200000B20026092	20	20	26	92	0,5
UFI20250000A25029100	UFI20250000B25029100	25	25	29	100	0,5

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI20

CUTTING CONDITIONS PARAMETRY SKRAWANIA

5 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 5 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	5	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	6-7	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	8-9	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	10 - 11.1	0.3D	1.5D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.024	0.027	0.035	0.044	0.049	0.054	0.058	0.062	0.071
				rpm obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				feed posuw mm/min	382	322	334	350	334	322	308	296	271
M	12 - 13	0.3D	1.5D	Vc m/min	117	117	117	117	117	117	117	117	117
				fz mm/tooth	0.024	0.025	0.030	0.046	0.051	0.054	0.057	0.061	0.071
				rpm obr/min	6207	4655	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	745	582	559	714	678	628	590	568	529
	14.1	0.3D	1.5D	Vc m/min	82	82	82	82	82	82	82	82	82
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	4350	3263	2610	2175	1864	1631	1450	1305	1044
				feed posuw mm/min	653	522	496	685	606	563	508	496	459
	14.2	0.3D	1.5D	Vc m/min	59	59	59	59	59	59	59	59	59
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	3130	2348	1878	1565	1341	1174	1043	939	751
				feed posuw mm/min	470	376	357	493	436	405	365	357	331
K	15-20	0.3D	1.5D	Vc m/min	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.043	0.048	0.063	0.079	0.087	0.096	0.103	0.111	0.126
				rpm obr/min	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	1209	1012	1063	1111	1048	1012	965	936	850
S	31-35	0.1D	1.5D	Vc m/min	31	31	31	31	31	31	31	31	31
				fz mm/tooth	0.021	0.022	0.027	0.044	0.046	0.048	0.049	0.053	0.062
				rpm obr/min	1645	1233	987	822	705	617	548	493	395
				feed posuw mm/min	173	136	133	181	162	148	134	131	122
	36-37	0.3D	1.5D	Vc m/min	69	69	69	69	69	69	69	69	69
				fz mm/tooth	0.027	0.029	0.034	0.057	0.059	0.062	0.063	0.069	0.079
				rpm obr/min	3661	2745	2196	1830	1569	1373	1220	1098	879
				feed posuw mm/min	494	398	373	522	463	426	384	379	347

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI25

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○											○	○	○	○	○	●	●				

PLAIN	FLAT	DC	DCON	APMX	OAL	CHAMFER
UFI25060000A06013057	UFI25060000B06013057	6	6	13	57	0,2
UFI25080000A08019063	UFI25080000B08019063	8	8	19	63	0,2
UFI25100000A10022072	UFI25100000B10022072	10	10	22	72	0,3
UFI25120000A12026083	UFI25120000B12026083	12	12	26	83	0,35
UFI25160000A16036092	UFI25160000B16036092	16	16	36	92	0,4
UFI25200000A20044104	UFI25200000B20044104	20	20	44	104	0,5
UFI25250000A25054121	UFI25250000B25054121	25	25	54	121	0,5

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI25

CUTTING CONDITIONS PARAMETRY SKRAWANIA

5 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 5 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	5	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	6-7	0.3D	1.5D	Vc m/min	144	144	144	144	144	144	144	144	144
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	7639	5730	4584	3820	3274	2865	2546	2292	1833
				feed posuw mm/min	1299	1089	1146	1203	1130	1089	1057	1020	926
	8-9	0.3D	1.5D	Vc m/min	101	101	101	101	101	101	101	101	101
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.083	0.089	0.101
				rpm obr/min	5358	4019	3215	2679	2296	2009	1786	1607	1286
				feed posuw mm/min	911	764	804	844	792	764	741	715	649
	10 - 11.1	0.3D	1.5D	Vc m/min	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.024	0.027	0.035	0.044	0.049	0.054	0.058	0.062	0.071
				rpm obr/min	3183	2387	1910	1592	1364	1194	1061	955	764
				feed posuw mm/min	382	322	334	350	334	322	308	296	271
M	12 - 13	0.3D	1.5D	Vc m/min	117	117	117	117	117	117	117	117	117
				fz mm/tooth	0.024	0.025	0.030	0.046	0.051	0.054	0.057	0.061	0.071
				rpm obr/min	6207	4655	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	745	582	559	714	678	628	590	568	529
	14.1	0.3D	1.5D	Vc m/min	82	82	82	82	82	82	82	82	82
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	4350	3263	2610	2175	1864	1631	1450	1305	1044
				feed posuw mm/min	653	522	496	685	606	563	508	496	459
	14.2	0.3D	1.5D	Vc m/min	59	59	59	59	59	59	59	59	59
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.070	0.076	0.088
				rpm obr/min	3130	2348	1878	1565	1341	1174	1043	939	751
				feed posuw mm/min	470	376	357	493	436	405	365	357	331
K	15-20	0.3D	1.5D	Vc m/min	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.043	0.048	0.063	0.079	0.087	0.096	0.103	0.111	0.126
				rpm obr/min	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	1209	1012	1063	1111	1048	1012	965	936	850
S	31-35	0.1D	1.5D	Vc m/min	31	31	31	31	31	31	31	31	31
				fz mm/tooth	0.021	0.022	0.027	0.044	0.046	0.048	0.049	0.053	0.062
				rpm obr/min	1645	1233	987	822	705	617	548	493	395
				feed posuw mm/min	173	136	133	181	162	148	134	131	122
	36-37	0.3D	1.5D	Vc m/min	69	69	69	69	69	69	69	69	69
				fz mm/tooth	0.027	0.029	0.034	0.057	0.059	0.062	0.063	0.069	0.079
				rpm obr/min	3661	2745	2196	1830	1569	1373	1220	1098	879
				feed posuw mm/min	494	398	373	522	463	426	384	379	347

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI60

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

ISO	N													S								H			
HRc														15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100						200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30				31	32	33	34	35	36	37		38	39	40	41
														○	○	○	○	○	○	○					

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFI16060005A06013057	UFI16060005B06013057	0,5	6	6	13	57
UFI16060010A06013057	UFI16060010B06013057	1	6	6	13	57
UFI16080005A08019063	UFI16080005B08019063	0,5	8	8	19	63
UFI16080010A08019063	UFI16080010B08019063	1	8	8	19	63
UFI16100005A10022072	UFI16100005B10022072	0,5	10	10	22	72
UFI16100010A10022072	UFI16100010B10022072	1	10	10	22	72
UFI16100015A10022072	UFI16100015B10022072	1,5	10	10	22	72
UFI16100020A10022072	UFI16100020B10022072	2	10	10	22	72
UFI16120005A12026083	UFI16120005B12026083	0,5	12	12	26	83
UFI16120010A12026083	UFI16120010B12026083	1	12	12	26	83
UFI16120015A12026083	UFI16120015B12026083	1,5	12	12	26	83
UFI16120020A12026083	UFI16120020B12026083	2	12	12	26	83
UFI16120030A12026083	UFI16120030B12026083	3	12	12	26	83
UFI16160010A16032092	UFI16160010B16032092	1	16	16	32	92
UFI16160015A16032092	UFI16160015B16032092	1,5	16	16	32	92
UFI16160020A16032092	UFI16160020B16032092	2	16	16	32	92
UFI16160030A16032092	UFI16160030B16032092	3	16	16	32	92
UFI16200010A20038104	UFI16200010B20038104	1	20	20	38	104
UFI16200015A20038104	UFI16200015B20038104	1,5	20	20	38	104
UFI16200020A20038104	UFI16200020B20038104	2	20	20	38	104
UFI16200030A20038104	UFI16200030B20038104	3	20	20	38	104
UFI16250010A25044104	UFI16250010B25044104	1	25	25	44	104
UFI16250015A25044104	UFI16250015B25044104	1,5	25	25	44	104
UFI16250020A25044104	UFI16250020B25044104	2	25	25	44	104
UFI16250030A25044104	UFI16250030B25044104	3	25	25	44	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI60

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SCORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 6 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	5	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	6-7	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	8-9	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	10 - 11.1	0.05D	2.0D	Vc m/min	100	100	100	100	100	100	100
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.144
				rpm obr/min	5305	3979	3183	2653	1989	1592	1273
				feed posuw mm/min	1305	1695	1681	1671	1468	1308	1100
M	12 - 13	0.05D	2.0D	Vc m/min	213	213	213	213	213	213	213
				fz mm/tooth	0.049	0.084	0.104	0.125	0.146	0.162	0.168
				rpm obr/min	11300	8475	6780	5650	4238	3390	2712
				feed posuw mm/min	3322	4271	4231	4238	3712	3295	2734
	14.1	0.05D	2.0D	Vc m/min	147	147	147	147	147	147	147
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.143
				rpm obr/min	7799	5849	4679	3899	2924	2340	1872
				feed posuw mm/min	1918	2492	2471	2457	2158	1923	1606
	14.2	0.05D	2.0D	Vc m/min	134	134	134	134	134	134	134
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.142
				rpm obr/min	7109	5332	4265	3554	2666	2133	1706
				feed posuw mm/min	1749	2271	2252	2239	1967	1753	1454
S	31-35	0.05D	2.0D	Vc m/min	33	33	33	33	33	33	33
				fz mm/tooth	0.033	0.055	0.07	0.082	0.097	0.112	0.115
				rpm obr/min	1751	1313	1050	875	657	525	420
				feed posuw mm/min	347	433	441	431	382	353	290
	36-37	0.05D	2.0D	Vc m/min	116	116	116	116	116	116	116
				fz mm/tooth	0.033	0.055	0.07	0.083	0.097	0.113	0.117
				rpm obr/min	6154	4615	3692	3077	2308	1846	1477
				feed posuw mm/min	1218	1523	1551	1532	1343	1252	1037

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI80

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFI18060005A06024075	UFI18060005B06024075	0,5	6	6	24	75
UFI18060010A06024075	UFI18060010B06024075	1	6	6	24	75
UFI18080005A08032075	UFI18080005B08032075	0,5	8	8	32	75
UFI18080010A08032075	UFI18080010B08032075	1	8	8	32	75
UFI18080020A08032075	UFI18080020B08032075	2	8	8	32	75
UFI18100005A10040100	UFI18100005B10040100	0,5	10	10	40	100
UFI18100010A10040100	UFI18100010B10040100	1	10	10	40	100
UFI18100015A10040100	UFI18100015B10040100	1,5	10	10	40	100
UFI18100020A10040100	UFI18100020B10040100	2	10	10	40	100
UFI18120005A12048120	UFI18120005B12048120	0,5	12	12	48	120
UFI18120010A12048120	UFI18120010B12048120	1	12	12	48	120
UFI18120015A12048120	UFI18120015B12048120	1,5	12	12	48	120
UFI18120020A12048120	UFI18120020B12048120	2	12	12	48	120
UFI18120030A12048120	UFI18120030B12048120	3	12	12	48	120
UFI18160010A16064140	UFI18160010B16064140	1	16	16	64	140
UFI18160015A16064140	UFI18160015B16064140	1,5	16	16	64	140
UFI18160020A16064140	UFI18160020B16064140	2	16	16	64	140
UFI18160030A16064140	UFI18160030B16064140	3	16	16	64	140
UFI18200010A20080150	UFI18200010B20080150	1	20	20	80	150
UFI18200015A20080150	UFI18200015B20080150	1,5	20	20	80	150
UFI18200020A20080150	UFI18200020B20080150	2	20	20	80	150
UFI18200030A20080150	UFI18200030B20080150	3	20	20	80	150
UFI18200040A20080150	UFI18200040B20080150	4	20	20	80	150
UFI18200050A20080150	UFI18200050B20080150	5	20	20	80	150
UFI18250010A25100170	UFI18250010B25100170	1	25	25	100	170
UFI18250015A25100170	UFI18250015B25100170	1,5	25	25	100	170
UFI18250020A25100170	UFI18250020B25100170	2	25	25	100	170
UFI18250030A25100170	UFI18250030B25100170	3	25	25	100	170
UFI18250040A25100170	UFI18250040B25100170	4	25	25	100	170
UFI18250050A25100170	UFI18250050B25100170	5	25	25	100	170

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI80

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 6 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	5	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	6-7	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	8-9	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	10 - 11.1	0.05D	2.0D	Vc m/min	100	100	100	100	100	100	100
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.144
				rpm obr/min	5305	3979	3183	2653	1989	1592	1273
				feed posuw mm/min	1305	1695	1681	1671	1468	1308	1100
M	12 - 13	0.05D	2.0D	Vc m/min	213	213	213	213	213	213	213
				fz mm/tooth	0.049	0.084	0.104	0.125	0.146	0.162	0.168
				rpm obr/min	11300	8475	6780	5650	4238	3390	2712
				feed posuw mm/min	3322	4271	4231	4238	3712	3295	2734
	14.1	0.05D	2.0D	Vc m/min	147	147	147	147	147	147	147
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.143
				rpm obr/min	7799	5849	4679	3899	2924	2340	1872
				feed posuw mm/min	1918	2492	2471	2457	2158	1923	1606
	14.2	0.05D	2.0D	Vc m/min	134	134	134	134	134	134	134
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.142
				rpm obr/min	7109	5332	4265	3554	2666	2133	1706
				feed posuw mm/min	1749	2271	2252	2239	1967	1753	1454
S	31-35	0.05D	2.0D	Vc m/min	33	33	33	33	33	33	33
				fz mm/tooth	0.033	0.055	0.07	0.082	0.097	0.112	0.115
				rpm obr/min	1751	1313	1050	875	657	525	420
				feed posuw mm/min	347	433	441	431	382	353	290
	36-37	0.05D	2.0D	Vc m/min	116	116	116	116	116	116	116
				fz mm/tooth	0.033	0.055	0.07	0.083	0.097	0.113	0.117
				rpm obr/min	6154	4615	3692	3077	2308	1846	1477
				feed posuw mm/min	1218	1523	1551	1532	1343	1252	1037

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI12

6 Finish Medium

HSM Vmax A B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	DC	DCON	APMX	OAL
UFI12060000A06013057	UFI12060000B06013057	6	6	13	57
UFI12080000A08019063	UFI12080000B08019063	8	8	19	63
UFI12100000A10022072	UFI12100000B10022072	10	10	22	72
UFI12120000A12026083	UFI12120000B12026083	12	12	26	83
UFI12160000A16032092	UFI12160000B16032092	16	16	32	92
UFI12200000A20038104	UFI12200000B20038104	20	20	38	104
UFI12250000A25044104	UFI12250000B25044104	25	25	44	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI12

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING / FREZ O 6 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	5	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	6-7	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	8-9	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	10 - 11.1	0.05D	2.0D	Vc m/min	100	100	100	100	100	100	100
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.144
				rpm obr/min	5305	3979	3183	2653	1989	1592	1273
				feed posuw mm/min	1305	1695	1681	1671	1468	1308	1100
M	12 - 13	0.05D	2.0D	Vc m/min	213	213	213	213	213	213	213
				fz mm/tooth	0.049	0.084	0.104	0.125	0.146	0.162	0.168
				rpm obr/min	11300	8475	6780	5650	4238	3390	2712
				feed posuw mm/min	3322	4271	4231	4238	3712	3295	2734
	14.1	0.05D	2.0D	Vc m/min	147	147	147	147	147	147	147
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.143
				rpm obr/min	7799	5849	4679	3899	2924	2340	1872
				feed posuw mm/min	1918	2492	2471	2457	2158	1923	1606
	14.2	0.05D	2.0D	Vc m/min	134	134	134	134	134	134	134
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.142
				rpm obr/min	7109	5332	4265	3554	2666	2133	1706
				feed posuw mm/min	1749	2271	2252	2239	1967	1753	1454
S	31-35	0.05D	2.0D	Vc m/min	33	33	33	33	33	33	33
				fz mm/tooth	0.033	0.055	0.07	0.082	0.097	0.112	0.115
				rpm obr/min	1751	1313	1050	875	657	525	420
				feed posuw mm/min	347	433	441	431	382	353	290
	36-37	0.05D	2.0D	Vc m/min	116	116	116	116	116	116	116
				fz mm/tooth	0.033	0.055	0.07	0.083	0.097	0.113	0.117
				rpm obr/min	6154	4615	3692	3077	2308	1846	1477
				feed posuw mm/min	1218	1523	1551	1532	1343	1252	1037

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFI14

6 Finish Medium

HSM Vmax A B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	DC	DCON	APMX	OAL
UFI14060000A06024075	UFI14060000B06024075	6	6	24	75
UFI14080000A08032075	UFI14080000B08032075	8	8	32	75
UFI14100000A10040100	UFI14100000B10040100	10	10	40	100
UFI14120000A12048120	UFI14120000B12048120	12	12	48	120
UFI14160000A16064140	UFI14160000B16064140	16	16	64	140
UFI14200000A20080150	UFI14200000B20080150	20	20	80	150
UFI14250000A25100170	UFI14250000B25100170	25	25	100	170

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFI14

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6 FLUTE SIDE CUTTING / FREZ O 6 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	5	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	6-7	0.05D	2.0D	Vc m/min	300	300	300	300	300	300	300
				fz mm/tooth	0.068	0.116	0.144	0.173	0.202	0.225	0.232
				rpm obr/min	15915	11937	9549	7958	5968	4775	3820
				feed posuw mm/min	6494	8308	8251	8260	7234	6446	5317
	8-9	0.05D	2.0D	Vc m/min	203	203	203	203	203	203	203
				fz mm/tooth	0.05	0.085	0.106	0.128	0.149	0.167	0.174
				rpm obr/min	10769	8077	6462	5385	4039	3231	2585
				feed posuw mm/min	3231	4119	4110	4135	3610	3237	2698
	10 - 11.1	0.05D	2.0D	Vc m/min	100	100	100	100	100	100	100
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.144
				rpm obr/min	5305	3979	3183	2653	1989	1592	1273
				feed posuw mm/min	1305	1695	1681	1671	1468	1308	1100
M	12 - 13	0.05D	2.0D	Vc m/min	213	213	213	213	213	213	213
				fz mm/tooth	0.049	0.084	0.104	0.125	0.146	0.162	0.168
				rpm obr/min	11300	8475	6780	5650	4238	3390	2712
				feed posuw mm/min	3322	4271	4231	4238	3712	3295	2734
	14.1	0.05D	2.0D	Vc m/min	147	147	147	147	147	147	147
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.143
				rpm obr/min	7799	5849	4679	3899	2924	2340	1872
				feed posuw mm/min	1918	2492	2471	2457	2158	1923	1606
	14.2	0.05D	2.0D	Vc m/min	134	134	134	134	134	134	134
				fz mm/tooth	0.041	0.071	0.088	0.105	0.123	0.137	0.142
				rpm obr/min	7109	5332	4265	3554	2666	2133	1706
				feed posuw mm/min	1749	2271	2252	2239	1967	1753	1454
S	31-35	0.05D	2.0D	Vc m/min	33	33	33	33	33	33	33
				fz mm/tooth	0.033	0.055	0.07	0.082	0.097	0.112	0.115
				rpm obr/min	1751	1313	1050	875	657	525	420
				feed posuw mm/min	347	433	441	431	382	353	290
	36-37	0.05D	2.0D	Vc m/min	116	116	116	116	116	116	116
				fz mm/tooth	0.033	0.055	0.07	0.083	0.097	0.113	0.117
				rpm obr/min	6154	4615	3692	3077	2308	1846	1477
				feed posuw mm/min	1218	1523	1551	1532	1343	1252	1037

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

P M K N S H

UFJ END MILLS are designed for HSM machining of stainless steels, titanium, Inconel and materials difficult to cut under 45 HRC.

FREZY UFJ przeznaczone są do obróbki szybkościowej (OS) stali nierdzewnej, tytanu, inconelu oraz materiałów ciężko obrabialnych poniżej 45 HRC.

UFJ END MILLS

FREZY UFJ

Group					ISO	PAGE
UFJ35		R	5		P M K N S H	314
UFJ11			2		P M K N S H	315
UFJ13			4		P M K N S H	317
UFJ15			6-8		P M K N S H	319
UFJ31			3-5		P M K N S H	322
UFJ17			4-6		P M K N S H	324
UFJ19			3-6		P M K N S H	326
UFJ21			4-6		P M K N S H	329
UFJ40			4		P M K N S H	331
UFJ79		R	4		P M K N S H	333
UFJ81		R	4		P M K N S H	336
UFJ83		R	4		P M K N S H	339
UFJ78			4		P M K N S H	343
UFJ80			4		P M K N S H	346
UFJ82			4		P M K N S H	349
UFJ74			5		P M K N S H	352

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

UFJ35

R 5 Finish

HSM Vmax A B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
												○	○	○																	○	○	○	○	○	●	●				

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFJ35060000A06016057	UFJ35060000B06016057	R0,2	6	6	16	57
UFJ35080000A08016063	UFJ35080000B08016063	R0,2	8	8	16	63
UFJ35100000A10022072	UFJ35100000B10022072	R0,3	10	10	22	72
UFJ35120000A12026083	UFJ35120000B12026083	R0,3	12	12	26	83
UFJ35140000A14026083	UFJ35140000B14026083	R0,3	14	14	26	83
UFJ35160000A16032092	UFJ35160000B16032092	R0,3	16	16	32	92
UFJ35200000A20038104	UFJ35200000B20038104	R0,3	20	20	38	104
UFJ35250000A25045121	UFJ35250000B25045121	R0,3	25	25	45	121

CUTTING CONDITIONS PARAMETRY SKRAWANIA

5 FLUTE ROUGHING SIDE CUTTING / FREZ O 6 ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
M	12 - 13	~10/0.15D ~16/0.10D ~025/0.05D	1.5D	Vc m/min	80	80	80	80	80	80	80	80
				fz mm/tooth	0.025	0.034	0.041	0.051	0.057	0.063	0.081	0.091
				rpm obr/min	4244	3183	2546	2122	1819	1592	1273	1019
				feed posuw mm/min	531	541	522	541	518	501	516	463
S	31-35	0.05D	1.0D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.020	0.025	0.037	0.040	0.046	0.052	0.061	0.068
				rpm obr/min	2122	1592	1273	1061	909	796	637	509
				feed posuw mm/min	212	199	236	212	209	207	194	173
	36-37	~10/0.15D ~16/0.10D ~025/0.05D	1.5D	Vc m/min	65	65	65	65	65	65	65	65
				fz mm/tooth	0.022	0.031	0.038	0.046	0.052	0.058	0.074	0.084
				rpm obr/min	3448	2586	2069	1724	1478	1293	1035	828
				feed posuw mm/min	379	401	393	397	384	375	383	348

TOLERANCE RANGE IN UM					
NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30
h10	0	0	0	0	0
	-40	-48	-58	-70	-84
h5	0	0	0	0	0
	-4	-5	-6	-8	-9

UFJ11

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	●																						●	●			○	

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UFJ11010000A04003040	-	1	4	2,5	40
UFJ11010000A06003040	UFJ11010000B06003040	1	6	2,5	40
UFJ11015000A04004040	-	1,5	4	4	40
UFJ11015000A06004040	UFJ11015000B06004040	1,5	6	4	40
UFJ11020000A04006040	-	2	4	6	40
UFJ11020000A06006040	UFJ11020000B06006040	2	6	6	40
UFJ11025000A04008040	-	2,5	4	8	40
UFJ11025000A06008040	UFJ11025000B06008040	2,5	6	8	40
UFJ11030000A06008045	UFJ11030000B06008045	3	6	8	45
UFJ11035000A06010045	UFJ11035000B06010045	3,5	6	10	45
UFJ11040000A06011045	UFJ11040000B06011045	4	6	11	45
UFJ11045000A06011045	UFJ11045000B06011045	4,5	6	11	45
UFJ11050000A06013050	UFJ11050000B06013050	5	6	13	50
UFJ11055000A06013050	UFJ11055000B06013050	5,5	6	13	50
UFJ11060000A06013050	UFJ11060000B06013050	6	6	13	50
UFJ11065000A08016060	UFJ11065000B08016060	6,5	8	16	60
UFJ11070000A08016060	UFJ11070000B08016060	7	8	16	60
UFJ11075000A08016060	UFJ11075000B08016060	7,5	8	16	60
UFJ11080000A08019060	UFJ11080000B08019060	8	8	19	60
UFJ11085000A10019070	UFJ11085000B10019070	8,5	10	19	70
UFJ11090000A10019070	UFJ11090000B10019070	9	10	19	70
UFJ11095000A10019070	UFJ11095000B10019070	9,5	10	19	70
UFJ11100000A10022070	UFJ11100000B10022070	10	10	22	70
UFJ11110000A12022075	UFJ11110000B12022075	11	12	122	75
UFJ11120000A12026075	UFJ11120000B12026075	12	12	2E	75
UFJ11140000A16026085	UFJ11140000B16026085	14	LE	2E	A5
UFJ11160000A16032100	UFJ11160000B16032100	16	LE	B2	100
UFJ11180000A16032100	UFJ11180000B16032100	18	LE	B2	100
UFJ11200000A20038105	UFJ11200000B20038105	20	20	SA	105
UFJ11220000A20038105	UFJ11220000B20038105	22	20	SA	105
UFJ11250000A25045120	UFJ11250000B25045120	25	25	45	120

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFJ11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	1.0D	0.5D (up to 3:0.2D)	Vc m/min	75	85	95	100	105	105	100	105	110	105	105
				fz mm/tooth	0.008	0.012	0.02	0.025	0.031	0.045	0.051	0.051	0.05	0.051	0.048
				rpm obr/min	11937	9019	7560	6366	5570	4178	3183	2785	2188	1671	1337
				feed posuw mm/min	191	216	302	318	345	376	325	284	219	170	128
	5	1.0D	0.5D (up to 3:0.2D)	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.008	0.013	0.019	0.025	0.033	0.04	0.04	0.039	0.04	0.038	0.042
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	127	138	181	191	228	207	166	134	111	79	70
	6-7	1.0D	0.5D (up to 3:0.2D)	Vc m/min	75	85	95	100	105	105	100	105	110	105	105
				fz mm/tooth	0.008	0.012	0.02	0.025	0.031	0.045	0.051	0.051	0.05	0.051	0.048
				rpm obr/min	11937	9019	7560	6366	5570	4178	3183	2785	2188	1671	1337
				feed posuw mm/min	191	216	302	318	345	376	325	284	219	170	128
	8-9	1.0D	0.5D (up to 3:0.2D)	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.008	0.013	0.019	0.025	0.033	0.04	0.04	0.039	0.04	0.038	0.042
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	127	138	181	191	228	207	166	134	111	79	70
	10	1.0D	0.5D (up to 3:0.2D)	Vc m/min	75	85	95	100	105	105	100	105	110	105	105
				fz mm/tooth	0.008	0.012	0.02	0.025	0.031	0.045	0.051	0.051	0.05	0.051	0.048
				rpm obr/min	11937	9019	7560	6366	5570	4178	3183	2785	2188	1671	1337
				feed posuw mm/min	191	216	302	318	345	376	325	284	219	170	128
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2D)	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.008	0.013	0.019	0.025	0.033	0.04	0.04	0.039	0.04	0.038	0.042
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	127	138	181	191	228	207	166	134	111	79	70
M	14.1	1.0D	0.5D (up to 3:0.2D)	Vc m/min	40	45	50	50	55	55	55	50	55	55	55
				fz mm/tooth	0.007	0.013	0.019	0.025	0.032	0.043	0.048	0.048	0.052	0.048	0.044
				rpm obr/min	6366	4775	3979	3183	2918	2188	1751	1326	1094	875	700
				feed posuw mm/min	89	124	151	159	187	188	168	127	114	84	62
S	36-37	1.0D	0.5D (up to 3:0.2D)	Vc m/min	40	45	50	50	55	55	55	50	55	55	55
				fz mm/tooth	0.007	0.013	0.019	0.025	0.032	0.043	0.048	0.048	0.052	0.048	0.044
				rpm obr/min	6366	4775	3979	3183	2918	2188	1751	1326	1094	875	700
				feed posuw mm/min	89	124	151	159	187	188	168	127	114	84	62
H	40	1.0D	0.5D (up to 3:0.2D)	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.008	0.013	0.019	0.025	0.033	0.04	0.04	0.039	0.04	0.038	0.042
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	127	138	181	191	228	207	166	134	111	79	70

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ13

4 Finish Medium

HSM Vmax A min AIR

ISO																																															
	P											M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	●																						●	●			○	

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UFJ13020000A04006040	-	2	4	6	40
UFJ13020000A06006040	UFJ13020000B06006040	2	6	6	40
UFJ13025000A04008040	-	2,5	4	8	40
UFJ13025000A06008040	UFJ13025000B06008040	2,5	6	8	40
UFJ13030000A06008045	UFJ13030000B06008045	3	6	8	45
UFJ13035000A06010045	UFJ13035000B06010045	3,5	6	10	45
UFJ13040000A06011045	UFJ13040000B06011045	4	6	11	45
UFJ13045000A06011045	UFJ13045000B06011045	4,5	6	11	45
UFJ13050000A06013050	UFJ13050000B06013050	5	6	13	50
UFJ13055000A06013050	UFJ13055000B06013050	5,5	6	13	50
UFJ13060000A06013050	UFJ13060000B06013050	6	6	13	50
UFJ13065000A08016060	UFJ13065000B08016060	6,5	8	16	60
UFJ13070000A08016060	UFJ13070000B08016060	7	8	16	60
UFJ13075000A08016060	UFJ13075000B08016060	7,5	8	16	60
UFJ13080000A08019060	UFJ13080000B08019060	8	8	19	60
UFJ13085000A10019070	UFJ13085000B10019070	8,5	10	19	70
UFJ13090000A10019070	UFJ13090000B10019070	9	10	19	70
UFJ13095000A10019070	UFJ13095000B10019070	9,5	10	19	70
UFJ13100000A10022070	UFJ13100000B10022070	10	10	22	70
UFJ13110000A12022075	UFJ13110000B12022075	11	12	22	75
UFJ13120000A12026075	UFJ13120000B12026075	12	12	26	75
UFJ13140000A16026085	UFJ13140000B16026085	14	16	26	85
UFJ13160000A16032100	UFJ13160000B16032100	16	16	32	100
UFJ13180000A16032100	UFJ13180000B16032100	18	16	32	100
UFJ13200000A20038105	UFJ13200000B20038105	20	20	38	105
UFJ13220000A20038105	UFJ13220000B20038105	22	20	38	105
UFJ13250000A25045120	UFJ13250000B25045120	25	25	45	120

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFJ13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.05D	1.0D	Vc m/min	75	85	95	100	105	105	100	105	110	105	105
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
				rpm obr/min	11937	9019	7560	6366	5570	4178	3183	2785	2188	1671	1337
				feed posuw mm/min	286	325	575	611	668	702	598	524	411	321	246
	5	0.05D	1.0D	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.039
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	191	191	363	367	428	393	314	255	206	157	129
	6-7	0.05D	1.0D	Vc m/min	75	85	95	100	105	105	100	105	110	105	105
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
				rpm obr/min	11937	9019	7560	6366	5570	4178	3183	2785	2188	1671	1337
				feed posuw mm/min	286	325	575	611	668	702	598	524	411	321	246
	8-9	0.05D	1.0D	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.039
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	191	191	363	367	428	393	314	255	206	157	129
	10	0.05D	1.0D	Vc m/min	75	85	95	100	105	105	100	105	110	105	105
				fz mm/tooth	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
				rpm obr/min	11937	9019	7560	6366	5570	4178	3183	2785	2188	1671	1337
				feed posuw mm/min	286	325	575	611	668	702	598	524	411	321	246
	11.1 - 11.2	0.05D	1.0D	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.039
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	191	191	363	367	428	393	314	255	206	157	129
M	14.1	0.05D	1.0D	Vc m/min	40	45	50	50	55	55	55	50	55	55	55
				fz mm/tooth	0.006	0.009	0.018	0.024	0.029	0.042	0.045	0.044	0.047	0.045	0.044
				rpm obr/min	6366	4775	3979	3183	2918	2188	1751	1326	1094	875	700
				feed posuw mm/min	153	172	286	306	338	368	315	233	206	158	123
S	36-37	0.05D	1.0D	Vc m/min	40	45	50	50	55	55	55	50	55	55	55
				fz mm/tooth	0.006	0.009	0.018	0.024	0.029	0.042	0.045	0.044	0.047	0.045	0.044
				rpm obr/min	6366	4775	3979	3183	2918	2188	1751	1326	1094	875	700
				feed posuw mm/min	153	172	286	306	338	368	315	233	206	158	123
H	40	0.05D	1.0D	Vc m/min	50	50	60	60	65	65	65	65	70	65	65
				fz mm/tooth	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.039
				rpm obr/min	7958	5305	4775	3820	3448	2586	2069	1724	1393	1035	828
				feed posuw mm/min	191	191	363	367	428	393	314	255	206	157	129

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ15

6-8 Rough

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	○	○	●	●	●	○	●	●	●	○	●	○	○	●						

ISO	N															S								H			
HRc																15	30	25	38	34	400	1050		55	60	42	55
HB	60	100	75	90	130	110	90	100								200	280	250	350	320	Rm	Rm		550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37		38	39	40	41				
												○	○	○	○	○	●	●				○					

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE
UFJ15060000A06013057	UFJ15060000B06013057	6	6	13	57	6
UFJ15070000A08016063	UFJ15070000B08016063	7	8	16	63	6
UFJ15080000A08019063	UFJ15080000B08019063	8	8	19	63	6
UFJ15090000A10019072	UFJ15090000B10019072	9	10	19	72	6
UFJ15100000A10022072	UFJ15100000B10022072	10	10	22	72	6
UFJ15120000A12026083	UFJ15120000B12026083	12	12	26	83	6
UFJ15140000A14026083	UFJ15140000B14026083	14	14	26	83	6
UFJ15160000A16032092	UFJ15160000B16032092	16	16	32	92	6
UFJ15180000A18032092	UFJ15180000B18032092	18	18	32	92	8
UFJ15200000A20038104	UFJ15200000B20038104	20	20	38	104	8
UFJ15250000A25044104	UFJ15250000B25044104	25	25	44	104	8

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFJ15

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6&8 FLUTE SIDE CUTTING NORMAL SPEED / FREZ O 6 I 8 ZĘBACH FREZOWANIE BOKIEM NORMALNA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.1D	1.5D	Vc m/min	105	105	105	105	105	105	120
				fz mm/tooth	0.06	0.079	0.099	0.099	0.1	0.075	0.075
				rpm obr/min	5570	4178	3342	2785	2089	1671	1528
				feed posuw mm/min	2005	1980	1985	1654	1253	1003	917
	5	0.05D	1.5D	Vc m/min	75	75	75	75	75	75	85
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.074	0.068
				rpm obr/min	3979	2984	2387	1989	1492	1194	1082
				feed posuw mm/min	1409	1397	1404	1158	886	707	589
	6-7	0.1D	1.5D	Vc m/min	105	105	105	105	105	105	120
				fz mm/tooth	0.06	0.079	0.099	0.099	0.1	0.075	0.075
				rpm obr/min	5570	4178	3342	2785	2089	1671	1528
				feed posuw mm/min	2005	1980	1985	1654	1253	1003	917
	8-9	0.05D	1.5D	Vc m/min	75	75	75	75	75	75	85
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.074	0.068
				rpm obr/min	3979	2984	2387	1989	1492	1194	1082
				feed posuw mm/min	1409	1397	1404	1158	886	707	589
	10	0.1D	1.5D	Vc m/min	105	105	105	105	105	105	120
				fz mm/tooth	0.06	0.079	0.099	0.099	0.1	0.075	0.075
				rpm obr/min	5570	4178	3342	2785	2089	1671	1528
				feed posuw mm/min	2005	1980	1985	1654	1253	1003	917
	11.1 - 11.2	0.05D	1.5D	Vc m/min	75	75	75	75	75	75	85
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.074	0.068
				rpm obr/min	3979	2984	2387	1989	1492	1194	1082
				feed posuw mm/min	1409	1397	1404	1158	886	707	589
M	14.1	0.05D	1.5D	Vc m/min	65	65	60	60	60	55	65
				fz mm/tooth	0.054	0.074	0.095	0.104	0.111	0.086	0.079
				rpm obr/min	3448	2586	1910	1592	1194	875	828
				feed posuw mm/min	1117	1148	1089	993	795	602	523
S	31-35	0.02D	1.0D	Vc m/min	25	25	15	15	15	15	15
				fz mm/tooth	0.035	0.047	0.106	0.104	0.102	0.078	0.077
				rpm obr/min	1326	995	477	398	298	239	191
				feed posuw mm/min	2Z5	281	304	248	183	149	118
	36-37	0.05D	1.5D	Vc m/min	65	65	60	60	60	55	65
				fz mm/tooth	0.054	0.074	0.095	0.104	0.111	0.086	0.079
				rpm obr/min	3448	2586	1910	1592	1194	875	828
				feed posuw mm/min	1117	1148	1089	993	795	602	523
H	40	0.05D	1.5D	Vc m/min	75	75	75	75	75	75	85
				fz mm/tooth	0.059	0.078	0.098	0.097	0.099	0.074	0.068
				rpm obr/min	3979	2984	2387	1989	1492	1194	1082
				feed posuw mm/min	1409	1397	1404	1158	886	707	589

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ15

CUTTING CONDITIONS PARAMETRY SKRAWANIA

6&8 FLUTE SIDE CUTTING HIGH SPEED / FREZ O 6 I 8 ZĘBACH FREZOWANIE BOKIEM WYSOKA PRĘDKOŚĆ

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-4	0.1D	1.5D	Vc m/min	420	420	420	430	420	420	470
				fz mm/tooth	0.060	0.079	0.100	0.099	0.100	0.075	0.075
				rpm obr/min	22282	16711	13369	11406	8356	6685	5984
				feed posuw mm/min	8021	7921	8021	6775	5013	4011	3591
	5	0.05D	1.5D	Vc m/min	315	315	315	315	315	315	355
				fz mm/tooth	0.060	0.081	0.100	0.100	0.100	0.076	0.075
				rpm obr/min	16711	12533	10027	8356	6267	5013	4520
				feed posuw mm/min	6016	6091	6016	5013	3760	3048	2712
	6-7	0.1D	1.5D	Vc m/min	420	420	420	430	420	420	470
				fz mm/tooth	0.060	0.079	0.100	0.099	0.100	0.075	0.075
				rpm obr/min	22282	16711	13369	11406	8356	6685	5984
				feed posuw mm/min	8021	7921	8021	6775	5013	4011	3591
	8-9	0.05D	1.5D	Vc m/min	315	315	315	315	315	315	355
				fz mm/tooth	0.060	0.081	0.100	0.100	0.100	0.076	0.075
				rpm obr/min	16711	12533	10027	8356	6267	5013	4520
				feed posuw mm/min	6016	6091	6016	5013	3760	3048	2712
	10	0.1D	1.5D	Vc m/min	420	420	420	430	420	420	470
				fz mm/tooth	0.060	0.079	0.100	0.099	0.100	0.075	0.075
				rpm obr/min	22282	16711	13369	11406	8356	6685	5984
				feed posuw mm/min	8021	7921	8021	6775	5013	4011	3591
	11.1 - 11.2	0.05D	1.5D	Vc m/min	315	315	315	315	315	315	355
				fz mm/tooth	0.060	0.081	0.100	0.100	0.100	0.076	0.075
				rpm obr/min	16711	12533	10027	8356	6267	5013	4520
				feed posuw mm/min	6016	6091	6016	5013	3760	3048	2712
H	40	0.05D	1.5D	Vc m/min	315	315	315	315	315	315	355
				fz mm/tooth	0.060	0.081	0.100	0.100	0.100	0.076	0.075
				rpm obr/min	16711	12533	10027	8356	6267	5013	4520
				feed posuw mm/min	6016	6091	6016	5013	3760	3048	2712

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ31

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	●																	○	○	○	○	○	●	●			○	

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
UFJ31060000A06016057	UFJ31060000B06016057	6	6	16	57	3	0,38
UFJ31070000A08016063	UFJ31070000B08016063	7	8	16	63	3	0,38
UFJ31080000A08016063	UFJ31080000B08016063	8	8	16	63	3	0,38
UFJ31090000A10019072	UFJ31090000B10019072	9	10	19	72	4	0,38
UFJ31100000A10022072	UFJ31100000B10022072	10	10	22	72	4	0,38
UFJ31120000A12026083	UFJ31120000B12026083	12	12	26	83	4	0,55
UFJ31140000A14026083	UFJ31140000B14026083	14	14	26	83	4	0,55
UFJ31160000A16032092	UFJ31160000B16032092	16	16	32	92	4	0,55
UFJ31180000A18032092	UFJ31180000B18032092	18	18	32	92	4	0,55
UFJ31200000A20038104	UFJ31200000B20038104	20	20	38	104	4	0,55
UFJ31250000A25045121	UFJ31250000B25045121	25	25	45	121	5	0,55

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM

	1-3	3-6	6-10	10-18	18-30
h10	0	0	0	0	0
	-40	-48	-58	-70	-84
h5	0	0	0	0	0
	-4	-5	-6	-8	-9

UFJ31

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SLOTTING / FREZ O WIELU ZĘBACH ROWKOWANIE ZGRUBNE

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	1.0D	0.5D	Vc m/min	294	292	289	302	299	302	294	302	338
				fz mm/tooth	0.03	0.04	0.038	0.045	0.053	0.06	0.067	0.068	0.06
				rpm obr/min	15597	11618	9199	8011	6798	6008	5199	4806	4304
				feed posuw mm/min	1404	1394	1398	1442	1441	1442	1393	1307	1291
	5	1.0D	0.5D	Vc m/min	234	231	239	226	229	241	249	226	251
				fz mm/tooth	0.013	0.018	0.016	0.02	0.024	0.024	0.024	0.024	0.023
				rpm obr/min	12414	9191	7608	5995	5207	4795	4403	3597	3196
				feed posuw mm/min	484	496	487	480	500	460	423	345	368
	6-7	1.0D	0.5D	Vc m/min	294	292	289	302	299	302	294	302	338
				fz mm/tooth	0.03	0.04	0.038	0.045	0.053	0.06	0.067	0.068	0.06
				rpm obr/min	15597	11618	9199	8011	6798	6008	5199	4806	4304
				feed posuw mm/min	1404	1394	1398	1442	1441	1442	1393	1307	1291
	8-9	1.0D	0.5D	Vc m/min	234	231	239	226	229	241	249	226	251
				fz mm/tooth	0.013	0.018	0.016	0.02	0.024	0.024	0.024	0.024	0.023
				rpm obr/min	12414	9191	7608	5995	5207	4795	4403	3597	3196
				feed posuw mm/min	484	496	487	480	500	460	423	345	368
	10	1.0D	0.5D	Vc m/min	294	292	289	302	299	302	294	302	338
				fz mm/tooth	0.03	0.04	0.038	0.045	0.053	0.06	0.067	0.068	0.06
				rpm obr/min	15597	11618	9199	8011	6798	6008	5199	4806	4304
				feed posuw mm/min	1404	1394	1398	1442	1441	1442	1393	1307	1291
	11.1 - 11.2	1.0D	0.5D	Vc m/min	234	231	239	226	229	241	249	226	251
				fz mm/tooth	0.013	0.018	0.016	0.02	0.024	0.024	0.024	0.024	0.023
				rpm obr/min	12414	9191	7608	5995	5207	4795	4403	3597	3196
				feed posuw mm/min	484	496	487	480	500	460	423	345	368
M	14.1	1.0D	0.5D	Vc m/min	158	158	160	158	158	166	153	151	170
				fz mm/tooth	0.013	0.018	0.017	0.02	0.024	0.023	0.023	0.023	0.023
				rpm obr/min	8382	6287	5093	4191	3592	3302	2706	2403	2165
				feed posuw mm/min	327	339	346	335	345	304	249	221	249
S	31-35	1.0D	0.05D	Vc m/min	45	45	41	45	40	40	40	41	47
				fz mm/tooth	0.016	0.02	0.022	0.024	0.022	0.02	0.021	0.023	0.022
				rpm obr/min	2387	1790	1305	1194	909	796	707	653	598
				feed posuw mm/min	115	107	115	115	80	64	59	60	66
	36-37	1.0D	4-10:0.25D 12-16:0.15D 18-25:0.1D	Vc m/min	158	158	160	158	158	166	153	151	170
				fz mm/tooth	0.013	0.018	0.017	0.02	0.024	0.023	0.023	0.023	0.023
				rpm obr/min	8382	6287	5093	4191	3592	3302	2706	2403	2165
				feed posuw mm/min	327	339	346	335	345	304	249	221	249
H	40	1.0D	0.05D	Vc m/min	234	231	239	226	229	241	249	226	251
				fz mm/tooth	0.013	0.018	0.016	0.02	0.024	0.024	0.024	0.024	0.023
				rpm obr/min	12414	9191	7608	5995	5207	4795	4403	3597	3196
				feed posuw mm/min	484	496	487	480	500	460	423	345	368

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ17

4-6 Rough

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	●																	○	○	○	○	○	●	●			○	

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
UFJ17060000A06007054	UFJ17060000B06007054	6	6	7	54	4	0,15
UFJ17080000A08009058	UFJ17080000B08009058	8	8	9	58	4	0,18
UFJ17100000A10014066	UFJ17100000B10014066	10	10	14	66	4	0,2
UFJ17120000A12016073	UFJ17120000B12016073	12	12	16	73	4	0,2
UFJ17160000A16022082	UFJ17160000B16022082	16	16	22	82	5	0,2
UFJ17200000A20026092	UFJ17200000B20026092	20	20	26	92	6	0,2

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM

	1-3	3-6	6-10	10-18	18-30
h10	0	0	0	0	0
	-40	-48	-58	-70	-84
h5	0	0	0	0	0
	-4	-5	-6	-8	-9

UFJ17

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SLOTTING / FREZ O WIELU ZĘBACH ROWKOWANIE ZGRUBNE

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	1.0D	0.5D	Vc m/min	294	292	289	302	302	302
				fz mm/tooth	0.022	0.03	0.038	0.045	0.048	0.045
				rpm obr/min	15597	11618	9199	8011	6008	4806
				feed posuw mm/min	1373	1394	1398	1442	1442	1298
	5	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	497	515	487	480	455	345
	6-7	1.0D	0.5D	Vc m/min	294	292	289	302	302	302
				fz mm/tooth	0.022	0.03	0.038	0.045	0.048	0.045
				rpm obr/min	15597	11618	9199	8011	6008	4806
				feed posuw mm/min	1373	1394	1398	1442	1442	1298
	8-9	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	497	515	487	480	455	345
	10	1.0D	0.5D	Vc m/min	294	292	289	302	302	302
				fz mm/tooth	0.022	0.03	0.038	0.045	0.048	0.045
				rpm obr/min	15597	11618	9199	8011	6008	4806
				feed posuw mm/min	1373	1394	1398	1442	1442	1298
	11.1 - 11.2	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	497	515	487	480	455	345
M	14.1	1.0D	4-10:0.25D 12-16:0.15D 18-25:0.1D	Vc m/min	158	158	160	158	166	151
				fz mm/tooth	0.01	0.013	0.017	0.02	0.019	0.015
				rpm obr/min	8382	6287	5093	4191	3302	2403
				feed posuw mm/min	335	327	346	335	314	216
S	31-35	1.0D	0.5D	Vc m/min	45	45	41	45	40	41
				fz mm/tooth	0.012	0.015	0.022	0.024	0.016	0.015
				rpm obr/min	2387	1790	1305	1194	796	653
				feed posuw mm/min	115	107	115	115	64	59
	36-37	1.0D	4-10:0.25D 12-16:0.15D 18-25:0.1D	Vc m/min	158	158	160	158	166	151
				fz mm/tooth	0.01	0.013	0.017	0.02	0.019	0.015
				rpm obr/min	8382	6287	5093	4191	3302	2403
				feed posuw mm/min	335	327	346	335	314	216
H	40	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	372	386	487	480	455	345

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ19

3-6 Rough

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	●																	○	○	○	○	○	●	●			○	

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
UFJ19040000A06011057	UFJ19040000B06011057	4	6	11	57	3	0,1
UFJ19050000A06013057	UFJ19050000B06013057	5	6	13	57	4	0,13
UFJ19060000A06016057	UFJ19060000B06016057	6	6	16	57	4	0,15
UFJ19070000A08016063	UFJ19070000B08016063	7	8	16	63	4	0,15
UFJ19080000A08016063	UFJ19080000B08016063	8	8	16	63	4	0,18
UFJ19090000A10019072	UFJ19090000B10019072	9	10	19	72	4	0,18
UFJ19100000A10022072	UFJ19100000B10022072	10	10	22	72	4	0,2
UFJ19120000A12026083	UFJ19120000B12026083	12	12	26	83	4	0,2
UFJ19140000A14026083	UFJ19140000B14026083	14	14	26	83	5	0,2
UFJ19160000A16032092	UFJ19160000B16032092	16	16	32	92	5	0,2
UFJ19200000A20038104	UFJ19200000B20038104	20	20	38	104	6	0,2
UFJ19250000A25045121	UFJ19250000B25045121	25	25	45	121	6	0,2

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM				
	1-3	3-6	6-10	10-18	18-30
h10	0	0	0	0	0
	-40	-48	-58	-70	-84
h5	0	0	0	0	0
	-4	-5	-6	-8	-9

UFJ19

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SLOTTING / FREZ O WIELU ZĘBACH ROWKOWANIE ZGRUBNE

ISO	VDI 3323	Ae mm	Ap mm	DC	4.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-4	1.0D	0.5D	Vc m/min	294	294	292	289	302	299	302	302	338
				fz mm/tooth	0.02	0.022	0.03	0.038	0.045	0.042	0.048	0.045	0.05
				rpm obr/min	23396	15597	11618	9199	8011	6798	6008	4806	4304
				feed posuw mm/min	1404	1373	1394	1398	1442	1428	1442	1298	1291
	5	1.0D	0.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.009	0.01	0.014	0.016	0.02	0.019	0.019	0.016	0.019
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	503	497	515	487	480	495	455	345	364
	6-7	1.0D	0.5D	Vc m/min	294	294	292	289	302	299	302	302	338
				fz mm/tooth	0.02	0.022	0.03	0.038	0.045	0.042	0.048	0.045	0.05
				rpm obr/min	23396	15597	11618	9199	8011	6798	6008	4806	4304
				feed posuw mm/min	1404	1373	1394	1398	1442	1428	1442	1298	1291
	8-9	1.0D	0.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.009	0.01	0.014	0.016	0.02	0.019	0.019	0.016	0.019
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	503	497	515	487	480	495	455	345	364
	10	1.0D	0.5D	Vc m/min	294	294	292	289	302	299	302	302	338
				fz mm/tooth	0.02	0.022	0.03	0.038	0.045	0.042	0.048	0.045	0.05
				rpm obr/min	23396	15597	11618	9199	8011	6798	6008	4806	4304
				feed posuw mm/min	1404	1373	1394	1398	1442	1428	1442	1298	1291
	11.1 - 11.2	1.0D	0.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.009	0.01	0.014	0.016	0.02	0.019	0.019	0.016	0.019
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	503	497	515	487	480	495	455	345	364
M	14.1	1.0D	4-10:0.25D 12-16:0.15D 18-25:0.1D	Vc m/min	158	158	158	160	158	158	166	151	170
				fz mm/tooth	0.009	0.01	0.013	0.017	0.02	0.019	0.019	0.015	0.019
				rpm obr/min	12573	8382	6287	5093	4191	3592	3302	2403	2165
				feed posuw mm/min	339	335	327	346	335	341	314	216	247
S	31-35	1.0D	0.05D	Vc m/min	45	45	45	41	45	40	40	41	47
				fz mm/tooth	0.011	0.012	0.015	0.022	0.024	0.018	0.016	0.015	0.018
				rpm obr/min	3581	2387	1790	1305	1194	909	796	653	598
				feed posuw mm/min	118	115	107	115	115	82	64	59	65
	36-37	1.0D	4-10:0.25D 12-16:0.15D 18-25:0.1D	Vc m/min	158	158	158	160	158	158	166	151	170
				fz mm/tooth	0.009	0.01	0.013	0.017	0.02	0.019	0.019	0.015	0.019
				rpm obr/min	12573	8382	6287	5093	4191	3592	3302	2403	2165
				feed posuw mm/min	339	335	327	346	335	341	314	216	247
H	40	1.0D	0.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.009	0.01	0.014	0.016	0.02	0.019	0.019	0.016	0.019
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	503	497	515	487	480	495	455	345	364

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ19

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SIDE CUTTNG / FREZ O WIELU ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	4.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-4	0.3D	1.5D	Vc m/min	294	294	292	289	302	299	302	302	338
				fz mm/tooth	0.033	0.037	0.05	0.063	0.075	0.071	0.08	0.075	0.083
				rpm obr/min	23396	15597	11618	9199	8011	6798	6008	4806	4304
				feed posuw mm/min	2316	2308	2324	2318	2403	2413	2403	2163	2143
	5	0.3D	1.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.015	0.017	0.023	0.028	0.033	0.032	0.032	0.026	0.032
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	838	844	846	852	791	833	767	561	614
	6-7	0.3D	1.5D	Vc m/min	294	294	292	289	302	299	302	302	338
				fz mm/tooth	0.033	0.037	0.05	0.063	0.075	0.071	0.08	0.075	0.083
				rpm obr/min	23396	15597	11618	9199	8011	6798	6008	4806	4304
				feed posuw mm/min	2316	2308	2324	2318	2403	2413	2403	2163	2143
	8-9	0.3D	1.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.015	0.017	0.023	0.028	0.033	0.032	0.032	0.026	0.032
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	838	844	846	852	791	833	767	561	614
	10	0.3D	1.5D	Vc m/min	294	294	292	289	302	299	302	302	338
				fz mm/tooth	0.033	0.037	0.05	0.063	0.075	0.071	0.08	0.075	0.083
				rpm obr/min	23396	15597	11618	9199	8011	6798	6008	4806	4304
				feed posuw mm/min	2316	2308	2324	2318	2403	2413	2403	2163	2143
	11.1 - 11.2	0.3D	1.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.015	0.017	0.023	0.028	0.033	0.032	0.032	0.026	0.032
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	838	844	846	852	791	833	767	561	614
M	14.1	4-10:0.25D 12-16:0.15D 18-25:0.1D	1.5D	Vc m/min	158	158	158	160	158	158	166	151	170
				fz mm/tooth	0.015	0.017	0.023	0.028	0.034	0.032	0.031	0.025	0.032
				rpm obr/min	12573	8382	6287	5093	4191	3592	3302	2403	2165
				feed posuw mm/min	566	570	578	570	570	575	512	360	416
S	31-35	0.05D	1.0D	Vc m/min	45	45	45	41	45	40	40	41	47
				fz mm/tooth	0.018	0.02	0.025	0.037	0.04	0.029	0.028	0.025	0.031
				rpm obr/min	3581	2387	1790	1305	1194	909	796	653	598
				feed posuw mm/min	193	191	179	193	191	132	111	98	111
	36-37	4-10:0.25D 12-16:0.15D 18-25:0.1D	1.0D	Vc m/min	158	158	158	160	158	158	166	151	170
				fz mm/tooth	0.015	0.017	0.023	0.028	0.034	0.032	0.031	0.025	0.032
				rpm obr/min	12573	8382	6287	5093	4191	3592	3302	2403	2165
				feed posuw mm/min	566	570	578	570	570	575	512	360	416
H	40	0.3D	1.5D	Vc m/min	234	234	231	239	226	229	241	226	251
				fz mm/tooth	0.015	0.017	0.023	0.028	0.033	0.032	0.032	0.026	0.032
				rpm obr/min	18621	12414	9191	7608	5995	5207	4795	3597	3196
				feed posuw mm/min	838	844	846	852	791	833	767	561	614

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ21

4-6 Rough

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	●	●	●	○	●	●	●	○	●	○	○	●																	○	○	○	○	○	●	●			○	

PLAIN	FLAT	DC	DCON	APMX	LU	OAL	DU	#FLUTE	CHAMFER
UFJ21060000A06020057	UFJ21060000B06020057	6	6	16	20	57	5,5	4	0,15
UFJ21080000A08026063	UFJ21080000B08026063	8	8	16	26	63	7,5	4	0,18
UFJ21100000A10031072	UFJ21100000B10031072	10	10	22	31	72	9,5	4	0,2
UFJ21120000A12037083	UFJ21120000B12037083	12	12	26	37	83	11,5	4	0,2
UFJ21160000A16051100	UFJ21160000B16051100	16	16	32	51	100	15,5	5	0,2
UFJ21200000A20059110	UFJ21200000B20059110	20	20	38	59	110	19,2	6	0,2

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM				
	1-3	3-6	6-10	10-18	18-30
h10	0	0	0	0	0
	-40	-48	-58	-70	-84
h5	0	0	0	0	0
	-4	-5	-6	-8	-9

UFJ21

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SLOTTING / FREZ O WIELU ZĘBACH ROWKOWANIE ZGRUBNE

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
P	1-4	1.0D	0.5D	Vc m/min	294	292	289	302	302	302
				fz mm/tooth	0.022	0.03	0.038	0.045	0.048	0.045
				rpm obr/min	15597	11618	9199	8011	6008	4806
				feed posuw mm/min	1373	1394	1398	1442	1442	1298
	5	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	497	515	487	480	455	345
	6-7	1.0D	0.5D	Vc m/min	294	292	289	302	302	302
				fz mm/tooth	0.022	0.03	0.038	0.045	0.048	0.045
				rpm obr/min	15597	11618	9199	8011	6008	4806
				feed posuw mm/min	1373	1394	1398	1442	1442	1298
	8-9	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	497	515	487	480	455	345
	10	1.0D	0.5D	Vc m/min	294	292	289	302	302	302
				fz mm/tooth	0.022	0.03	0.038	0.045	0.048	0.045
				rpm obr/min	15597	11618	9199	8011	6008	4806
				feed posuw mm/min	1373	1394	1398	1442	1442	1298
	11.1 - 11.2	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	497	515	487	480	455	345
M	14.1	1.0D	4-10:0.25D 12-16:0.15D 18-25:0.1D	Vc m/min	158	158	160	158	166	151
				fz mm/tooth	0.01	0.013	0.017	0.02	0.019	0.015
				rpm obr/min	8382	6287	5093	4191	3302	2403
				feed posuw mm/min	335	327	346	335	314	216
S	31-35	1.0D	0.5D	Vc m/min	45	45	41	45	40	41
				fz mm/tooth	0.012	0.015	0.022	0.024	0.016	0.015
				rpm obr/min	2387	1790	1305	1194	796	653
				feed posuw mm/min	115	107	115	115	64	59
	36-37	1.0D	4-10:0.25D 12-16:0.15D 18-25:0.1D	Vc m/min	158	158	160	158	166	151
				fz mm/tooth	0.01	0.013	0.017	0.02	0.019	0.015
				rpm obr/min	8382	6287	5093	4191	3302	2403
				feed posuw mm/min	335	327	346	335	314	216
H	40	1.0D	0.5D	Vc m/min	234	231	239	226	241	226
				fz mm/tooth	0.01	0.014	0.016	0.02	0.019	0.016
				rpm obr/min	12414	9191	7608	5995	4795	3597
				feed posuw mm/min	372	386	487	480	455	345

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ40

4 Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFJ40030015A06008057	UFJ40030015B06008057	1,5	3	6	8	57
UFJ40040020A06011057	UFJ40040020B06011057	2	4	6	11	57
UFJ40050025A06013057	UFJ40050025B06013057	2,5	5	6	13	57
UFJ40060030A06013057	UFJ40060030B06013057	3	6	6	13	57
UFJ40080040A08019063	UFJ40080040B08019063	4	8	8	19	63
UFJ40100050A10022072	UFJ40100050B10022072	5	10	10	22	72
UFJ40120060A12026083	UFJ40120060B12026083	6	12	12	26	83
UFJ40160080A16032092	UFJ40160080B16032092	8	16	16	32	92
UFJ40200100A20038104	UFJ40200100B20038104	10	20	20	38	104
UFJ40250125A25038104	UFJ40250125B25038104	12,5	25	25	38	104

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 ~-0.02	h5 DIA>12: h6
OVER TO R12	0 ~-0.03	

UFJ40

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE BALL NOSE / FREZ KULOWY O 4 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	18.0	20.0	25.0
P	1-4	0.5D	1.0D	Vc m/min	162	162	162	162	162	162	162	162	162	162	162
				fz mm/tooth	0.025	0.027	0.03	0.04	0.06	0.065	0.07	0.075	0.08	0.09	0.099
				rpm obr/min	17189	12892	10313	8594	6446	5157	4297	3223	2865	2578	2063
				feed posuw mm/min	1719	1392	1238	1375	1547	1341	1203	967	917	928	817
	5	0.5D	1.0D	Vc m/min	113	113	113	113	113	113	113	113	113	113	113
				fz mm/tooth	0.025	0.027	0.03	0.04	0.06	0.065	0.07	0.074	0.079	0.09	0.099
				rpm obr/min	11990	8992	7194	5995	4496	3597	2997	2248	1998	1798	1439
				feed posuw mm/min	1199	971	863	959	1079	935	839	665	631	647	570
	6-7	0.5D	1.0D	Vc m/min	162	162	162	162	162	162	162	162	162	162	162
				fz mm/tooth	0.025	0.027	0.03	0.04	0.06	0.065	0.07	0.075	0.08	0.09	0.099
				rpm obr/min	17189	12892	10313	8594	6446	5157	4297	3223	2865	2578	2063
				feed posuw mm/min	1719	1392	1238	1375	1547	1341	1203	967	917	928	817
	8-9	0.5D	1.0D	Vc m/min	113	113	113	113	113	113	113	113	113	113	113
				fz mm/tooth	0.025	0.027	0.03	0.04	0.06	0.065	0.07	0.074	0.079	0.09	0.099
				rpm obr/min	11990	8992	7194	5995	4496	3597	2997	2248	1998	1798	1439
				feed posuw mm/min	1199	971	863	959	1079	935	839	665	631	647	570
	10 - 11.1	0.5D	1.0D	Vc m/min	68	68	68	68	68	68	68	68	68	68	68
				fz mm/tooth	0.017	0.019	0.021	0.028	0.042	0.045	0.049	0.052	0.056	0.063	0.07
				rpm obr/min	7215	5411	4329	3608	2706	2165	1804	1353	1203	1082	866
				feed posuw mm/min	491	411	364	404	455	390	354	281	269	273	242
M	12-13	0.5D	1.0D	Vc m/min	77	77	77	77	77	77	77	77	77	77	77
				fz mm/tooth	0.015	0.015	0.025	0.03	0.04	0.045	0.05	0.054	0.059	0.058	0.059
				rpm obr/min	8170	6127	4902	4085	3064	2451	2042	1532	1362	1225	980
				feed posuw mm/min	490	368	490	490	490	441	408	331	321	284	231
	14.1	0.5D	1.0D	Vc m/min	85	85	85	85	85	85	85	85	85	85	85
				fz mm/tooth	0.02	0.02	0.025	0.041	0.045	0.05	0.055	0.06	0.064	0.065	0.068
				rpm obr/min	9019	6764	5411	4509	3382	2706	2255	1691	1503	1353	1082
				feed posuw mm/min	722	541	541	740	609	541	496	406	385	352	294
	14.2	0.5D	1.0D	Vc m/min	77	77	77	77	77	77	77	77	77	77	77
				fz mm/tooth	0.02	0.02	0.025	0.041	0.045	0.05	0.055	0.06	0.064	0.065	0.068
				rpm obr/min	8170	6127	4902	4085	3064	2451	2042	1532	1362	1225	980
				feed posuw mm/min	654	490	490	670	551	490	449	368	349	319	267
K	15-20	0.5D	1.0D	Vc m/min	119	119	119	119	119	119	119	119	119	119	119
				fz mm/tooth	0.031	0.033	0.037	0.05	0.074	0.081	0.087	0.093	0.099	0.112	0.124
				rpm obr/min	12626	9470	7576	6313	4735	3788	3157	2367	2104	1894	1515
				feed posuw mm/min	1566	1250	1121	1263	1402	1227	1098	881	833	848	752
S	31-35	0.2D	0.3D	Vc m/min	21	21	21	21	21	21	21	21	21	21	21
				fz mm/tooth	0.014	0.014	0.017	0.028	0.031	0.035	0.038	0.042	0.045	0.045	0.048
				rpm obr/min	2228	1671	1337	1114	836	668	557	418	371	334	267
				feed posuw mm/min	125	94	91	125	104	94	85	70	67	60	51
	36-37	0.5D	0.3D	Vc m/min	47	47	47	47	47	47	47	47	47	47	47
				fz mm/tooth	0.018	0.018	0.022	0.037	0.04	0.045	0.049	0.054	0.058	0.058	0.061
				rpm obr/min	4987	3740	2992	2493	1870	1496	1247	935	831	748	598
				feed posuw mm/min	359	269	263	369	299	269	244	202	193	174	146

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ79

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFJ79030003A06007054	UFJ79030003B06007054	R0,3	3	6	7	54
UFJ79030005A06007054	UFJ79030005B06007054	R0,5	3	6	7	54
UFJ79040003A06008054	UFJ79040003B06008054	R0,3	4	6	8	54
UFJ79040005A06008054	UFJ79040005B06008054	R0,5	4	6	8	54
UFJ79050003A06010054	UFJ79050003B06010054	R0,3	5	6	10	54
UFJ79050005A06010054	UFJ79050005B06010054	R0,5	5	6	10	54
UFJ79060003A06010054	UFJ79060003B06010054	R0,3	6	6	10	54
UFJ79060005A06010054	UFJ79060005B06010054	R0,5	6	6	10	54
UFJ79060010A06010054	UFJ79060010B06010054	R1,0	6	6	10	54
UFJ79080005A08012058	UFJ79080005B08012058	R0,5	8	8	12	58
UFJ79080010A08012058	UFJ79080010B08012058	R1,0	8	8	12	58
UFJ79100005A10014066	UFJ79100005B10014066	R0,5	10	10	14	66
UFJ79100010A10014066	UFJ79100010B10014066	R1,0	10	10	14	66
UFJ79120005A12016073	UFJ79120005B12016073	R0,5	12	12	16	73
UFJ79120010A12016073	UFJ79120010B12016073	R1,0	12	12	16	73
UFJ79120020A12016073	UFJ79120020B12016073	R2,0	12	12	16	73
UFJ79140005A14018075	UFJ79140005B14018075	R0,5	14	14	18	75
UFJ79160010A16022082	UFJ79160010B16022082	R1,0	16	16	22	82
UFJ79160020A16022082	UFJ79160020B16022082	R2,0	16	16	22	82
UFJ79160030A16022082	UFJ79160030B16022082	R3,0	16	16	22	82
UFJ79180010A18024084	UFJ79180010B18024084	R1,0	18	18	24	84
UFJ79200010A20026092	UFJ79200010B20026092	R1,0	20	20	26	92
UFJ79200020A20026092	UFJ79200020B20026092	R2,0	20	20	26	92
UFJ79200030A20026092	UFJ79200030B20026092	R3,0	20	20	26	92

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 –-0.02	h5 DIA>12: h6
OVER TO R12	0 –-0.03	

UFJ79

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	0.5D	1.0D	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	0.5D	1.0D	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	0.5D	1.0D	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	0.5D	1.0D	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	0.5D	1.0D	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	0.25D	1.0D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	0.4D	1.0D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ79

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE RADIUS SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	1.0D	0.5D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	1.0D	0.5D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ81

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
UFJ81030003A06008057	UFJ81030003B06008057	R0,3	3	6	8	57
UFJ81030005A06008057	UFJ81030005B06008057	R0,5	3	6	8	57
UFJ81040003A06011057	UFJ81040003B06011057	R0,3	4	6	11	57
UFJ81040005A06011057	UFJ81040005B06011057	R0,5	4	6	11	57
UFJ81050003A06013057	UFJ81050003B06013057	R0,3	5	6	13	57
UFJ81050005A06013057	UFJ81050005B06013057	R0,5	5	6	13	57
UFJ81060003A06013057	UFJ81060003B06013057	R0,3	6	6	13	57
UFJ81060005A06013057	UFJ81060005B06013057	R0,5	6	6	13	57
UFJ81060010A06013057	UFJ81060010B06013057	R1,0	6	6	13	57
UFJ81080005A08019063	UFJ81080005B08019063	R0,5	8	8	19	63
UFJ81080010A08019063	UFJ81080010B08019063	R1,0	8	8	19	63
UFJ81100005A10022072	UFJ81100005B10022072	R0,5	10	10	22	72
UFJ81100010A10022072	UFJ81100010B10022072	R1,0	10	10	22	72
UFJ81120005A12026083	UFJ81120005B12026083	R0,5	12	12	26	83
UFJ81120010A12026083	UFJ81120010B12026083	R1,0	12	12	26	83
UFJ81120020A12026083	UFJ81120020B12026083	R2,0	12	12	26	83
UFJ81140005A14026083	UFJ81140005B14026083	R0,5	14	14	26	83
UFJ81160010A16032092	UFJ81160010B16032092	R1,0	16	16	32	92
UFJ81160020A16032092	UFJ81160020B16032092	R2,0	16	16	32	92
UFJ81160030A16032092	UFJ81160030B16032092	R3,0	16	16	32	92
UFJ81180010A18032092	UFJ81180010B18032092	R1,0	18	18	32	92
UFJ81200010A20038104	UFJ81200010B20038104	R1,0	20	20	38	104
UFJ81200020A20038104	UFJ81200020B20038104	R2,0	20	20	38	104
UFJ81200030A20038104	UFJ81200030B20038104	R3,0	20	20	38	104
UFJ81250010A25038104	UFJ81250010B25038104	R1,0	25	25	38	104

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 –-0.02	h5 DIA>12: h6
OVER TO R12	0 –-0.03	

UFJ81

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	0.5D	1.0D	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	0.5D	1.0D	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	0.5D	1.0D	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	0.5D	1.0D	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	0.5D	1.0D	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	0.25D	1.0D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	0.4D	1.0D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ81

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE RADIUS SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	1.0D	0.5D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	1.0D	0.5D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ83

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	RE	DC	DCON	APMX	LU	OAL	DN
UFJ83030003A06012054	UFJ83030003B06012054	0,3	3	6	7	12	54	2,7
UFJ83030005A06012054	UFJ83030005B06012054	0,5	3	6	7	12	54	2,7
UFJ83030003A06017057	UFJ83030003B06017057	0,3	3	6	7	17	57	2,7
UFJ83030005A06017057	UFJ83030005B06017057	0,5	3	6	7	17	57	2,7
UFJ83040003A06015057	UFJ83040003B06015057	0,3	4	6	8	15	57	3,7
UFJ83040005A06015057	UFJ83040005B06015057	0,5	4	6	8	15	57	3,7
UFJ83040003A06022063	UFJ83040003B06022063	0,3	4	6	8	22	63	3,7
UFJ83040005A06022063	UFJ83040005B06022063	0,5	4	6	8	22	63	3,7
UFJ83050003A06017057	UFJ83050003B06017057	0,3	5	6	10	17	57	4,7
UFJ83050005A06017057	UFJ83050005B06017057	0,5	5	6	10	17	57	4,7
UFJ83050003A06027067	UFJ83050003B06027067	0,3	5	6	10	27	67	4,7
UFJ83050005A06027067	UFJ83050005B06027067	0,5	5	6	10	27	67	4,7
UFJ83060003A06015057	UFJ83060003B06015057	0,3	6	6	10	15	57	5,5
UFJ83060005A06015057	UFJ83060005B06015057	0,5	6	6	10	15	57	5,5
UFJ83060010A06015057	UFJ83060010B06015057	1	6	6	10	15	57	5,5
UFJ83060003A06020062	UFJ83060003B06020062	0,3	6	6	10	20	62	5,5
UFJ83060005A06020062	UFJ83060005B06020062	0,5	6	6	10	20	62	5,5
UFJ83060010A06020062	UFJ83060010B06020062	1	6	6	10	20	62	5,5
UFJ83060003A06032074	UFJ83060003B06032074	0,3	6	6	10	32	74	5,5
UFJ83060005A06032074	UFJ83060005B06032074	0,5	6	6	10	32	74	5,5
UFJ83060010A06032074	UFJ83060010B06032074	1	6	6	10	32	74	5,5
UFJ83080005A08020063	UFJ83080005B08020063	0,5	8	8	12	20	63	7,5
UFJ83080010A08020063	UFJ83080010B08020063	1	8	8	12	20	63	7,5
UFJ83080005A08030073	UFJ83080005B08030073	0,5	8	8	12	30	73	7,5
UFJ83080010A08030073	UFJ83080010B08030073	1	8	8	12	30	73	7,5
UFJ83080005A08046090	UFJ83080005B08046090	0,5	8	8	12	46	90	7,5
UFJ83080010A08046090	UFJ83080010B08046090	1	8	8	12	46	90	7,5
UFJ83100005A10025072	UFJ83100005B10025072	0,5	10	10	14	25	72	9,2
UFJ83100010A10025072	UFJ83100010B10025072	1	10	10	14	25	72	9,2
UFJ83100005A10035082	UFJ83100005B10035082	0,5	10	10	14	35	82	9,2
UFJ83100010A10035082	UFJ83100010B10035082	1	10	10	14	35	82	9,2
UFJ83100005A10055102	UFJ83100005B10055102	0,5	10	10	14	55	102	9,2
UFJ83100010A10055102	UFJ83100010B10055102	1	10	10	14	55	102	9,2
UFJ83120005A12030083	UFJ83120005B12030083	0,5	12	12	16	30	83	11
UFJ83120010A12030083	UFJ83120010B12030083	1	12	12	16	30	83	11
UFJ83120020A12030083	UFJ83120020B12030083	2	12	12	16	30	83	11
UFJ83120005A12040093	UFJ83120005B12040093	0,5	12	12	16	40	93	11

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 –-0.02	h5 DIA>12: h6
OVER TO R12	0 –-0.03	

UFJ83

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

ISO	N										S							H			
HRc											15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
											○	○	○	○	○	○	○				

PLAIN	FLAT	RE	DC	DCON	APMX	LU	OAL	DN
UFJ83120010A12040093	UFJ83120010B12040093	1	12	12	16	40	93	11
UFJ83120020A12040093	UFJ83120020B12040093	2	12	12	16	40	93	11
UFJ83120005A12064117	UFJ83120005B12064117	0,5	12	12	16	64	117	11
UFJ83120010A12064117	UFJ83120010B12064117	1	12	12	16	64	117	11
UFJ83120020A12064117	UFJ83120020B12064117	2	12	12	16	64	117	11
UFJ83160010A16038092	UFJ83160010B16038092	1	16	16	22	38	92	15
UFJ83160020A16038092	UFJ83160020B16038092	2	16	16	22	38	92	15
UFJ83160030A16038092	UFJ83160030B16038092	3	16	16	22	38	92	15
UFJ83160010A16055109	UFJ83160010B16055109	1	16	16	22	55	109	15
UFJ83160020A16055109	UFJ83160020B16055109	2	16	16	22	55	109	15
UFJ83160030A16055109	UFJ83160030B16055109	3	16	16	22	55	109	15
UFJ83160010A16087141	UFJ83160010B16087141	1	16	16	22	87	141	15
UFJ83160020A16087141	UFJ83160020B16087141	2	16	16	22	87	141	15
UFJ83160030A16087141	UFJ83160030B16087141	3	16	16	22	87	141	15
UFJ83200010A20050104	UFJ83200010B20050104	1	20	20	26	50	104	19
UFJ83200020A20050104	UFJ83200020B20050104	2	20	20	26	50	104	19
UFJ83200030A20050104	UFJ83200030B20050104	3	20	20	26	50	104	19
UFJ83200010A20070124	UFJ83200010B20070124	1	20	20	26	70	124	19
UFJ83200020A20070124	UFJ83200020B20070124	2	20	20	26	70	124	19
UFJ83200030A20070124	UFJ83200030B20070124	3	20	20	26	70	124	19
UFJ83200010A20110164	UFJ83200010B20110164	1	20	20	26	110	164	19
UFJ83200020A20110164	UFJ83200020B20110164	2	20	20	26	110	164	19
UFJ83200030A20110164	UFJ83200030B20110164	3	20	20	26	110	164	19

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 ~-0.02	h5 DIA>12: h6
OVER TO R12	0 ~-0.03	

UFJ83

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	0.5D	1.0D	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	0.5D	1.0D	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	0.5D	1.0D	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	0.5D	1.0D	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	0.5D	1.0D	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	0.25D	1.0D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	0.4D	1.0D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ83

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE RADIUS SLOTTING / FREZ PROMIENIOWY O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	1.0D	0.5D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	1.0D	0.5D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ78

4 Finish

HSM Vmax A B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											○	○	○	○	○	○	○				

PLAIN	FLAT	DC	DCON	APMX	OAL	CHAMFER
UFJ78030000A06007054	UFJ78030000B06007054	3	6	7	54	0,1
UFJ78040000A06008054	UFJ78040000B06008054	4	6	8	54	0,15
UFJ78050000A06010054	UFJ78050000B06010054	5	6	10	54	0,15
UFJ78060000A06010054	UFJ78060000B06010054	6	6	10	54	0,2
UFJ78080000A08012058	UFJ78080000B08012058	8	8	12	58	0,2
UFJ78100000A10014066	UFJ78100000B10014066	10	10	14	66	0,3
UFJ78120000A12016073	UFJ78120000B12016073	12	12	16	73	0,35
UFJ78140000A14018075	UFJ78140000B14018075	14	14	18	75	0,4
UFJ78160000A16022082	UFJ78160000B16022082	16	16	22	82	0,4
UFJ78180000A18024084	UFJ78180000B18024084	18	18	24	84	0,5
UFJ78200000A20026092	UFJ78200000B20026092	20	20	26	92	0,5

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 –-0.02	h5 DIA>12: h6
OVER TO R12	0 –-0.03	

UFJ78

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	0.5D	1.0D	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	0.5D	1.0D	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	0.5D	1.0D	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	0.5D	1.0D	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	0.5D	1.0D	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	0.25D	1.0D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	0.4D	1.0D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ78

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SLOTTING / FREZ O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	1.0D	0.5D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	1.0D	0.5D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

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ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

ISO	N												S							H			
HRc													15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100					200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41		
											○	○	○	○	○	○	○						

PLAIN	FLAT	DC	DCON	APMX	OAL	CHAMFER
UFJ80030000A06008057	UFJ80030000B06008057	3	6	8	57	0,1
UFJ80040000A06011057	UFJ80040000B06011057	4	6	11	57	0,15
UFJ80050000A06013057	UFJ80050000B06013057	5	6	13	57	0,15
UFJ80060000A06013057	UFJ80060000B06013057	6	6	13	57	0,2
UFJ80080000A08019063	UFJ80080000B08019063	8	8	19	63	0,2
UFJ80100000A10022072	UFJ80100000B10022072	10	10	22	72	0,3
UFJ80120000A12026083	UFJ80120000B12026083	12	12	26	83	0,35
UFJ80140000A14026083	UFJ80140000B14026083	14	14	26	83	0,4
UFJ80160000A16032092	UFJ80160000B16032092	16	16	32	92	0,4
UFJ80180000A18032092	UFJ80180000B18032092	18	18	32	92	0,5
UFJ80200000A20038104	UFJ80200000B20038104	20	20	38	104	0,5
UFJ80250000A25038104	UFJ80250000B25038104	25	25	38	104	0,5

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 –-0.02	h5 DIA.>12: h6
OVER TO R12	0 –-0.03	

UFJ80

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	0.5D	1.0D	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	0.5D	1.0D	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	0.5D	1.0D	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	0.5D	1.0D	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	0.5D	1.0D	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	0.25D	1.0D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	0.4D	1.0D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ80

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SLOTTING / FREZ O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	1.0D	0.5D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	1.0D	0.5D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ82

4 Finish

HSM Vmax A B min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

ISO	N												S							H			
HRc													15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100					200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41		
											○	○	○	○	○	○	○						

PLAIN	FLAT	DC	DCON	APMX	LU	OAL	DN	CHAMFER
UFJ82030000A06007054	UFJ82030000B06007054	3	6	7	12	54	2,7	0,1
UFJ82030000A06007057	UFJ82030000B06007057	3	6	7	17	57	2,7	0,1
UFJ82030000A06008057	UFJ82030000B06008057	3	6	8	14	57	2,7	0,1
UFJ82040000A06008057	UFJ82040000B06008057	4	6	8	15	57	3,7	0,15
UFJ82040000A06008063	UFJ82040000B06008063	4	6	8	22	63	3,7	0,15
UFJ82040000A06011057	UFJ82040000B06011057	4	6	11	16	57	3,7	0,15
UFJ82050000A06010057	UFJ82050000B06010057	5	6	10	17	57	4,7	0,15
UFJ82050000A06010067	UFJ82050000B06010067	5	6	10	27	67	4,7	0,15
UFJ82050000A06013057	UFJ82050000B06013057	5	6	13	18	57	4,7	0,15
UFJ82060000A06010057	UFJ82060000B06010057	6	6	10	15	57	5,5	0,2
UFJ82060000A06010062	UFJ82060000B06010062	6	6	10	20	62	5,5	0,2
UFJ82060000A06010074	UFJ82060000B06010074	6	6	10	32	74	5,5	0,2
UFJ82060000A06013057	UFJ82060000B06013057	6	6	13	21	57	5,5	0,2
UFJ82080000A08012063	UFJ82080000B08012063	8	8	12	20	63	7,5	0,2
UFJ82080000A08012073	UFJ82080000B08012073	8	8	12	30	73	7,5	0,2
UFJ82080000A08012090	UFJ82080000B08012090	8	8	12	46	90	7,5	0,2
UFJ82080000A08019063	UFJ82080000B08019063	8	8	19	27	63	7,5	0,2
UFJ82100000A10014072	UFJ82100000B10014072	10	10	14	25	72	9,2	0,3
UFJ82100000A10014082	UFJ82100000B10014082	10	10	14	35	82	9,2	0,3
UFJ82100000A10014102	UFJ82100000B10014102	10	10	14	55	102	9,2	0,3
UFJ82100000A10022072	UFJ82100000B10022072	10	10	22	32	72	9,2	0,3
UFJ82120000A12016083	UFJ82120000B12016083	12	12	16	30	83	11	0,35
UFJ82120000A12016093	UFJ82120000B12016093	12	12	16	40	93	11	0,35
UFJ82120000A12016117	UFJ82120000B12016117	12	12	16	64	117	11	0,35
UFJ82120000A12026083	UFJ82120000B12026083	12	12	26	38	83	11	0,35
UFJ82160000A16022092	UFJ82160000B16022092	16	16	22	38	92	15	0,4
UFJ82160000A16022109	UFJ82160000B16022109	16	16	22	55	109	15	0,4
UFJ82160000A16022141	UFJ82160000B16022141	16	16	22	87	141	15	0,4
UFJ82160000A16032092	UFJ82160000B16032092	16	16	32	44	92	15	0,4
UFJ82200000A20026104	UFJ82200000B20026104	20	20	26	50	104	19	0,5
UFJ82200000A20026124	UFJ82200000B20026124	20	20	26	70	124	19	0,5
UFJ82200000A20026164	UFJ82200000B20026164	20	20	26	110	164	19	0,5
UFJ82200000A20038104	UFJ82200000B20038104	20	20	38	54	104	19	0,5

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R12	0 –-0.02	h5 DIA>12: h6
OVER TO R12	0 –-0.03	

UFJ82

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	0.5D	1.0D	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	0.5D	1.0D	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	0.5D	1.0D	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	0.5D	1.0D	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	0.5D	1.0D	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	0.5D	1.0D	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	0.5D	1.0D	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	0.25D	1.0D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	0.4D	1.0D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ82

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SLOTTING / FREZ O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	5	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	6-7	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	152	152	152	152	152	168	168	168	168	168	168	168
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	16128	12096	9677	8064	6048	5348	4456	3820	3342	2971	2674	2139
				feed posuw mm/min	323	387	426	516	653	813	838	749	709	701	695	548
	8-9	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	107	107	107	107	107	117	117	117	117	117	117	117
				fz mm/tooth	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.049	0.053	0.059	0.065	0.064
				rpm obr/min	11353	8515	6812	5677	4257	3724	3104	2660	2328	2069	1862	1490
				feed posuw mm/min	227	272	300	363	460	566	583	521	493	488	484	381
	10 - 11.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	64	64	64	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.034	0.037	0.041	0.045	0.045
				rpm obr/min	6791	5093	4074	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	81	122	130	149	194	241	238	216	206	203	201	160
M	12-13	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	148	148	148	148	148	148	148	148	148	148	148	148
				fz mm/tooth	0.004	0.006	0.009	0.013	0.022	0.034	0.039	0.042	0.045	0.05	0.055	0.055
				rpm obr/min	15703	11777	9422	7852	5889	4711	3926	3365	2944	2617	2355	1884
				feed posuw mm/min	251	283	339	408	518	641	612	565	530	523	518	415
	14.1	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	106	106	106	106	106	106	106	106	106	106	106	106
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.07	0.077	0.077
				rpm obr/min	11247	8435	6748	5623	4218	3374	2812	2410	2109	1874	1687	1350
				feed posuw mm/min	225	270	351	405	472	648	619	569	523	525	520	416
	14.2	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	95	95	95	95	95	95	95	95	95	95	95	95
				fz mm/tooth	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.059	0.062	0.069	0.076	0.076
				rpm obr/min	10080	7560	6048	5040	3780	3024	2520	2160	1890	1680	1512	1210
				feed posuw mm/min	202	242	314	363	423	581	554	510	469	464	460	368
K	15-20	1.5D (1.2D)	1.0D (0.8D)	Vc m/min	112	112	112	112	112	123	123	123	123	123	123	123
				fz mm/tooth	0.006	0.01	0.014	0.02	0.034	0.048	0.058	0.061	0.065	0.073	0.081	0.079
				rpm obr/min	11884	8913	7130	5942	4456	3915	3263	2797	2447	2175	1958	1566
				feed posuw mm/min	285	357	399	475	606	752	757	682	636	635	634	495
S	31-35	1.0D	0.5D	Vc m/min	26	26	26	26	26	26	26	26	26	26	26	26
				fz mm/tooth	0.005	0.007	0.008	0.012	0.019	0.033	0.038	0.04	0.043	0.048	0.054	0.052
				rpm obr/min	2759	2069	1655	1379	1035	828	690	591	517	460	414	331
				feed posuw mm/min	55	58	53	66	79	109	105	95	89	88	89	69
	36-37	1.0D	0.5D	Vc m/min	58	58	58	58	58	58	58	58	58	58	58	58
				fz mm/tooth	0.004	0.007	0.011	0.016	0.025	0.042	0.05	0.053	0.055	0.062	0.068	0.069
				rpm obr/min	6154	4615	3692	3077	2308	1846	1538	1319	1154	1026	923	738
				feed posuw mm/min	98	129	162	197	231	310	308	280	254	254	251	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFJ74

5 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	○	○	○	●	○	○	○	●	○	●	●	●	○	○	○	○	○	○											○	○	○	○	○	●	●				

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UFJ74060000A06013057	UFJ7406000B06013057	6.0	6	13	57	0.1
UFJ74080000A08019063	UFJ7408000B08019063	8.0	8	19	63	0.1
UFJ74100000A10022072	UFJ74100000B10022072	10.0	10	22	72	0.1
UFJ74120000A12026083	UFJ74120000B12026083	12.0	12	26	83	0.1
UFJ74140000A14026083	UFJ74140000B14026083	14.0	14	26	83	0.2
UFJ74160000A16032092	UFJ74160000B16032092	16.0	16	32	92	0.2
UFJ74180000A18032092	UFJ74180000B18032092	18.0	18	32	92	0.2
UFJ74200000A20038104	UFJ74200000B20038104	20.0	20	38	104	0.2
UFJ74250000A25038104	UFJ74250000B25038104	25.0	25	38	104	0.2

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5 DIA>12: h6

UFJ74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

5 FLUTE SIDE CUTTING / FREZ O 5 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-2	0.25D	1.25D	Vc m/min	135	135	135	135	135	135	135
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.089
				rpm obr/min	7162	5371	4297	3581	3069	2686	2149
				feed posuw mm/min	1218	1021	1074	1128	1059	1021	956
	6	0.25D	1.25D	Vc m/min	135	135	135	135	135	135	135
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.089
				rpm obr/min	7162	5371	4297	3581	3069	2686	2149
				feed posuw mm/min	1218	1021	1074	1128	1059	1021	956
	10	0.25D	1.25D	Vc m/min	135	135	135	135	135	135	135
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.089
				rpm obr/min	7162	5371	4297	3581	3069	2686	2149
				feed posuw mm/min	1218	1021	1074	1128	1059	1021	956
M	12-13	0.25D	1.25D	Vc m/min	105	105	105	145	105	105	105
				fz mm/tooth	0.030	0.032	0.038	0.043	0.064	0.068	0.076
				rpm obr/min	5570	4178	3342	3846	2387	2089	1671
				feed posuw mm/min	836	668	635	827	764	710	635
	14.1	0.25D	1.25D	Vc m/min	115	115	115	115	115	115	115
				fz mm/tooth	0.030	0.032	0.038	0.063	0.065	0.069	0.076
				rpm obr/min	6101	4576	3661	3050	2615	2288	1830
				feed posuw mm/min	915	732	696	961	850	789	696
K	15-20	0.25D	1.25D	Vc m/min	135	135	135	135	135	135	135
				fz mm/tooth	0.034	0.038	0.050	0.063	0.069	0.076	0.089
				rpm obr/min	7162	5371	4297	3581	3069	2686	2149
				feed posuw mm/min	1218	1021	1074	1128	1059	1021	956
S	31-35	0.25D	1.0D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.017	0.020	0.025	0.036	0.045	0.048	0.060
				rpm obr/min	1326	995	796	663	568	497	398
				feed posuw mm/min	113	99	99	119	128	119	119
	36-37	0.25D	1.25D	Vc m/min	85	85	85	85	85	85	85
				fz mm/tooth	0.030	0.031	0.038	0.050	0.057	0.063	0.075
				rpm obr/min	4509	3382	2706	2255	1933	1691	1353
				feed posuw mm/min	676	524	514	564	551	533	507

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

P M K **N** S H

UFA END MILLS are designed for HSM machining of aluminum and it's alloys, copper, graphite (economic type),non-ferrous materials.

FREZY UFA przeznaczone są do obróbki szybkościowej (OS) aluminium i jego stopów, miedzi, grafitu (wariant ekonomiczny) oraz materiałów nieżelaznych.

UFA END MILLS
FREZY UFA

Group					ISO	PAGE
UFA60			3		P M K **N** S H	357
UFA61			3		P M K **N** S H	357
UFA62			3		P M K **N** S H	360
UFA63			3		P M K **N** S H	360
UFA64			3		P M K **N** S H	363
UFA65			3		P M K **N** S H	363
UFA58			3		P M K **N** S H	365
UFA59			3		P M K **N** S H	365
UFA15			2		P M K **N** S H	367
UFA31			3		P M K **N** S H	368
UFA18		R	2		P M K **N** S H	369
UFA14		R	2		P M K **N** S H	370
UFA21		R	3		P M K **N** S H	371
UFA11			1		P M K **N** S H	373
UFA17			2		P M K **N** S H	374
UFA12			2		P M K **N** S H	375
UFA20			3		P M K **N** S H	376
UFA19			3		P M K **N** S H	377
UFA27			3		P M K **N** S H	378
UFA32			3		P M K **N** S H	379

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

UFA60, UFA61

3 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○	○	○	○	○												

UNCOATED	DLC CLOATED	RE	DC	DCON	APMX	OAL
UFA60060005A06013057	UFA61060005A06013057	0,5	6	6	13	57
UFA60060010A06013057	UFA61060010A06013057	1	6	6	13	57
UFA60060015A06013057	UFA61060015A06013057	1,5	6	6	13	57
UFA60060008A06013072	UFA61060008A06013072	0,8	6	6	13	72
UFA60060012A06013072	UFA61060012A06013072	1,2	6	6	13	72
UFA60060005A06024075	UFA61060005A06024075	0,5	6	6	24	75
UFA60060010A06024075	UFA61060010A06024075	1	6	6	24	75
UFA60080003A08019063	UFA61080003A08019063	0,3	8	8	19	63
UFA60080005A08019063	UFA61080005A08019063	0,5	8	8	19	63
UFA60080010A08019063	UFA61080010A08019063	1	8	8	19	63
UFA60080015A08019063	UFA61080015A08019063	1,5	8	8	19	63
UFA60080005A08032075	UFA61080005A08032075	0,5	8	8	32	75
UFA60080010A08032075	UFA61080010A08032075	1	8	8	32	75
UFA60080015A08032075	UFA61080015A08032075	1,5	8	8	32	75
UFA60080020A08032075	UFA61080020A08032075	2	8	8	32	75
UFA60100003A10022072	UFA61100003A10022072	0,3	10	10	22	72
UFA60100005A10022072	UFA61100005A10022072	0,5	10	10	22	72
UFA60100010A10022072	UFA61100010A10022072	1	10	10	22	72
UFA60100015A10022072	UFA61100015A10022072	1,5	10	10	22	72
UFA60100005A10040100	UFA61100005A10040100	0,5	10	10	40	100
UFA60100010A10040100	UFA61100010A10040100	1	10	10	40	100
UFA60100015A10040100	UFA61100015A10040100	1,5	10	10	40	100
UFA60100020A10040100	UFA61100020A10040100	2	10	10	40	100
UFA60120015A12026083	UFA61120015A12026083	1,5	12	12	26	83
UFA60120020A12026083	UFA61120020A12026083	2	12	12	26	83
UFA60120025A12026083	UFA61120025A12026083	2,5	12	12	26	83
UFA60120030A12026083	UFA61120030A12026083	3	12	12	26	83
UFA60120005A12048100	UFA61120005A12048100	0,5	12	12	48	100
UFA60120010A12048100	UFA61120010A12048100	1	12	12	48	100
UFA60120015A12048100	UFA61120015A12048100	1,5	12	12	48	100
UFA60120020A12048100	UFA61120020A12048100	2	12	12	48	100
UFA60120025A12048100	UFA61120025A12048100	2,5	12	12	48	100
UFA60120030A12048100	UFA61120030A12048100	3	12	12	48	100

MILL DIA TOLERANCE mm		SHANK DIA TOLERANCE
Up to 3	+0/-0.006	h5
Over 3 ~ up to 6	+0/-0.008	h5
Over 6 ~ up to 10	+0/-0.009	h5
Over 10 ~ up to 18	+0/-0.011	h5
Over 18 ~ up to 25	+0/-0.013	h5

UFA60, UFA61

3 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○	○	○	○	○												

UNCOATED	DLC CLOATED	RE	DC	DCON	APMX	OAL
UFA60140010A14030089	UFA61140010A14030089	1	14	14	30	89
UFA60140020A14030089	UFA61140020A14030089	2	14	14	30	89
UFA60140030A14030089	UFA61140030A14030089	3	14	14	30	89
UFA60160015A16032092	UFA61160015A16032092	1,5	16	16	32	92
UFA60160020A16032092	UFA61160020A16032092	2	16	16	32	92
UFA60160025A16032092	UFA61160025A16032092	2,5	16	16	32	92
UFA60160030A16032092	UFA61160030A16032092	3	16	16	32	92
UFA60160040A16032092	UFA61160040A16032092	4	16	16	32	92
UFA60160005A16064125	UFA61160005A16064125	0,5	16	16	64	125
UFA60160010A16064125	UFA61160010A16064125	1	16	16	64	125
UFA60160015A16064125	UFA61160015A16064125	1,5	16	16	64	125
UFA60160020A16064125	UFA61160020A16064125	2	16	16	64	125
UFA60160025A16064125	UFA61160025A16064125	2,5	16	16	64	125
UFA60160030A16064125	UFA61160030A16064125	3	16	16	64	125
UFA60160040A16064125	UFA61160040A16064125	4	16	16	64	125
UFA60200020A20038104	UFA61200020A20038104	2	20	20	38	104
UFA60200025A20038104	UFA61200025A20038104	2,5	20	20	38	104
UFA60200030A20038104	UFA61200030A20038104	3	20	20	38	104
UFA60200040A20038104	UFA61200040A20038104	4	20	20	38	104
UFA60200005A20080150	UFA61200005A20080150	0,5	20	20	80	150
UFA60200010A20080150	UFA61200010A20080150	1	20	20	80	150
UFA60200015A20080150	UFA61200015A20080150	1,5	20	20	80	150
UFA60200020A20080150	UFA61200020A20080150	2	20	20	80	150
UFA60200025A20080150	UFA61200025A20080150	2,5	20	20	80	150
UFA60200030A20080150	UFA61200030A20080150	3	20	20	80	150
UFA60200040A20080150	UFA61200040A20080150	4	20	20	80	150

MILL DIA TOLERANCE mm		SHANK DIA TOLERANCE
Up to 3	+0/-0.006	h5
Over 3 ~ up to 6	+0/-0.008	h5
Over 6 ~ up to 10	+0/-0.009	h5
Over 10 ~ up to 18	+0/-0.011	h5
Over 18 ~ up to 25	+0/-0.013	h5

UFA60, UFA61

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	10.0	12.0	16.0	20.0
N	21-22	1.0D	1.0D	Vc m/min	488	488	488	488	488
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	25889	15533	12945	9708	7767
				feed posuw mm/min	5918	5326	5918	4883	4439
	23-25	1.0D	1.0D	Vc m/min	183	183	183	183	183
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	9708	5825	4854	3641	2913
				feed posuw mm/min	2219	1997	2219	1831	1665
	26-28	1.0D	1.0D	Vc m/min	268	268	268	268	268
				fz mm/tooth	0.051	0.102	0.127	0.140	0.152
				rpm obr/min	14218	8531	7109	5332	4265
				feed posuw mm/min	2167	2600	2708	2235	1950
	29.1	1.0D	1.0D	Vc m/min	503	503	503	503	503
				fz mm/tooth	0.102	0.191	0.254	0.279	0.305
				rpm obr/min	26685	16011	13342	10007	8005
				feed posuw mm/min	8134	9150	10167	8388	7320

3 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	10.0	12.0	16.0	20.0
N	21-22	0.5D	1.5D	Vc m/min	610	610	610	610	610
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	32361	19417	16181	12136	9708
				feed posuw mm/min	7398	6658	7398	6103	5548
	23-25	0.5D	1.5D	Vc m/min	244	244	244	244	244
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	12945	7767	6472	4854	3883
				feed posuw mm/min	2959	2663	2959	2441	2219
	26-28	0.5D	1.5D	Vc m/min	351	351	351	351	351
				fz mm/tooth	0.051	0.102	0.127	0.140	0.152
				rpm obr/min	18621	11173	9311	6983	5586
				feed posuw mm/min	2838	3405	3547	2927	2554
	29.1	0.5D	1.5D	Vc m/min	625	625	625	625	625
				fz mm/tooth	0.102	0.191	0.254	0.279	0.305
				rpm obr/min	33157	19894	16579	12434	9947
				feed posuw mm/min	10106	11370	12633	10422	9096

3 FLUTE CORNER RADIUS SIDE CUTTING HSM / FREZ PROMIENIOWY O 3 ZĘBACH FREZOWANIE BOKIEM HSM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	10.0	12.0	16.0	20.0
N	21-22	0.05D	2.0D	Vc m/min	1006	1006	1006	1006	1006
				fz mm/tooth	0.140	0.267	0.356	0.381	0.419
				rpm obr/min	53370	32022	26685	20014	16011
				feed posuw mm/min	22367	25621	28467	22876	20131
	23-25	0.05D	2.0D	Vc m/min	366	366	366	366	366
				fz mm/tooth	0.140	0.267	0.356	0.381	0.419
				rpm obr/min	19417	11650	9708	7281	5825
				feed posuw mm/min	8138	9321	10357	8323	7324
	26-28	0.05D	2.0D	Vc m/min	564	564	564	564	564
				fz mm/tooth	0.114	0.216	0.292	0.330	0.356
				rpm obr/min	29921	17953	14961	11220	8976
				feed posuw mm/min	10260	11628	13110	11115	9576
	29.1	0.05D	2.0D	Vc m/min	1021	1021	1021	1021	1021
				fz mm/tooth	0.229	0.432	0.584	0.635	0.699
				rpm obr/min	54166	32499	27083	20312	16250
				feed posuw mm/min	37147	42100	47465	38695	34051

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFA62, UFA63

3 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

ISO																																				
HRc																																				
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550															
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41															
	●	●	●	●	○	○	○	○	○																											

UNCOATED	DLC CLOATED	RE	DC	DCON	APMX	LU	OAL	DN
UFA62060005A06020063	UFA63060005A06020063	0,5	6	6	10	20	63	5,7
UFA62060010A06020063	UFA63060010A06020063	1	6	6	10	20	63	5,7
UFA62060005A06030072	UFA63060005A06030072	0,5	6	6	13	30	72	5,7
UFA62060010A06030072	UFA63060010A06030072	1	6	6	13	30	72	5,7
UFA62080003A08025075	UFA63080003A08025075	0,3	8	8	12	25	75	7,4
UFA62080005A08025075	UFA63080005A08025075	0,5	8	8	12	25	75	7,4
UFA62080008A08025075	UFA63080008A08025075	0,8	8	8	12	25	75	7,4
UFA62080010A08025075	UFA63080010A08025075	1	8	8	12	25	75	7,4
UFA62080012A08025075	UFA63080012A08025075	1,2	8	8	12	25	75	7,4
UFA62080015A08025075	UFA63080015A08025075	1,5	8	8	12	25	75	7,4
UFA62080016A08025075	UFA63080016A08025075	1,6	8	8	12	25	75	7,4
UFA62100003A10035100	UFA63100003A10035100	0,3	10	10	14	35	100	9,2
UFA62100005A10035100	UFA63100005A10035100	0,5	10	10	14	35	100	9,2
UFA62100008A10035100	UFA63100008A10035100	0,8	10	10	14	35	100	9,2
UFA62100010A10035100	UFA63100010A10035100	1	10	10	14	35	100	9,2
UFA62100012A10035100	UFA63100012A10035100	1,2	10	10	14	35	100	9,2
UFA62100015A10035100	UFA63100015A10035100	1,5	10	10	14	35	100	9,2
UFA62100016A10035100	UFA63100016A10035100	1,6	10	10	14	35	100	9,2
UFA62100024A10035100	UFA63100024A10035100	2,4	10	10	14	35	100	9,2
UFA62120005A12040100	UFA63120005A12040100	0,5	12	12	16	40	100	11
UFA62120008A12040100	UFA63120008A12040100	0,8	12	12	16	40	100	11
UFA62120010A12040100	UFA63120010A12040100	1	12	12	16	40	100	11
UFA62120012A12040100	UFA63120012A12040100	1,2	12	12	16	40	100	11
UFA62120015A12040100	UFA63120015A12040100	1,5	12	12	16	40	100	11
UFA62120016A12040100	UFA63120016A12040100	1,6	12	12	16	40	100	11
UFA62120020A12040100	UFA63120020A12040100	2	12	12	16	40	100	11
UFA62120024A12040100	UFA63120024A12040100	2,4	12	12	16	40	100	11
UFA62120025A12040100	UFA63120025A12040100	2,5	12	12	16	40	100	11
UFA62120030A12040100	UFA63120030A12040100	3	12	12	16	40	100	11
UFA62120040A12040100	UFA63120040A12040100	4	12	12	16	40	100	11
UFA62140010A14045125	UFA63140010A14045125	1	14	14	18	45	125	13
UFA62140020A14045125	UFA63140020A14045125	2	14	14	18	45	125	13
UFA62140030A14045125	UFA63140030A14045125	3	14	14	18	45	125	13

MILL DIA TOLERANCE mm		SHANK DIA TOLERANCE
Up to 3	+0/-0.006	h5
Over 3 ~ up to 6	+0/-0.008	h5
Over 6 ~ up to 10	+0/-0.009	h5
Over 10 ~ up to 18	+0/-0.011	h5
Over 18 ~ up to 25	+0/-0.013	h5

UFA62, UFA63

3 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

ISO																																				
HRc																																				
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550															
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41															
	●	●	●	●	○	○	○	○	○																											

UNCOATED	DLC CLOATED	RE	DC	DCON	APMX	LU	OAL	DN
UFA62140040A14045125	UFA63140040A14045125	4	14	14	18	45	125	13
UFA62160008A16050125	UFA63160008A16050125	0,8	16	16	20	50	125	15
UFA62160012A16050125	UFA63160012A16050125	1,2	16	16	20	50	125	15
UFA62160016A16050125	UFA63160016A16050125	1,6	16	16	20	50	125	15
UFA62160020A16050125	UFA63160020A16050125	2	16	16	20	50	125	15
UFA62160024A16050125	UFA63160024A16050125	2,4	16	16	20	50	125	15
UFA62160025A16050125	UFA63160025A16050125	2,5	16	16	20	50	125	15
UFA62160030A16050125	UFA63160030A16050125	3	16	16	20	50	125	15
UFA62160032A16050125	UFA63160032A16050125	3,2	16	16	20	50	125	15
UFA62160040A16050125	UFA63160040A16050125	4	16	16	20	50	125	15
UFA62200008A20065150	UFA63200008A20065150	0,8	20	20	25	65	150	19
UFA62200012A20065150	UFA63200012A20065150	1,2	20	20	25	65	150	19
UFA62200016A20065150	UFA63200016A20065150	1,6	20	20	25	65	150	19
UFA62200020A20065150	UFA63200020A20065150	2	20	20	25	65	150	19
UFA62200024A20065150	UFA63200024A20065150	2,4	20	20	25	65	150	19
UFA62200025A20065150	UFA63200025A20065150	2,5	20	20	25	65	150	19
UFA62200030A20065150	UFA63200030A20065150	3	20	20	25	65	150	19
UFA62200032A20065150	UFA63200032A20065150	3,2	20	20	25	65	150	19
UFA62200040A20065150	UFA63200040A20065150	4	20	20	25	65	150	19

MILL DIA TOLERANCE mm		SHANK DIA TOLERANCE
Up to 3	+0/-0.006	h5
Over 3 ~ up to 6	+0/-0.008	h5
Over 6 ~ up to 10	+0/-0.009	h5
Over 10 ~ up to 18	+0/-0.011	h5
Over 18 ~ up to 25	+0/-0.013	h5

UFA62, UFA63

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	10.0	12.0	16.0	20.0
N	21-22	1.0D	1.0D	Vc m/min	488	488	488	488	488
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	25889	15533	12945	9708	7767
				feed posuw mm/min	5918	5326	5918	4883	4439
	23-25	1.0D	1.0D	Vc m/min	183	183	183	183	183
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	9708	5825	4854	3641	2913
				feed posuw mm/min	2219	1997	2219	1831	1665
	26-28	1.0D	1.0D	Vc m/min	268	268	268	268	268
				fz mm/tooth	0.051	0.102	0.127	0.140	0.152
				rpm obr/min	14218	8531	7109	5332	4265
				feed posuw mm/min	2167	2600	2708	2235	1950
	29.1	1.0D	1.0D	Vc m/min	503	503	503	503	503
				fz mm/tooth	0.102	0.191	0.254	0.279	0.305
				rpm obr/min	26685	16011	13342	10007	8005
				feed posuw mm/min	8134	9150	10167	8388	7320

3 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	10.0	12.0	16.0	20.0
N	21-22	0.5D	1.5D	Vc m/min	610	610	610	610	610
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	32361	19417	16181	12136	9708
				feed posuw mm/min	7398	6658	7398	6103	5548
	23-25	0.5D	1.5D	Vc m/min	244	244	244	244	244
				fz mm/tooth	0.076	0.114	0.152	0.168	0.191
				rpm obr/min	12945	7767	6472	4854	3883
				feed posuw mm/min	2959	2663	2959	2441	2219
	26-28	0.5D	1.5D	Vc m/min	351	351	351	351	351
				fz mm/tooth	0.051	0.102	0.127	0.140	0.152
				rpm obr/min	18621	11173	9311	6983	5586
				feed posuw mm/min	2838	3405	3547	2927	2554
	29.1	0.5D	1.5D	Vc m/min	625	625	625	625	625
				fz mm/tooth	0.102	0.191	0.254	0.279	0.305
				rpm obr/min	33157	19894	16579	12434	9947
				feed posuw mm/min	10106	11370	12633	10422	9096

3 FLUTE CORNER RADIUS SIDE CUTTING HSM / FREZ PROMIENIOWY O 3 ZĘBACH FREZOWANIE BOKIEM HSM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	10.0	12.0	16.0	20.0
N	21-22	0.05D	2.0D	Vc m/min	1006	1006	1006	1006	1006
				fz mm/tooth	0.140	0.267	0.356	0.381	0.419
				rpm obr/min	53370	32022	26685	20014	16011
				feed posuw mm/min	22367	25621	28467	22876	20131
	23-25	0.05D	2.0D	Vc m/min	366	366	366	366	366
				fz mm/tooth	0.140	0.267	0.356	0.381	0.419
				rpm obr/min	19417	11650	9708	7281	5825
				feed posuw mm/min	8138	9321	10357	8323	7324
	26-28	0.05D	2.0D	Vc m/min	564	564	564	564	564
				fz mm/tooth	0.114	0.216	0.292	0.330	0.356
				rpm obr/min	29921	17953	14961	11220	8976
				feed posuw mm/min	10260	11628	13110	11115	9576
	29.1	0.05D	2.0D	Vc m/min	1021	1021	1021	1021	1021
				fz mm/tooth	0.229	0.432	0.584	0.635	0.699
				rpm obr/min	54166	32499	27083	20312	16250
				feed posuw mm/min	37147	42100	47465	38695	34051

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFA64, UFA65

3 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○	○	○	○	○												

UNCOATED	DLC CLOATED	DC	DCON	APMX	OAL
UFA64030000A06008052	UFA65030000A06008052	3	6	8	52
UFA64040000A06011055	UFA65040000A06011055	4	6	11	55
UFA64050000A06013057	UFA65050000A06013057	5	6	13	57
UFA64060000A06013057	UFA65060000A06013057	6	6	13	57
UFA64060000A06013072	UFA65060000A06013072	6	6	13	72
UFA64060000A06024075	UFA65060000A06024075	6	6	24	75
UFA64080000A08019063	UFA65080000A08019063	8	8	19	63
UFA64080000A08032075	UFA65080000A08032075	8	8	32	75
UFA64100000A10022072	UFA65100000A10022072	10	10	22	72
UFA64100000A10040100	UFA65100000A10040100	10	10	40	100
UFA64120000A12026083	UFA65120000A12026083	12	12	26	83
UFA64120000A12048100	UFA65120000A12048100	12	12	48	100
UFA64140000A14030089	UFA65140000A14030089	14	14	30	89
UFA64160000A16032092	UFA65160000A16032092	16	16	32	92
UFA64160000A16064125	UFA65160000A16064125	16	16	64	125
UFA64200000A20038104	UFA65200000A20038104	20	20	38	104
UFA64200000A20080150	UFA65200000A20080150	20	20	80	150
UFA64250000A25050125	UFA65250000A25050125	25	25	50	125

MILL DIA TOLERANCE mm		SHANK DIA TOLERANCE
Up to 3	+0/-0.006	h5
Over 3 ~ up to 6	+0/-0.008	h5
Over 6 ~ up to 10	+0/-0.009	h5
Over 10 ~ up to 18	+0/-0.011	h5
Over 18 ~ up to 25	+0/-0.013	h5

UFA64, UFA65

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	10.0	12.0	16.0	20.0	25.0
N	21-22	1.0D	1.0D	Vc m/min	488	488	488	488	488	488	488
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	51778	25889	15533	12945	9708	7767	6213
				feed posuw mm/min	3946	5918	5326	5918	4883	4439	4735
	23-25	1.0D	1.0D	Vc m/min	183	183	183	183	183	183	183
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	19417	9708	5825	4854	3641	2913	2330
				feed posuw mm/min	1480	2219	1997	2219	1831	1665	1775
	26-28	1.0D	1.0D	Vc m/min	268	268	268	268	268	268	268
				fz mm/tooth	0.020	0.051	0.102	0.127	0.140	0.152	0.178
				rpm obr/min	28436	14218	8531	7109	5332	4265	3412
				feed posuw mm/min	1733	2167	2600	2708	2235	1950	1820
	29.1	1.0D	1.0D	Vc m/min	503	503	503	503	503	503	503
				fz mm/tooth	0.038	0.102	0.191	0.254	0.279	0.305	0.356
				rpm obr/min	53370	26685	16011	13342	10007	8005	6404
				feed posuw mm/min	6100	8134	9150	10167	8388	7320	6832

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	10.0	12.0	16.0	20.0	25.0
N	21-22	0.5D	1.5D	Vc m/min	610	610	610	610	610	610	610
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	64723	32361	19417	16181	12136	9708	7767
				feed posuw mm/min	4932	7398	6658	7398	6103	5548	5918
	23-25	0.5D	1.5D	Vc m/min	244	244	244	244	244	244	244
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	25889	12945	7767	6472	4854	3883	3107
				feed posuw mm/min	1973	2959	2663	2959	2441	2219	2367
	26-28	0.5D	1.5D	Vc m/min	351	351	351	351	351	351	351
				fz mm/tooth	0.020	0.051	0.102	0.127	0.140	0.152	0.178
				rpm obr/min	37242	18621	11173	9311	6983	5586	4469
				feed posuw mm/min	2270	2838	3405	3547	2927	2554	2384
	29.1	0.5D	1.5D	Vc m/min	625	625	625	625	625	625	625
				fz mm/tooth	0.038	0.102	0.191	0.254	0.279	0.305	0.356
				rpm obr/min	66314	33157	19894	16579	12434	9947	7958
				feed posuw mm/min	7580	10106	11370	12633	10422	9096	8489

3 FLUTE SIDE CUTTING HSM / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM HSM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	10.0	12.0	16.0	20.0	25.0
N	21-22	0.05D	2.0D	Vc m/min	1006	1006	1006	1006	1006	1006	1006
				fz mm/tooth	0.053	0.140	0.267	0.356	0.381	0.419	0.495
				rpm obr/min	106740	53370	32022	26685	20014	16011	12809
				feed posuw mm/min	17080	22367	25621	28467	22876	20131	19033
	23-25	0.05D	2.0D	Vc m/min	366	366	366	366	366	366	366
				fz mm/tooth	0.053	0.140	0.267	0.356	0.381	0.419	0.495
				rpm obr/min	38834	19417	11650	9708	7281	5825	4660
				feed posuw mm/min	6214	8138	9321	10357	8323	7324	6924
	26-28	0.05D	2.0D	Vc m/min	564	564	564	564	564	564	564
				fz mm/tooth	0.043	0.114	0.216	0.292	0.330	0.356	0.406
				rpm obr/min	59842	29921	17953	14961	11220	8976	7181
				feed posuw mm/min	7752	10260	11628	13110	11115	9576	8755
	29.1	0.05D	2.0D	Vc m/min	1021	1021	1021	1021	1021	1021	1021
				fz mm/tooth	0.086	0.229	0.432	0.584	0.635	0.699	0.813
				rpm obr/min	108331	54166	32499	27083	20312	16250	13000
				feed posuw mm/min	28066	37147	42100	47465	38695	34051	31699

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFA58, UFA59

3 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○	○	○	○	○												

UNCOATED	DLC CLOATED	DC	DCON	APMX	LU	OAL	DN
UFA58060000A06020075	UFA59060000A06020075	6	6	10	20	75	5,7
UFA58080000A08025075	UFA59080000A08025075	8	8	12	25	75	7,4
UFA58100000A10035100	UFA59100000A10035100	10	10	14	35	100	9,2
UFA58120000A12040100	UFA59120000A12040100	12	12	16	40	100	11
UFA58140000A14045125	UFA59140000A14045125	14	14	18	45	125	13
UFA58160000A16050125	UFA59160000A16050125	16	16	20	50	125	15
UFA58200000A20065150	UFA59200000A20065150	20	20	25	65	150	19

MILL DIA TOLERANCE mm		SHANK DIA TOLERANCE
Up to 3	+0/-0.006	h5
Over 3 ~ up to 6	+0/-0.008	h5
Over 6 ~ up to 10	+0/-0.009	h5
Over 10 ~ up to 18	+0/-0.011	h5
Over 18 ~ up to 25	+0/-0.013	h5

UFA58, UFA59

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	10.0	12.0	16.0	20.0	25.0
N	21-22	1.0D	1.0D	Vc m/min	488	488	488	488	488	488	488
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	51778	25889	15533	12945	9708	7767	6213
				feed posuw mm/min	3946	5918	5326	5918	4883	4439	4735
	23-25	1.0D	1.0D	Vc m/min	183	183	183	183	183	183	183
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	19417	9708	5825	4854	3641	2913	2330
				feed posuw mm/min	1480	2219	1997	2219	1831	1665	1775
	26-28	1.0D	1.0D	Vc m/min	268	268	268	268	268	268	268
				fz mm/tooth	0.020	0.051	0.102	0.127	0.140	0.152	0.178
				rpm obr/min	28436	14218	8531	7109	5332	4265	3412
				feed posuw mm/min	1733	2167	2600	2708	2235	1950	1820
	29.1	1.0D	1.0D	Vc m/min	503	503	503	503	503	503	503
				fz mm/tooth	0.038	0.102	0.191	0.254	0.279	0.305	0.356
				rpm obr/min	53370	26685	16011	13342	10007	8005	6404
				feed posuw mm/min	6100	8134	9150	10167	8388	7320	6832

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	10.0	12.0	16.0	20.0	25.0
N	21-22	0.5D	1.5D	Vc m/min	610	610	610	610	610	610	610
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	64723	32361	19417	16181	12136	9708	7767
				feed posuw mm/min	4932	7398	6658	7398	6103	5548	5918
	23-25	0.5D	1.5D	Vc m/min	244	244	244	244	244	244	244
				fz mm/tooth	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				rpm obr/min	25889	12945	7767	6472	4854	3883	3107
				feed posuw mm/min	1973	2959	2663	2959	2441	2219	2367
	26-28	0.5D	1.5D	Vc m/min	351	351	351	351	351	351	351
				fz mm/tooth	0.020	0.051	0.102	0.127	0.140	0.152	0.178
				rpm obr/min	37242	18621	11173	9311	6983	5586	4469
				feed posuw mm/min	2270	2838	3405	3547	2927	2554	2384
	29.1	0.5D	1.5D	Vc m/min	625	625	625	625	625	625	625
				fz mm/tooth	0.038	0.102	0.191	0.254	0.279	0.305	0.356
				rpm obr/min	66314	33157	19894	16579	12434	9947	7958
				feed posuw mm/min	7580	10106	11370	12633	10422	9096	8489

3 FLUTE SIDE CUTTING HSM / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM HSM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	10.0	12.0	16.0	20.0	25.0
N	21-22	0.05D	2.0D	Vc m/min	1006	1006	1006	1006	1006	1006	1006
				fz mm/tooth	0.053	0.140	0.267	0.356	0.381	0.419	0.495
				rpm obr/min	106740	53370	32022	26685	20014	16011	12809
				feed posuw mm/min	17080	22367	25621	28467	22876	20131	19033
	23-25	0.05D	2.0D	Vc m/min	366	366	366	366	366	366	366
				fz mm/tooth	0.053	0.140	0.267	0.356	0.381	0.419	0.495
				rpm obr/min	38834	19417	11650	9708	7281	5825	4660
				feed posuw mm/min	6214	8138	9321	10357	8323	7324	6924
	26-28	0.05D	2.0D	Vc m/min	564	564	564	564	564	564	564
				fz mm/tooth	0.043	0.114	0.216	0.292	0.330	0.356	0.406
				rpm obr/min	59842	29921	17953	14961	11220	8976	7181
				feed posuw mm/min	7752	10260	11628	13110	11115	9576	8755
	29.1	0.05D	2.0D	Vc m/min	1021	1021	1021	1021	1021	1021	1021
				fz mm/tooth	0.086	0.229	0.432	0.584	0.635	0.699	0.813
				rpm obr/min	108331	54166	32499	27083	20312	16250	13000
				feed posuw mm/min	28066	37147	42100	47465	38695	34051	31699

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFA15

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○	○	○	○													

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFA15006003A06025055	3	6	6	5,5	25	55	5,4
UFA15008004A07030065	4	8	8	7	30	65	7,2
UFA15010005A09035075	5	10	10	8,5	35	75	9
UFA15012006A11040075	6	12	12	10,5	40	75	11
UFA15016008A14050090	8	16	16	14	50	90	14,5
UFA15020010A17050100	10	20	20	17	50	100	18

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	16.0	20.0
N	21-22	0.2D	0.5D	Vc m/min	270	280	350	420	440	350
				fz mm/tooth	0.049	0.071	0.084	0.107	0.123	0.157
				rpm obr/min	14324	11141	11141	11141	8754	5570
				feed posuw mm/min	1404	1582	1872	2384	2153	1749
	23-24	0.2D	0.5D	Vc m/min	176	182	228	273	286	228
				fz mm/tooth	0.049	0.071	0.084	0.107	0.123	0.157
				rpm obr/min	9311	7242	7242	7242	5690	3621
				feed posuw mm/min	912	1028	1217	1550	1400	1137
	26-28	0.2D	0.5D	Vc m/min	85	85	105	125	135	105
				fz mm/tooth	0.04	0.06	0.069	0.089	0.101	0.131
				rpm obr/min	4509	3382	3342	3316	2686	1671
				feed posuw mm/min	361	406	461	590	543	438

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
± 0.02	h5

UFA31

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○	○	○	○													

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFA31020010A03060060	1	2	6	3	5	60	1,9
UFA31025013A04060060	1,25	2,5	6	4	6	60	2,4
UFA31030015A04560060	1,5	3	6	4,5	6,5	60	2,8
UFA31035018A05065060	1,75	3,5	6	5	7	65	3,2
UFA31040020A06065060	2	4	6	6	8	65	3,7
UFA31050025A07565060	2,5	5	6	7,5	10	65	4,6
UFA31060030A09075060	3	6	6	9	12	75	5,6
UFA31080040A12075080	4	8	8	12	25	75	7,4
UFA31100050A15080100	5	10	10	15	30	80	9,4
UFA31120060A18090120	6	12	12	18	36	90	11,4
UFA31160080A24010160	8	16	16	24	40	100	15,4

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE BALL / FREZ KULOWY O 3 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	2.5	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.0	16.0
N	21-22	0.2D	0.5D	Vc m/min	135	140	135	160	180	225	270	280	350	420	440
				fz mm/tooth	0.018	0.022	0.026	0.028	0.035	0.038	0.049	0.071	0.084	0.107	0.123
				rpm obr/min	21486	17825	14324	14551	14324	14324	14324	11141	11141	11141	8754
				feed posuw mm/min	1160	1176	1117	1222	1504	1633	2106	2373	2807	3576	3230
	23-24	0.2D	0.5D	Vc m/min	88	91	88	104	117	146	176	182	228	273	286
				fz mm/tooth	0.018	0.022	0.026	0.028	0.035	0.038	0.049	0.071	0.084	0.107	0.123
				rpm obr/min	13966	11586	9311	9458	9311	9311	9311	7242	7242	7242	5690
				feed posuw mm/min	754	765	726	795	978	1061	1369	1542	1825	2325	2100
	26-28	0.2D	0.5D	Vc m/min	40	40	40	50	55	70	85	85	105	125	135
				fz mm/tooth	0.015	0.018	0.022	0.022	0.028	0.031	0.04	0.06	0.069	0.089	0.101
				rpm obr/min	6366	5093	4244	4547	4377	4456	4509	3382	3342	3316	2686
				feed posuw mm/min	286	275	280	300	368	414	541	609	692	885	814

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFA18

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○	○	○	○													

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFA18004003A05010050	0,3	4	6	5	10	50	3,6
UFA18006005A08020060	0,5	6	6	8	20	60	5,4
UFA18008006A10030070	0,6	8	8	10	30	70	7,2
UFA18010008A12036080	0,8	10	10	12	36	80	9
UFA18012010A14040090	1	12	12	14	40	90	11
UFA18016013A18045100	1,3	16	16	18	45	100	14,5
UFA18020016A24045100	1,6	20	20	24	45	100	18

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	4.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	130	195	200	250	300	320	250
				fz mm/tooth	0.046	0.058	0.09	0.11	0.135	0.156	0.2
				rpm obr/min	10345	10345	7958	7958	7958	6366	3979
				feed posuw mm/min	952	1200	1432	1751	2149	1986	1592
	23-24	1.0D	0.5D	Vc m/min	85	127	130	163	195	208	163
				fz mm/tooth	0.046	0.058	0.09	0.11	0.135	0.156	0.2
				rpm obr/min	6724	6724	5173	5173	5173	4138	2586
				feed posuw mm/min	619	780	931	1138	1397	1291	1035
	26-28	1.0D	0.5D	Vc m/min	40	60	60	75	90	95	75
				fz mm/tooth	0.038	0.049	0.075	0.092	0.114	0.132	0.167
				rpm obr/min	3183	3183	2387	2387	2387	1890	1194
				feed posuw mm/min	242	312	358	439	544	499	399

2 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	4.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	130	195	200	250	300	320	250
				fz mm/tooth	0.054	0.077	0.115	0.135	0.17	0.194	0.25
				rpm obr/min	10345	10345	7958	7958	7958	6366	3979
				feed posuw mm/min	1117	1593	1830	2149	2706	2470	1989
	23-24	1.0D	0.5D	Vc m/min	85	127	130	163	195	208	163
				fz mm/tooth	0.054	0.077	0.115	0.135	0.17	0.194	0.25
				rpm obr/min	6724	6724	5173	5173	5173	4138	2586
				feed posuw mm/min	726	1036	1190	1397	1759	1606	1293
	26-28	1.0D	0.5D	Vc m/min	40	60	60	75	90	95	75
				fz mm/tooth	0.045	0.064	0.097	0.114	0.142	0.163	0.21
				rpm obr/min	3183	3183	2387	2387	2387	1890	1194
				feed posuw mm/min	286	407	463	544	678	616	501

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFA14

R 2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFA21

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	95	125	155	190	200	250	300	300	250
				fz mm/tooth	0.039	0.050	0.055	0.066	0.096	0.117	0.145	0.174	0.220
				rpm obr/min	10080	9947	9868	10080	7958	7958	7958	5968	3979
				feed posuw mm/min	1179	1492	1628	1996	2292	2793	3462	3115	2626
	23-24	1.0D	0.5D	Vc m/min	62	81	101	124	130	163	195	195	163
				fz mm/tooth	0.039	0.050	0.055	0.066	0.096	0.117	0.145	0.174	0.220
				rpm obr/min	6552	6466	6414	6552	5173	5173	5173	3879	2586
				feed posuw mm/min	767	970	1058	1297	1490	1816	2250	2025	1707

3 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-22	0.15D	2.5D	Vc m/min	95	125	155	190	200	250	300	300	250
				fz mm/tooth	0.050	0.061	0.072	0.083	0.125	0.145	0.179	0.220	0.262
				rpm obr/min	10080	9947	9868	10080	7958	7958	7958	5968	3979
				feed posuw mm/min	1512	1820	2131	2510	2984	3462	4273	3939	3127
	23-24	0.15D	2.5D	Vc m/min	62	81	101	124	130	163	195	195	163
				fz mm/tooth	0.050	0.061	0.072	0.083	0.125	0.145	0.179	0.220	0.262
				rpm obr/min	6552	6466	6414	6552	5173	5173	5173	3879	2586
				feed posuw mm/min	983	1183	1385	1631	1940	2250	2778	2560	2033

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFA11

1 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○				●												

CODE	DC	DCON	APMX	OAL	CHAMFER
UFA11020000A03008050	2	3	8	50	0,04
UFA11030000A03012050	3	3	12	50	0,05
UFA11040000A04015060	4	4	15	60	0,07
UFA11050000A05017060	5	5	17	60	0,09
UFA11060000A06020065	6	6	20	65	0,1
UFA11080000A08022065	8	8	22	65	0,14
UFA11100000A10025075	10	10	25	75	0,14
UFA11120000A12030080	12	12	30	80	0,14

CUTTING CONDITIONS PARAMETRY SKRAWANIA

1 FLUTE SLOTTING / FREZ O 1 ZĘBIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	21-22	1.0D	1.5D	Vc m/min	145	170	190	190	190	195	190	190
				fz mm/tooth	0.065	0.094	0.120	0.150	0.180	0.244	0.333	0.440
				rpm obr/min	23077	18038	15120	12096	10080	7759	6048	5040
				feed posuw mm/min	1500	1696	1814	1814	1814	1893	2014	2218
	23-24	1.0D	1.5D	Vc m/min	94	111	124	124	124	127	124	124
				fz mm/tooth	0.065	0.094	0.120	0.150	0.180	0.244	0.333	0.440
				rpm obr/min	15000	11724	9828	7862	6552	5043	3931	3276
				feed posuw mm/min	975	1102	1179	1179	1179	1231	1309	1441
	29.1	1.0D	1.5D	Vc m/min	200	235	250	235	255	250	250	255
				fz mm/tooth	0.069	0.096	0.120	0.147	0.170	0.240	0.300	0.343
				rpm obr/min	31831	24934	19894	14961	13528	9947	7958	6764
				feed posuw mm/min	2196	2394	2387	2199	2300	2387	2387	2320

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFA17

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○																

CODE	DC	DCON	APMX	OAL
UFA17030000A06005050	3	6	5	50
UFA17040000A06008054	4	6	8	54
UFA17050000A06009054	5	6	9	54
UFA17060000A06010054	6	6	10	54
UFA17080000A08012058	8	8	12	58
UFA17100000A10014066	10	10	14	66
UFA17120000A12016073	12	12	16	73
UFA17140000A14018075	14	14	18	75
UFA17160000A16022082	16	16	22	82
UFA17180000A18024084	18	18	24	84
UFA17200000A20026092	20	20	26	92

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	95	125	155	190	200	250	300	265	300	225	250
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.106	0.131	0.150	0.158	0.175	0.200
				rpm obr/min	10080	9947	9868	10080	7958	7958	7958	6025	5968	3979	3979
				feed posuw mm/min	706	895	987	1210	1401	1687	2085	1808	1886	1393	1592
	23-24	1.0D	0.5D	Vc m/min	62	81	101	124	130	163	195	172	195	146	163
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.106	0.131	0.150	0.158	0.175	0.200
				rpm obr/min	6552	6466	6414	6552	5173	5173	5173	3916	3879	2586	2586
				feed posuw mm/min	459	582	641	786	910	1097	1355	1175	1226	905	1035

2 FLUTE SIDE CUTTING / FREZ O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	3-10:0.25D 12-20:0.5D	0.5D	Vc m/min	95	125	155	190	200	250	300	265	300	225	250
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.131	0.163	0.183	0.200	0.225	0.238
				rpm obr/min	10080	9947	9868	10080	7958	7958	7958	6025	5968	3979	3979
				feed posuw mm/min	907	1094	1283	1512	1798	2085	2594	2205	2387	1790	1894
	23-24	3-10:0.25D 12-20:0.5D	0.5D	Vc m/min	62	81	101	124	130	163	195	172	195	146	163
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.131	0.163	0.183	0.200	0.225	0.238
				rpm obr/min	6552	6466	6414	6552	5173	5173	5173	3916	3879	2586	2586
				feed posuw mm/min	590	711	834	983	1169	1355	1686	1433	1552	1164	1231

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.015	h5

UFA12

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○																

PLAIN	FLAT	DC	DCON	APMX	OAL	CHAMFER
UFA12030000A06008057	UFA12030000B06008057	3	6	8	57	0,05
UFA12040000A06011057	UFA12040000B06011057	4	6	11	57	0,05
UFA12050000A06013057	UFA12050000B06013057	5	6	13	57	0,05
UFA12060000A06013057	UFA12060000B06013057	6	6	13	57	0,05
UFA12080000A08019063	UFA12080000B08019063	8	8	19	63	0,05
UFA12100000A10022072	UFA12100000B10022072	10	10	22	72	0,1
UFA12120000A12026083	UFA12120000B12026083	12	12	26	83	0,1
UFA12140000A14026083	UFA12140000B14026083	14	14	26	83	0,1
UFA12160000A16032092	UFA12160000B16032092	16	16	32	92	0,1
UFA12180000A18032092	UFA12180000B18032092	18	18	32	92	0,1
UFA12200000A20038104	UFA12200000B20038104	20	20	38	104	0,1

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	95	125	155	190	200	250	300	265	300	225	250
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.106	0.131	0.150	0.158	0.175	0.200
				rpm obr/min	10080	9947	9868	10080	7958	7958	7958	6025	5968	3979	3979
				feed posuw mm/min	706	895	987	1210	1401	1687	2085	1808	1886	1393	1592
	23-24	1.0D	0.5D	Vc m/min	62	81	101	124	130	163	195	172	195	146	163
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.106	0.131	0.150	0.158	0.175	0.200
				rpm obr/min	6552	6466	6414	6552	5173	5173	5173	3916	3879	2586	2586
				feed posuw mm/min	459	582	641	786	910	1097	1355	1175	1226	905	1035

2 FLUTE SIDE CUTTING / FREZ O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	3-10:0.25D 12-20:0.5D	1.0D	Vc m/min	95	125	155	190	200	250	300	265	300	225	250
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.131	0.163	0.183	0.200	0.225	0.238
				rpm obr/min	10080	9947	9868	10080	7958	7958	7958	6025	5968	3979	3979
				feed posuw mm/min	907	1094	1283	1512	1798	2085	2594	2205	2387	1790	1894
	23-24	3-10:0.25D 12-20:0.5D	1.0D	Vc m/min	62	81	101	124	130	163	195	172	195	146	163
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.131	0.163	0.183	0.200	0.225	0.238
				rpm obr/min	6552	6466	6414	6552	5173	5173	5173	3916	3879	2586	2586
				feed posuw mm/min	590	711	834	983	1169	1355	1686	1433	1552	1164	1231

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.015	h5

UFA20

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○																

CODE	DC	DCON	APMX	OAL
UFA20030000A06012057	3	6	12	57
UFA20040000A06015057	4	6	15	57
UFA20050000A06020057	5	6	20	57
UFA20060000A06020065	6	6	20	65
UFA20080000A08022065	8	8	22	65
UFA20100000A10025070	10	10	25	70
UFA20120000A12025075	12	12	25	75
UFA20160000A16035090	16	16	35	90
UFA20200000A20040100	20	20	40	100

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	9.0	10.0	12.0	16.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	65	90	110	130	140	160	175	210	210	175
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.097	0.106	0.131	0.158	0.200
				rpm obr/min	6897	7162	7003	6897	5570	5659	5570	5570	4178	2785
				feed posuw mm/min	724	967	1050	1241	1471	1647	1771	2189	1980	1671
	23-24	1.0D	0.5D	Vc m/min	42	59	72	85	91	104	114	137	137	114
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.097	0.106	0.131	0.158	0.200
				rpm obr/min	4483	4655	4552	4483	3621	3678	3621	3621	2716	1810
				feed posuw mm/min	471	628	683	807	956	1070	1151	1423	1287	1086

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	9.0	10.0	12.0	16.0	20.0
N	21-22	0.15D	1.5D-2.5D	Vc m/min	65	90	110	130	140	160	175	210	210	175
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.122	0.131	0.163	0.200	0.238
				rpm obr/min	6897	7162	7003	6897	5570	5659	5570	5570	4178	2785
				feed posuw mm/min	931	1182	1366	1552	1888	2071	2189	2724	2507	1989
	23-24	0.15D	1.5D-2.5D	Vc m/min	42	59	72	85	91	104	114	137	137	114
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.122	0.131	0.163	0.200	0.238
				rpm obr/min	4483	4655	4552	4483	3621	3678	3621	3621	2716	1810
				feed posuw mm/min	605	768	888	1009	1227	1346	1423	1771	1629	1293

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.015	h5

UFA19

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					●	●	●	●	○																

CODE	DC	DCON	APMX	LU	OAL	DN
UFA19030000A06008012	3	6	8	12	57	2,7
UFA19040000A06011018	4	6	11	18	57	3,7
UFA19050000A06013018	5	6	13	18	57	4,7
UFA19060000A06013018	6	6	13	18	57	5,7
UFA19080000A08021025	8	8	21	25	63	7,4
UFA19100000A10022030	10	10	22	30	72	9,2
UFA19120000A12026036	12	12	26	36	83	11
UFA19160000A16036042	16	16	36	42	92	15
UFA19200000A20041052	20	20	41	52	104	19

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	9.0	10.0	12.0	16.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	65	90	110	130	140	160	175	210	210	175
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.097	0.106	0.131	0.158	0.200
				rpm obr/min	6897	7162	7003	6897	5570	5659	5570	5570	4178	2785
				feed posuw mm/min	724	967	1050	1241	1471	1647	1771	2189	1980	1671
	23-24	1.0D	0.5D	Vc m/min	42	59	72	85	91	104	114	137	137	114
				fz mm/tooth	0.035	0.045	0.050	0.060	0.088	0.097	0.106	0.131	0.158	0.200
				rpm obr/min	4483	4655	4552	4483	3621	3678	3621	3621	2716	1810
				feed posuw mm/min	471	628	683	807	956	1070	1151	1423	1287	1086

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	9.0	10.0	12.0	16.0	20.0
N	21-22	0.15D	1.5D- 2.5D	Vc m/min	65	90	110	130	140	160	175	210	210	175
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.122	0.131	0.163	0.200	0.238
				rpm obr/min	6897	7162	7003	6897	5570	5659	5570	5570	4178	2785
				feed posuw mm/min	931	1182	1366	1552	1888	2071	2189	2724	2507	1989
	23-24	0.15D	1.5D- 2.5D	Vc m/min	42	59	72	85	91	104	114	137	137	114
				fz mm/tooth	0.045	0.055	0.065	0.075	0.113	0.122	0.131	0.163	0.200	0.238
				rpm obr/min	4483	4655	4552	4483	3621	3678	3621	3621	2716	1810
				feed posuw mm/min	605	768	888	1009	1227	1346	1423	1771	1629	1293

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 –-0.015	h5

UFA27

3 Finish Medium

HSM Vmax A min AIR

| ISO | | |

P M K **N** S H

DIAMOND COATING UFD END MILLS are designed for HSM and dry machining of graphite, high silicon aluminum, magnesium alloys, plastics, glass and carbon fiber reinforced plastics.

FREZY Z POWŁOKĄ DIAMENTOWĄ UFD przeznaczone są do obróbki szybkościowej oraz na sucho grafitu, stopów aluminium o wysokiej zawartości krzemu oraz metali nieżelaznych, stopów magnezu, tworzyw sztucznych, tworzyw z włókna szklanego i włókna węglowego.

UFD END MILLS
FREZY UFD

DIAMOND COATING UFD END MILLS ARE DESIGNED FOR HSM AND DRY MACHING OF GRAPHITE, HIGH SILICON ALUMINIUM, MAGNESIUM ALLOYS, PLASTICS, GLASS AND CARBON FIBER REINFORCED PLASTICS, GREEN COMPACT. **IMPOSSIBLE FOR STEELS !!!**

FREZY WALCOWO-CZOŁOWE UFD Z POWŁOKĄ DIAMENTOWĄ PRZEDE WSZYSTKIM ZALECANE SĄ DO OBRÓBKI SZYBKOŚCIOWEJ NA SUCHO (OS) GRAFITU, STOPÓW ALUMINIUM O WYSOKIEJ ZAWARTOŚCI KRZEMU ORAZ METALI NIEŻELAZNYCH, STOPÓW MAGNEZU, TWORZYW SZTUCZNYCH, TWORZYW WZMOCNIONYCH WŁÓKNEM SZKLANYM I WĘGLOWYM, PRASÓWKI SUROWEJ. **NIE STOSOWAĆ DO STALI !!!**

NOTE:

- If the rigidity of the machine or the work material installation is very low, or chattering and noise is generated, please reduce RPM and FEED rate proportionally.
- Cutting conditions may be considerably different due to the tool overhang, depth of cut, and machining tool condition, please use the catalogue cutting parameters as a reference starting point.
- If the depth of cut is shallow, the RPM and FEED rate can be increased.
- A high-speed spindle is recommended, when using a reduced RPM, the FEED rate must be reduced proportionally.
- High pressure coolant and air blow are recommended to dispose of chips efficiency.
- Use a rigid machine and work clamping method.
- Down (climb) cutting is recommended.
- We recommend that you set the width of cut as small as possible (about 5% of dia.) and divide the machining into several passes and work on high cutting parameters. There will be much higher tool life and surface roughness.
- When drilling, please set the FEED rate 30% below the normal rate.

UWAGA:

- Jeżeli sztywność obrabiarki lub mocowanie obrabianego przedmiotu nie są wystarczające lub występują wibracje i nadmierny hałas, należy proporcjonalnie zmniejszyć obroty i posuw.
- Parametry skrawania mogą być różne w zależności od długości narzędzia wystającego z oprawki, głębokości skrawania oraz stanu obrabiarki. Proszę stosować parametry skrawania podane w katalogu jako wyjściowy punkt odniesienia.
- Przy zmniejszeniu głębokości skrawania, obroty i posuw mogą być zwiększone.
- Zalecane jest stosowanie wysokoobrotowych obrabiarek, w przypadku mniejszych prędkości obrotowych, posuw powinien być zmniejszony proporcjonalnie.
- Dla efektywnego odprowadzania wiórów zalecane jest stosowanie nadmuchu powietrza lub chłodziwa pod dużym ciśnieniem.
- Zalecane jest stosowanie sztywnych obrabiarek oraz systemów mocowania.
- Zalecane jest frezowanie współbieżne.
- Zalecamy stosowanie możliwie najmniejszej szerokości skrawania - około 5% średnicy roboczej narzędzia i podzielenie operacji obróbki na kilka przejść przy większych parametrach skrawania, co znacznie wydłuży żywotność narzędzia oraz polepszy jakość obrabianej powierzchni.
- Przy zagłębianiu zalecane jest ustawienie posuwu wgłębnego na poziomie o 30% mniejszym od posuwu roboczego.

Group					ISO	PAGE
UFD97			2		P M K **N** S H	384
UFD16			2		P M K **N** S H	386
UFD80			2		P M K **N** S H	387
UFD51			2		P M K **N** S H	388
UFD50			2		P M K **N** S H	389
UFD28			2		P M K **N** S H	390
UFD81			3		P M K **N** S H	391
UFD96		R	2		P M K **N** S H	392
UFD24			2		P M K **N** S H	394
UFD13		R	3		P M K **N** S H	395
UFD14		R	3		P M K **N** S H	396
UFD25		R	4		P M K **N** S H	397
UFD27		R	2		P M K **N** S H	398

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

UFD97

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD97002001A03000040	0,1	0,2	3	0,2	-	40	-
UFD97003002A03000040	0,15	0,3	3	0,3	-	40	-
UFD97004002A03000040	0,2	0,4	3	0,4	-	40	-
UFD97005003A03003040	0,25	0,5	3	0,5	2,5	40	0,45
UFD97006003A03003040	0,3	0,6	3	0,6	3	40	0,55
UFD97006003A03005040	0,3	0,6	3	0,6	5	40	0,55
UFD97008004A03004040	0,4	0,8	3	0,8	4	40	0,75
UFD97008004A03007040	0,4	0,8	3	0,8	7	40	0,75
UFD97010005A03005040	0,5	1	3	1	5	40	0,95
UFD97010005A03009040	0,5	1	3	1	8,5	40	0,95
UFD97010005A03012040	0,5	1	3	1	12	40	0,95
UFD97012006A03006050	0,6	1,2	3	1,2	6	50	1,15
UFD97012006A03010050	0,6	1,2	3	1,2	10	50	1,15
UFD97015008A03008050	0,75	1,5	3	1,5	7,5	50	1,4
UFD97015008A03012050	0,75	1,5	3	1,5	12	50	1,4
UFD97015008A03018050	0,75	1,5	3	1,5	18	50	1,4
UFD97020010A03010060	1	2	3	2,2	10	60	1,9
UFD97020010A03016060	1	2	3	2,2	16	60	1,9
UFD97020010A03025060	1	2	3	2,2	25	60	1,9
UFD97030015A04010065	1,5	3	4	3	10	65	2,9
UFD97030015A04015065	1,5	3	4	3	15	65	2,9
UFD97030015A04020065	1,5	3	4	3	20	65	2,9
UFD97030015A04025075	1,5	3	4	3	25	75	2,9
UFD97030015A04030075	1,5	3	4	3	30	75	2,9

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	29.2	0.2D	0.2D	Vc m/min	50	75	100	125	150	190	250	255	250	250	265
				fz mm/tooth	0.008	0.010	0.012	0.015	0.018	0.020	0.025	0.041	0.073	0.091	0.104
				rpm obr/min	39789	39789	39789	39789	39789	40319	39789	27056	19894	15915	14059
				feed posuw mm/min	637	796	955	1194	1432	1613	1989	2219	2905	2897	2924

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	h5

UFD97

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD97040020A06020065	2	4	6	4	20	65	3,9
UFD97040020A06030075	2	4	6	4	30	75	3,9
UFD97040020A06040090	2	4	6	4	40	90	3,9
UFD97050025A06020065	2,5	5	6	5	20	65	4,9
UFD97050025A06030075	2,5	5	6	5	30	75	4,9
UFD97050025A06040090	2,5	5	6	5	40	90	4,9
UFD97050025A06050090	2,5	5	6	5	50	90	4,9
UFD97060030A06030075	3	6	6	6	30	75	5,9
UFD97060030A06040090	3	6	6	6	40	90	5,9
UFD97060030A06050090	3	6	6	6	50	90	5,9
UFD97060030A06060100	3	6	6	6	60	100	5,9

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	29.2	0.2D	0.2D	Vc m/min	50	75	100	125	150	190	250	255	250	250	265
				fz mm/tooth	0.008	0.010	0.012	0.015	0.018	0.020	0.025	0.041	0.073	0.091	0.104
				rpm obr/min	39789	39789	39789	39789	39789	40319	39789	27056	19894	15915	14059
				feed posuw mm/min	637	796	955	1194	1432	1613	1989	2219	2905	2897	2924

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	h5

UFD16

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD16004002A04004045	0,2	0,4	4	0,6	4	45	0,36
UFD16004002A04006045	0,2	0,4	4	0,6	6	45	0,36
UFD16006003A04004045	0,3	0,6	4	1	4	45	0,56
UFD16006003A04006045	0,3	0,6	4	1	6	45	0,56
UFD16006003A04008045	0,3	0,6	4	1	8	45	0,56
UFD16010005A04006045	0,5	1	4	1,5	6	45	0,95
UFD16010005A04008045	0,5	1	4	1,5	8	45	0,95
UFD16010005A04012045	0,5	1	4	1,5	12	45	0,95
UFD16015008A04012045	0,75	1,5	4	1,75	12	45	1,45
UFD16020010A04008060	1	2	4	3	8	60	1,95
UFD16020010A04012060	1	2	4	3	12	60	1,95
UFD16020010A04016060	1	2	4	3	16	60	1,95
UFD16040020A04016060	2	4	4	6	16	60	3,9

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	29.2	0.2D	0.2D	Vc m/min	50	75	100	125	150	190	250	255	250	250	265
				fz mm/tooth	0.008	0.010	0.012	0.015	0.018	0.020	0.025	0.041	0.073	0.091	0.104
				rpm obr/min	39789	39789	39789	39789	39789	40319	39789	27056	19894	15915	14059
				feed posuw mm/min	637	796	955	1194	1432	1613	1989	2219	2905	2897	2924

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	h5

UFD80

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD80020010A06005060	1	2	6	3	5	60	1,9
UFD80025013A06006060	1,25	2,5	6	4	6	60	2,4
UFD80030015A06007060	1,5	3	6	4,5	6,5	60	2,8
UFD80035018A06007065	1,75	3,5	6	5	7	65	3,2
UFD80040020A06008065	2	4	6	6	8	65	3,7
UFD80050025A06010065	2,5	5	6	7,5	10	65	4,6
UFD80060030A06012075	3	6	6	9	12	75	5,6
UFD80080040A08025075	4	8	8	12	25	75	7,4
UFD80100050A10030080	5	10	10	15	30	80	9,4
UFD80120060A12036090	6	12	12	18	36	90	11,4

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	25	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.0
N	29.2	0.2D	0.2D	Vc m/min	100	125	150	175	200	245	285	325	360	395
				fz mm/tooth	0.025	0.035	0.045	0.055	0.066	0.082	0.098	0.115	0.133	0.150
				rpm obr/min	15915	15915	15915	15915	15915	15597	15120	12931	11459	10478
				feed posuw mm/min	796	1114	1432	1751	2101	2558	2963	2974	3048	3143

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFD51

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD51020010A04020080	1	2	4	10	20	80	1,95
UFD51030015A04025080	1,5	3	4	15	25	80	2,9
UFD51040020A04030080	2	4	4	20	30	80	3,9
UFD51050025A06050100	2,5	5	6	30	50	100	4,9
UFD51060030A06050100	3	6	6	30	50	100	5,5
UFD51070035A06000100	3,5	7	6	30	-	100	-
UFD51080040A08060110	4	8	8	40	60	110	7,5
UFD51090045A08000110	4,5	9	8	40	-	110	-
UFD51100050A10070120	5	10	10	50	70	120	9,5
UFD51120060A12075130	6	12	12	55	75	130	11,5

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	25	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.0
N	29.2	0.2D	0.2D	Vc m/min	100	125	150	175	200	245	285	325	360	395
				fz mm/tooth	0.025	0.035	0.045	0.055	0.066	0.082	0.098	0.115	0.133	0.150
				rpm obr/min	15915	15915	15915	15915	15915	15597	15120	12931	11459	10478
				feed posuw mm/min	796	1114	1432	1751	2101	2558	2963	2974	3048	3143

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFD50

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD50020010A04020100	R1.0	2.0	4	10	20	100	1.95
UFD50030015A04025100	R1.5	3.0	4	15	25	100	2.9
UFD50040020A04030100	R2.0	4.0	4	20	30	100	3.9
UFD50050025A06050120	R2.5	5.0	6	30	50	120	4.9
UFD50060030A06050150	R3.0	6.0	6	30	50	150	5.5
UFD50070035A06000150	R3.5	7.0	6	30	-	150	-
UFD50080040A08060150	R4.0	8.0	8	40	60	150	7.5
UFD50090045A08000150	R4.5	9.0	8	40	-	150	-
UFD50100050A10070180	R5.0	10.0	10	50	70	180	9.5
UFD50120060A12075200	R6.0	12.0	12	55	75	200	11.5

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	25	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.0
N	29.2	0.2D	0.2D	Vc m/min	100	125	150	175	200	245	285	325	360	395
				fz mm/tooth	0.025	0.035	0.045	0.055	0.066	0.082	0.098	0.115	0.133	0.150
				rpm obr/min	15915	15915	15915	15915	15915	15597	15120	12931	11459	10478
				feed posuw mm/min	796	1114	1432	1751	2101	2558	2963	2974	3048	3143

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFD28

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S								H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	θ
UFD28010005A03002040	0,5	1	3	2	-	40	8° 30'
UFD28010005A03002060	0,5	1	3	2	30	60	2°
UFD28010005A03002100	0,5	1	3	2	70	100	1°
UFD28015008A03003040	0,75	1,5	3	3	-	40	6° 15'
UFD28015008A03003060	0,75	1,5	3	3	30	60	1° 30'
UFD28015008A03003100	0,75	1,5	3	3	58	100	45'
UFD28020010A03004040	1	2	3	4	-	40	4° 15'
UFD28020010A03004060	1	2	3	4	30	60	1°
UFD28020010A04004100	1	2	4	4	70	100	1°

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	29.2	0.2D	0.2D	Vc m/min	50	75	100	125	150	190	250	255	250	250	265
				fz mm/tooth	0.008	0.010	0.012	0.015	0.018	0.020	0.025	0.041	0.073	0.091	0.104
				rpm obr/min	39789	39789	39789	39789	39789	40319	39789	27056	19894	15915	14059
				feed posuw mm/min	637	796	955	1194	1432	1613	1989	2219	2905	2897	2924

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	h5

UFD81

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S								H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD81020010A06005060	1	2	6	3	5	60	1,9
UFD81025013A06006060	1,25	2,5	6	4	6	60	2,4
UFD81030015A06007060	1,5	3	6	4,5	6,5	60	2,8
UFD81035018A06007065	1,75	3,5	6	5	7	65	3,2
UFD81040020A06008065	2	4	6	6	8	65	3,7
UFD81050025A06010065	2,5	5	6	7,5	10	65	4,6
UFD81060030A06012075	3	6	6	9	12	75	5,6
UFD81080040A08025075	4	8	8	12	25	75	7,4
UFD81100050A10030080	5	10	10	15	30	80	9,4
UFD81120060A12036090	6	12	12	18	36	90	11,4

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE BALL NOSE / FREZ KULOWY O 3 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	2.5	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.0
N	29.2	0.2D	0.2D	Vc m/min	100	125	150	175	200	245	285	325	360	395
				fz mm/tooth	0.025	0.035	0.045	0.055	0.065	0.082	0.099	0.115	0.133	0.151
				rpm obr/min	15915	15915	15915	15915	15915	15597	15120	12931	11459	10478
				feed posuw mm/min	1194	1671	2149	2626	3104	3837	4491	4461	4572	4746

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UFD96

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD96002X50A03000040	-	0,2	3	0,3	-	40	-
UFD96003X50A03000040	-	0,3	3	0,5	-	40	-
UFD96004X50A03000040	-	0,4	3	0,6	-	40	-
UFD96005X50A03003040	0,05	0,5	3	0,7	2,5	40	0,45
UFD96005X50A03004040	0,05	0,5	3	0,7	4	40	0,45
UFD96006X50A03003040	0,05	0,6	3	0,9	3	40	0,55
UFD96006X50A03005040	0,05	0,6	3	0,9	5	40	0,55
UFD96008X50A03004040	0,05	0,8	3	1,2	4	40	0,75
UFD96008X50A03007040	0,05	0,8	3	1,2	7	40	0,75
UFD96010X50A03005040	0,1	1	3	1,5	5	40	0,95
UFD96010X50A03009040	0,1	1	3	1,5	8,5	40	0,95
UFD96010X50A03012040	0,1	1	3	1,5	12	40	0,95
UFD96012X50A03006050	0,1	1,2	3	1,8	6	50	1,15
UFD96012X50A03010050	0,1	1,2	3	1,8	10	50	1,15
UFD96015X50A03008050	0,15	1,5	3	2,2	7,5	50	1,4
UFD96015X50A03012050	0,15	1,5	3	2,2	12	50	1,4
UFD96015X50A03018050	0,15	1,5	3	2,2	18	50	1,4
UFD96020X50A03010060	0,15	2	3	2,2	10	60	1,9
UFD96020X50A03016060	0,15	2	3	2,2	16	60	1,9
UFD96020X50A03025060	0,15	2	3	2,2	25	60	1,9
UFD96030X50A04010065	0,2	3	4	3	10	65	2,9
UFD96030X50A04015065	0,2	3	4	3	15	65	2,9
UFD96030X50A04020065	0,2	3	4	3	20	65	2,9
UFD96030X50A04025075	0,2	3	4	3	25	75	2,9

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	29.2	1.0D	0.5D	Vc m/min	50	75	100	125	150	190	250	255	250	250	265
				fz mm/tooth	0.008	0.008	0.010	0.012	0.015	0.018	0.020	0.035	0.058	0.072	0.082
				rpm obr/min	39789	39789	39789	39789	39789	40319	39789	27056	19894	15915	14059
				feed posuw mm/min	637	637	796	955	1194	1451	1592	1894	2308	2292	2306

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	h5

UFD96

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFD96030X50A04030075	R0.2	3.0	4	3	30	75	2.9
UFD96040X50A06020065	R0.2	4.0	6	4	20	65	3.9
UFD96040X50A06030075	R0.2	4.0	6	4	30	75	3.9
UFD96040X50A06040090	R0.2	4.0	6	4	40	90	3.9
UFD96050X50A06020075	R0.3	5.0	6	5	20	75	4.9
UFD96050X50A06030075	R0.3	5.0	6	5	30	75	4.9
UFD96050X50A06040090	R0.3	5.0	6	5	40	90	4.9
UFD96050X50A06050090	R0.3	5.0	6	5	50	90	4.9
UFD96060X50A06030075	R0.3	6.0	6	6	30	75	5.9
UFD96060X50A06040090	R0.3	6.0	6	6	40	90	5.9
UFD96060X50A06050090	R0.3	6.0	6	6	50	90	5.9
UFD96060X50A06060100	R0.3	6.0	6	6	60	100	5.9

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	29.2	1.0D	0.5D	Vc m/min	50	75	100	125	150	190	250	255	250	250	265
				fz mm/tooth	0.008	0.008	0.010	0.012	0.015	0.018	0.020	0.035	0.058	0.072	0.082
				rpm obr/min	39789	39789	39789	39789	39789	40319	39789	27056	19894	15915	14059
				feed posuw mm/min	637	637	796	955	1194	1451	1592	1894	2308	2292	2306

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.02	h5

UFD24

2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFD14

R 3 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UFD27

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○	○	○	○				●												

CODE	RE	DC	DCON	APMX	LU	OAL
UFD27005000A03002040	0,5	3	1	2	40	0,45
UFD27006000A03003040	0,6	3	2	3	40	0,55
UFD27007000A03004040	0,7	3	2	4	40	0,65
UFD27008000A03005040	0,8	3	2	5	40	0,75
UFD27009000A03006040	0,9	3	2	6	40	0,85
UFD27010000A04008075	1	4	3	8	75	0,95
UFD27015000A04010075	1,5	4	4	10	75	1,45
UFD27020000A04016100	2	4	6	16	100	1,9
UFD27025000A04020100	2,5	4	8	20	100	2,4
UFD27030000A06030100	3	6	8	30	100	2,8
UFD27035000A06035100	3,5	6	10	35	100	3,2
UFD27040000A06040100	4	6	20	40	100	3,7
UFD27050000A06050125	5	6	25	50	125	4,6
UFD27060000A06060140	6	6	30	60	140	5,6
UFD27070000A06035140	7	6	35	-	140	-
UFD27080000A06060150	8	8	40	80	150	7,4
UFD27090000A06045150	9	8	45	-	150	-
UFD27100000A10080150	10	10	50	80	150	9,4
UFD27110000A10050150	11	10	50	-	150	-
UFD27120000A12080150	12	12	55	80	150	11,4

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SIDE CUTTING / FREZ PROMIENIOWY O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.6	0.8	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	29.2	0.1D	1.5D	Vc m/min	50	75	100	125	190	155	190	225	220	205	200	205	205
				fz mm/tooth	0.003	0.004	0.007	0.009	0.010	0.016	0.020	0.026	0.043	0.064	0.081	0.092	0.109
				rpm obr/min	39789	39789	39789	39789	40319	24669	20160	17905	14006	10876	7958	6525	5438
				feed posuw mm/min	239	318	557	716	806	789	806	931	1204	1392	1289	1201	1185

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

P M K **N** S H

UFC END MILLS are designed for HSM and dry machining of copper.

FREZY UFC zalecane są przede wszystkim do obróbki szybkościowej (OS) na sucho miedzi.

UFC END MILLS
FREZY UFC

DESCRIPTION - UFC OPIS - UFC

UFC END Mills are designed for HSM and dry machining of copper.

NOTE:

- If the rigidity of the machine or the work material installation is very low, or chattering and noise is generated, please reduce RPM and FEED rate proportionally.
- Cutting conditions may be considerably different due to the tool overhang, depth of cut, and machining tool condition, please use the catalogue cutting parameters as a reference starting point.
- If the depth of cut is shallow, the RPM and FEED rate can be increased.
- A high-speed spindle is recommended, when using a reduced RPM, the FEED rate must be reduced proportionally.
- High pressure coolant and air blow are recommended to dispose of chips efficiency.
- Use a rigid machine and work clamping method.
- Down (climb) cutting is recommended.
- We recommend that you set the width of cut as small as possible (about 5% of dia.) and divide the machining into several passes and work on high cutting parameters. There will be much higher tool life and surface roughness.
- When drilling, please set the FEED rate 30% below the normal rate.

UWAGA:

- Jeżeli sztywność obrabiarki lub mocowanie obrabianego przedmiotu nie są wystarczające lub występują wibracje i nadmierny hałas, należy proporcjonalnie zmniejszyć obroty i posuw.
- Parametry skrawania mogą być różne w zależności od długości narzędzia wystającego z oprawki, głębokości skrawania oraz stanu obrabiarki. Proszę stosować parametry skrawania podane w katalogu jako wyjściowy punkt odniesienia.
- Przy zmniejszeniu głębokości skrawania, obroty i posuw mogą być zwiększone.
- Zalecane jest stosowanie wysokoobrotowych obrabiarek, w przypadku mniejszych prędkości obrotowych, posuw powinien być zmniejszony proporcjonalnie.
- Dla efektywnego odprowadzania wiórów zalecane jest stosowanie nadmuchu powietrza lub chłodziwa pod dużym ciśnieniem.
- Zalecane jest stosowanie sztywnych obrabiarek oraz systemów mocowania.
- Zalecane jest frezowanie współbieżne.
- Zalecamy stosowanie możliwie najmniejszej szerokości skrawania - około 5% średnicy roboczej narzędzia i podzielenie operacji obróbki na kilka przejść przy większych parametrach skrawania, co znacznie wydłuży żywotność narzędzia oraz polepszy jakość obrabianej powierzchni.
- Przy zagłębianiu zalecane jest ustawienie posuwu wgłębnego na poziomie o 30% mniejszym od posuwu roboczego.

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

Group					ISO	PAGE
UFC11			2		P M K **N** S H	403
UFC10			2		P M K **N** S H	404
UFC12		R	2		P M K **N** S H	406
UFC14			2		P M K **N** S H	408
UFC13			2		P M K **N** S H	410

UFC11

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																					○	○				●	●	●	○												

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UFC11010005A06003050	0,5	1	6	2,5	50
UFC11015008A06004050	0,75	1,5	6	4	50
UFC11020010A06005050	1	2	6	5	50
UFC11030015A06008060	1,5	3	6	8	60
UFC11040020A06008070	2	4	6	8	70
UFC11050025A06012090	2,5	5	6	12	90
UFC11060030A06012090	3	6	6	12	90
UFC11080040A08016100	4	8	8	16	100
UFC11100050A10020100	5	10	10	20	100
UFC11120060A12025110	6	12	12	25	110

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	21-22	0.05D	0.02D	Vc m/min	155	300	295	285	290	295	300	300	300
				fz mm/tooth	0.01	0.022	0.031	0.042	0.052	0.061	0.079	0.101	0.12
				rpm obr/min	49338	47746	31300	22680	18462	15650	11937	9549	7958
				feed posuw mm/min	987	2101	1941	1905	1920	1909	1886	1929	1910
	26-28	0.05D	0.02D	Vc m/min	130	150	150	145	145	145	150	150	150
				fz mm/tooth	0.011	0.02	0.028	0.038	0.047	0.055	0.072	0.092	0.109
				rpm obr/min	41380	23873	15915	11539	9231	7692	5968	4775	3979
				feed posuw mm/min	910	955	891	877	868	846	859	879	867
	29.1	0.05D	0.02D	Vc m/min	155	315	445	435	440	445	450	455	450
				fz mm/tooth	0.008	0.015	0.019	0.026	0.033	0.038	0.05	0.063	0.076
				rpm obr/min	49338	50134	47216	34616	28011	23608	17905	14483	11937
				feed posuw mm/min	789	1504	1794	1800	1849	1794	1790	1825	1814

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	h5
OVER TO R3	0 ~-0.015	h5

UFC10

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFC10005003A04002045	0,25	0,5	4	0,5	2	45	0,45
UFC10005003A04004045	0,25	0,5	4	0,5	4	45	0,45
UFC10005003A04006045	0,25	0,5	4	0,5	6	45	0,45
UFC10005003A04008045	0,25	0,5	4	0,5	8	45	0,45
UFC10005003A04010045	0,25	0,5	4	0,5	10	45	0,45
UFC10006003A04002045	0,3	0,6	4	0,6	2	45	0,55
UFC10006003A04004045	0,3	0,6	4	0,6	4	45	0,55
UFC10006003A04006045	0,3	0,6	4	0,6	6	45	0,55
UFC10006003A04008045	0,3	0,6	4	0,6	8	45	0,55
UFC10006003A04010045	0,3	0,6	4	0,6	10	45	0,55
UFC10008004A04004045	0,4	0,8	4	0,8	4	45	0,75
UFC10008004A04006045	0,4	0,8	4	0,8	6	45	0,75
UFC10008004A04008045	0,4	0,8	4	0,8	8	45	0,75
UFC10008004A04010045	0,4	0,8	4	0,8	10	45	0,75
UFC10008106A04012045	0,4	0,8	4	0,8	12	45	0,75
UFC10010005A04004045	0,5	1	4	1	4	45	0,95
UFC10010005A04006045	0,5	1	4	1	6	45	0,95
UFC10010005A04008045	0,5	1	4	1	8	45	0,95
UFC10010005A04010045	0,5	1	4	1	10	45	0,95
UFC10010005A04012045	0,5	1	4	1	12	45	0,95
UFC10015008A04006045	0,75	1,5	4	1,5	6	45	1,45
UFC10015008A04008045	0,75	1,5	4	1,5	8	45	1,45
UFC10015008A04010045	0,75	1,5	4	1,5	10	45	1,45
UFC10015008A04012045	0,75	1,5	4	1,5	12	45	1,45
UFC10015008A04016050	0,75	1,5	4	1,5	16	50	1,45
UFC10020010A04006045	1	2	4	3	6	45	1,95
UFC10020010A04008045	1	2	4	3	8	45	1,95
UFC10020010A04010045	1	2	4	3	10	45	1,95
UFC10020010A04012045	1	2	4	3	12	45	1,95
UFC10020010A04016050	1	2	4	3	16	50	1,95
UFC10030015A06010050	1,5	3	6	4	10	50	2,85
UFC10030015A06012050	1,5	3	6	4	12	50	2,85
UFC10030015A06016060	1,5	3	6	4	16	60	2,85
UFC10030015A06020060	1,5	3	6	4	20	60	2,85
UFC10040020A06010050	2	4	6	5	10	50	3,85
UFC10040020A06012050	2	4	6	5	12	50	3,85

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFC10

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFC10040020A06016060	2	4	6	5	16	60	3,85
UFC10040020A06020060	2	4	6	5	20	60	3,85
UFC10040020A06025060	2	4	6	5	25	60	3,85
UFC10060030A06020060	3	6	6	8	20	60	5,85
UFC10060030A06030090	3	6	6	8	30	90	5,85
UFC10080040A08020070	4	8	8	10	20	70	7,7
UFC10100050A10025080	5	10	10	12	25	80	9,7
UFC10120060A12025080	6	12	12	14	25	80	11,7

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	0.5	0.6	0.8	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	21	0.05D	0.02D	Vc m/min	80	95	125	155	250	245	240	240	245	250	250	250
				fz mm/tooth	0.005	0.007	0.009	0.01	0.022	0.03	0.042	0.052	0.061	0.079	0.1	0.122
				rpm obr/min	50930	50399	49736	49338	39789	25995	19099	15279	12998	9947	7958	6631
				feed posuw mm/min	509	706	895	987	1751	1560	1604	1589	1586	1572	1592	1618
	26-28	0.05D	0.02D	Vc m/min	80	95	110	110	125	125	120	120	125	125	125	125
				fz mm/tooth	0.005	0.007	0.009	0.011	0.02	0.028	0.038	0.047	0.055	0.072	0.091	0.111
				rpm obr/min	50930	50399	43768	35014	19894	13263	9549	7639	6631	4974	3979	3316
				feed posuw mm/min	509	706	788	770	796	743	726	718	729	716	724	736
	29.1	0.05D	0.02D	Vc m/min	80	95	125	155	315	370	360	365	370	375	375	375
				fz mm/tooth	0.004	0.005	0.006	0.006	0.013	0.019	0.027	0.033	0.039	0.05	0.064	0.077
				rpm obr/min	50930	50399	49736	49338	50134	39258	28648	23237	19629	14921	11937	9947
				feed posuw mm/min	407	504	597	592	1303	1492	1547	1534	1531	1492	1528	1532

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFC12

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFC12010001A04004045	0,1	1	4	1,5	4	45	0,95
UFC12010001A04006045	0,1	1	4	1,5	6	45	0,95
UFC12010001A04008045	0,1	1	4	1,5	8	45	0,95
UFC12010002A04004045	0,2	1	4	1,5	4	45	0,95
UFC12010002A04006045	0,2	1	4	1,5	6	45	0,95
UFC12010002A04008045	0,2	1	4	1,5	8	45	0,95
UFC12015001A04006045	0,1	1,5	4	2,3	6	45	1,45
UFC12015001A04008045	0,1	1,5	4	2,3	8	45	1,45
UFC12015001A04010045	0,1	1,5	4	2,3	10	45	1,45
UFC12015002A04006045	0,2	1,5	4	2,3	6	45	1,45
UFC12015002A04008045	0,2	1,5	4	2,3	8	45	1,45
UFC12015002A04010045	0,2	1,5	4	2,3	10	45	1,45
UFC12020002A04008045	0,2	2	4	3	8	45	1,95
UFC12020002A04010045	0,2	2	4	3	10	45	1,95
UFC12020002A04012045	0,2	2	4	3	12	45	1,95
UFC12020005A04008045	0,5	2	4	3	8	45	1,95
UFC12020005A04010045	0,5	2	4	3	10	45	1,95
UFC12020005A04012045	0,5	2	4	3	12	45	1,95
UFC12030002A06010050	0,2	3	6	4,5	10	50	2,85
UFC12030002A06012050	0,2	3	6	4,5	12	50	2,85
UFC12030002A06016060	0,2	3	6	4,5	16	60	2,85
UFC12030003A06010050	0,3	3	6	4,5	10	50	2,85
UFC12030003A06012050	0,3	3	6	4,5	12	50	2,85
UFC12030003A06016060	0,3	3	6	4,5	16	60	2,85
UFC12040002A06012050	0,2	4	6	6	12	50	3,85
UFC12040002A06016060	0,2	4	6	6	16	60	3,85
UFC12040002A06020060	0,2	4	6	6	20	60	3,85
UFC12040005A06012050	0,5	4	6	6	12	50	3,85
UFC12040005A06016060	0,5	4	6	6	16	60	3,85
UFC12040005A06020060	0,5	4	6	6	20	60	3,85
UFC12060003A06020060	0,3	6	6	9	20	60	5,85
UFC12060005A06020060	0,5	6	6	9	20	60	5,85
UFC12060010A06020060	1	6	6	9	20	60	5,85
UFC12080003A08025065	0,3	8	8	12	25	65	7,7
UFC12080005A08025065	0,5	8	8	12	25	65	7,7

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFC12

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	RE	DC	DCON	APMX	LU	OAL	DN
UFC12080010A08025065	1	8	8	12	25	65	7,7
UFC12100005A10030070	0,5	10	10	15	30	70	9,7
UFC12100010A10030070	1	10	10	15	30	70	9,7
UFC12120005A12032080	0,5	12	12	18	32	80	11,7
UFC12120010A12032080	1	12	12	18	32	80	11,7

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	21-22	1.0D	0.5D	Vc m/min	155	315	470	630	785	840	840	840	835
				fz mm/tooth	0.01	0.018	0.026	0.037	0.043	0.052	0.068	0.089	0.105
				rpm obr/min	49338	50134	49869	50134	49975	44563	33423	26738	22149
				feed posuw mm/min	987	1805	2593	3710	4298	4635	4545	4759	4651
	26-28	1.0D	0.5D	Vc m/min	155	315	420	420	425	420	420	420	420
				fz mm/tooth	0.01	0.017	0.026	0.031	0.039	0.047	0.063	0.079	0.095
				rpm obr/min	49338	50134	44563	33423	27056	22282	16711	13369	11141
				feed posuw mm/min	987	1705	2317	2072	2110	2094	2106	2112	2117
	29.1	1.0D	0.5D	Vc m/min	155	315	470	630	785	940	1255	1255	1265
				fz mm/tooth	0.007	0.014	0.021	0.026	0.034	0.042	0.057	0.069	0.084
				rpm obr/min	49338	50134	49869	50134	49975	49869	49935	39948	33555
				feed posuw mm/min	691	1404	2094	2607	3398	4189	5693	5513	5637

2 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	21-22	0.5D	1.0D	Vc m/min	155	315	470	630	785	940	940	940	940
				fz mm/tooth	0.014	0.028	0.042	0.053	0.065	0.079	0.105	0.131	0.157
				rpm obr/min	49338	50134	49869	50134	49975	49869	37401	29921	24934
				feed posuw mm/min	1381	2807	4189	5314	6497	7879	7854	7839	7829
	26-28	0.5D	1.0D	Vc m/min	155	315	470	630	630	630	630	630	630
				fz mm/tooth	0.012	0.025	0.037	0.047	0.06	0.073	0.094	0.12	0.141
				rpm obr/min	49338	50134	49869	50134	40107	33423	25067	20054	16711
				feed posuw mm/min	1184	2507	3690	4713	4813	4880	4713	4813	4713
	29.1	0.5D	1.0D	Vc m/min	155	315	470	630	785	940	1255	1255	1265
				fz mm/tooth	0.012	0.025	0.037	0.05	0.065	0.075	0.084	0.105	0.125
				rpm obr/min	49338	50134	49869	50134	49975	49869	49935	39948	33555
				feed posuw mm/min	1184	2507	3690	5013	6497	7480	8389	8389	8389

SIZE	MILL DIA TOLERANCE mm	RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R3	0 ~-0.012	± 0.005	h5
OVER TO R3	0 ~-0.015	± 0.010	h5

UFC14

2 Finish Medium

HSM Vmax | A | min | AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UFC14010000A06003050	1	6	2,5	50
UFC14015000A06004050	1,5	6	4	50
UFC14020000A06006050	2	6	6	50
UFC14025000A06008050	2,5	6	8	50
UFC14030000A06010050	3	6	10	50
UFC14040000A06012050	4	6	12	50
UFC14050000A06015060	5	6	15	60
UFC14060000A06015060	6	6	15	60
UFC14080000A08020065	8	8	20	65
UFC14100000A10025070	10	10	25	70
UFC14120000A12030080	12	12	30	80

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 ~-0.012	h5
OVER TO R6	0 ~-0.015	h5

UFC14

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	0.5	0.6	0.8	1.0	2.0	3.0	4.0	6.0	8.0	10.0	12.0
N	21-22	1.0D	0.5D	Vc m/min	80	95	125	155	315	330	325	325	330	325	330
				fz mm/tooth	0.005	0.006	0.008	0.01	0.01	0.023	0.032	0.048	0.064	0.081	0.097
				rpm obr/min	50930	50399	49736	49338	50134	35014	25863	17242	13130	10345	8754
				feed posuw mm/min	509	605	796	987	1003	1611	1655	1655	1681	1676	1698
	26-28	1.0D	0.5D	Vc m/min	80	95	105	110	160	165	160	165	165	160	165
				fz mm/tooth	0.005	0.006	0.008	0.01	0.01	0.023	0.032	0.048	0.064	0.081	0.097
				rpm obr/min	50930	50399	41778	35014	25465	17507	12732	8754	6565	5093	4377
				feed posuw mm/min	509	605	668	700	509	805	815	840	840	825	849
	29.1	1.0D	0.5D	Vc m/min	80	95	125	155	315	470	490	490	500	490	495
				fz mm/tooth	0.001	0.002	0.002	0.003	0.004	0.007	0.009	0.014	0.018	0.023	0.028
				rpm obr/min	50930	50399	49736	49338	50134	49869	38993	25995	19894	15597	13130
				feed posuw mm/min	102	202	199	296	401	698	702	728	716	717	735

2 FLUTE SIDE CUTTING / FREZ O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	0.5	0.6	0.8	1.0	2.0	3.0	4.0	6.0	8.0	10.0	12.0
N	21-22	0.5D	1.0D	Vc m/min	80	95	125	130	260	260	265	270	265	265	270
				fz mm/tooth	0.005	0.006	0.008	0.01	0.011	0.025	0.034	0.053	0.069	0.086	0.107
				rpm obr/min	50930	50399	49736	41380	41380	27587	21088	14324	10544	8435	7162
				feed posuw mm/min	509	605	796	828	910	1379	1434	1518	1455	1451	1533
	26-28	0.5D	1.0D	Vc m/min	80	85	85	85	170	175	175	180	175	175	180
				fz mm/tooth	0.005	0.006	0.008	0.01	0.01	0.023	0.032	0.05	0.064	0.08	0.1
				rpm obr/min	50930	45094	33820	27056	27056	18568	13926	9549	6963	5570	4775
				feed posuw mm/min	509	541	541	541	541	854	891	955	891	891	955
	29.1	0.5D	1.0D	Vc m/min	80	95	125	155	315	350	350	360	350	350	360
				fz mm/tooth	0.004	0.005	0.006	0.008	0.009	0.018	0.026	0.04	0.051	0.064	0.08
				rpm obr/min	50930	50399	49736	49338	50134	37136	27852	19099	13926	11141	9549
				feed posuw mm/min	407	504	597	789	902	1337	1448	1528	1420	1426	1528

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UFC13

2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

P	M	K	N	S	H

UCX END MILLS: multi purpose solid carbide end mills

FREZY UCX: węglikowe frezy monolityczne do obróbki ogólnej

UCX END MILLS
FREZY UCX

NOTE:
- Suitable for dry milling applications at high temperatures.
- Excellent high-performance end mills.
- 2 flute design for slotting
- 3 flute design possess the advantage of 2 flute and 4 flute end mill.
- 4 flute allows for better work piece finishes.
- Designed for milling of radius bottom slots, fillets and special contours.
- Fast chip ejection.

UWAGI:
- Odpowiednie do obróbki na sucho oraz w wysokich temperaturach.
- Doskonałe i wysoko wydajne frezy.
- Konstrukcja 2 zębowa zaprojektowana do rowkowania.
- Konstrukcja 3 zębowa łączy zalety konstrukcji 2 i 4 zębowowych frezów.
- Konstrukcja 4 zębowa pozwalana na lepszą obróbkę wykończeniową.
- Frezy przeznaczone do frezowania gniazd, promieni i do specjalnych konturów.
- Szybkie wyrzucanie wióra.

Group					ISO	PAGE
UCX13			2		P M K N S H	416
UCX86			2		P M K N	428
UCX15			4		P M K N S H	431
UCX18		R	2		P M K N H	433
UCX19		R	4		P M K N H	439
UCX10			2		P M K N S H	443
UCX83			2		P M K N	459
UCX95			3		P M K N S H	462
UCX96			3		P M K N S H	486
UCX11			4		P M K N S H	492
UCX32			4-6		P M K N S H	508
UCX14			3-5		P M K N S H	510
UCX34			2		P M K N S H	512

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

UCX13

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX13020010A06004048	1	2	6	4	48
UCX13025013A06004048	1,25	2,5	6	4	48
UCX13030015A06004048	1,5	3	6	4	48
UCX13040020A06006050	2	4	6	6	50
UCX13040020A04012040	2	4	4	12	40
UCX13050025A06007051	2,5	5	6	7	51
UCX13050025A05014050	2,5	5	5	14	50
UCX13060030A06007051	3	6	6	7	51
UCX13080040A08009059	4	8	8	9	59
UCX13100050A10010060	5	10	10	10	60
UCX13120060A12014071	6	12	12	14	71
UCX13140070A14014071	7	14	14	14	71
UCX13160080A16016076	8	16	16	16	76
UCX13180090A18018076	9	18	18	18	76
UCX13200100A20020082	10	20	20	20	82

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	1-4	0.2D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	5	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	6-7	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	8-9	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	10	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
K	15-20	0.25D	Vc m/min	65	65	65	65	65	65	65	65	60	65	60	65
			fz mm/tooth	0.01	0.016	0.028	0.04	0.053	0.092	0.112	0.131	0.164	0.177	0.209	0.2
			rpm obr/min	10345	6897	5173	4138	3448	2586	2069	1724	1364	1293	1061	1035
			feed posuw mm/min	207	221	290	331	366	476	463	452	447	458	444	414
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
N	21-22	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	23-25	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
H	38.1	0.25D	Vc m/min	25	35	45	50	50	50	55	55	55	60	60	60
			fz mm/tooth	0.016	0.016	0.021	0.024	0.03	0.046	0.054	0.07	0.081	0.091	0.1	0.111
			rpm obr/min	3979	3714	3581	3183	2653	1989	1751	1459	1251	1194	1061	955
			feed posuw mm/min	127	119	150	153	159	183	189	204	203	217	212	212
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	40	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX13

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K							N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX13010005A03003039	0,5	1	3	3	39
UCX13015008A03005039	0,75	1,5	3	5	39
UCX13020010A03007039	1	2	3	7	39
UCX13025013A03007039	1,25	2,5	3	8	39
UCX13030015A03009039	1,5	3	3	9	39
UCX13040020A04014051	2	4	4	14	51
UCX13050025A05016051	2,5	5	5	16	51
UCX13060030A06019064	3	6	6	19	64
UCX13080040A08021064	4	8	8	21	64
UCX13100050A10022070	5	10	10	22	70
UCX13110055A11025070	5,5	11	11	25	70
UCX13120060A12025076	6	12	12	25	76
UCX13160080A16032089	8	16	16	32	89
UCX13200100A20038102	10	20	20	38	102

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	1-4	0.2D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	5	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	6-7	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	8-9	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	10	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
K	15-20	0.25D	Vc m/min	65	65	65	65	65	65	65	65	60	65	60	65
			fz mm/tooth	0.01	0.016	0.028	0.04	0.053	0.092	0.112	0.131	0.164	0.177	0.209	0.2
			rpm obr/min	10345	6897	5173	4138	3448	2586	2069	1724	1364	1293	1061	1035
			feed posuw mm/min	207	221	290	331	366	476	463	452	447	458	444	414
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
N	21-22	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	23-25	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
H	38.1	0.25D	Vc m/min	25	35	45	50	50	50	55	55	55	60	60	60
			fz mm/tooth	0.016	0.016	0.021	0.024	0.03	0.046	0.054	0.07	0.081	0.091	0.1	0.111
			rpm obr/min	3979	3714	3581	3183	2653	1989	1751	1459	1251	1194	1061	955
			feed posuw mm/min	127	119	150	153	159	183	189	204	203	217	212	212
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	40	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX13

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K							N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX13020010B06003050	1	2	6	3	50
UCX13030015B06004050	1,5	3	6	4	50
UCX13040020B06005054	2	4	6	5	54
UCX13050025B06006054	2,5	5	6	6	54
UCX13060030B06007054	3	6	6	7	54
UCX13080040B08009058	4	8	8	9	58
UCX13100050B10011066	5	10	10	11	66
UCX13120060B12012073	6	12	12	12	73
UCX13140070B14014075	7	14	14	14	75
UCX13180090B18018084	9	18	18	18	84
UCX13200100B20020092	10	20	20	20	92

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	1-4	0.2D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	5	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	6-7	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	8-9	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	10	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
K	15-20	0.25D	Vc m/min	65	65	65	65	65	65	65	65	60	65	60	65
			fz mm/tooth	0.01	0.016	0.028	0.04	0.053	0.092	0.112	0.131	0.164	0.177	0.209	0.2
			rpm obr/min	10345	6897	5173	4138	3448	2586	2069	1724	1364	1293	1061	1035
			feed posuw mm/min	207	221	290	331	366	476	463	452	447	458	444	414
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
N	21-22	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	23-25	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
H	38.1	0.25D	Vc m/min	25	35	45	50	50	50	55	55	55	60	60	60
			fz mm/tooth	0.016	0.016	0.021	0.024	0.03	0.046	0.054	0.07	0.081	0.091	0.1	0.111
			rpm obr/min	3979	3714	3581	3183	2653	1989	1751	1459	1251	1194	1061	955
			feed posuw mm/min	127	119	150	153	159	183	189	204	203	217	212	212
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	40	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX13

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX13020010A03006038	1	2	3	6	38
UCX13030015B06007057	1,5	3	6	7	57
UCX13040020B06008057	2	4	6	8	57
UCX13050025B06010057	2,5	5	6	10	57
UCX13060030B06010057	3	6	6	10	57
UCX13080040B08016063	4	8	8	16	63
UCX13100050B10019072	5	10	10	19	72
UCX13120060B12022083	6	12	12	22	83
UCX13140070B14022083	7	14	14	22	83
UCX13160080B16026092	8	16	16	26	92
UCX13180090B18026092	9	18	18	26	92
UCX13200100B20032104	10	20	20	32	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	1-4	0.2D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	5	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	6-7	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	8-9	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	10	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
K	15-20	0.25D	Vc m/min	65	65	65	65	65	65	65	65	60	65	60	65
			fz mm/tooth	0.01	0.016	0.028	0.04	0.053	0.092	0.112	0.131	0.164	0.177	0.209	0.2
			rpm obr/min	10345	6897	5173	4138	3448	2586	2069	1724	1364	1293	1061	1035
			feed posuw mm/min	207	221	290	331	366	476	463	452	447	458	444	414
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
N	21-22	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	23-25	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
H	38.1	0.25D	Vc m/min	25	35	45	50	50	50	55	55	55	60	60	60
			fz mm/tooth	0.016	0.016	0.021	0.024	0.03	0.046	0.054	0.07	0.081	0.091	0.1	0.111
			rpm obr/min	3979	3714	3581	3183	2653	1989	1751	1459	1251	1194	1061	955
			feed posuw mm/min	127	119	150	153	159	183	189	204	203	217	212	212
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	40	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX13

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX13030015A03005075	1,5	3	3	5	75
UCX13040020A04008075	2	4	4	8	75
UCX13050025A05009075	2,5	5	5	9	75
UCX13060030A06010100	3	6	6	10	100
UCX13080040A08012100	4	8	8	12	100
UCX13100050A10014100	5	10	10	14	100
UCX13120060A12016100	6	12	12	16	100
UCX13140070A14018100	7	14	14	18	100
UCX13160080A16022150	8	16	16	22	150
UCX13200100A20026150	10	20	20	26	150

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX13

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	1-4	0.2D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	5	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	6-7	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	8-9	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	10	0.25D	Vc m/min	80	105	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.026	0.025	0.035	0.045	0.06	0.089	0.122	0.15	0.165	0.18	0.188	0.201
			rpm obr/min	12732	11141	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	662	557	613	716	859	1098	1320	1512	1501	1468	1430	1440
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
K	15-20	0.25D	Vc m/min	65	65	65	65	65	65	65	65	60	65	60	65
			fz mm/tooth	0.01	0.016	0.028	0.04	0.053	0.092	0.112	0.131	0.164	0.177	0.209	0.2
			rpm obr/min	10345	6897	5173	4138	3448	2586	2069	1724	1364	1293	1061	1035
			feed posuw mm/min	207	221	290	331	366	476	463	452	447	458	444	414
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
N	21-22	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	23-25	0.25D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.092
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	372	414	403	460	476	541	546	631	631	543	531	542
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
H	38.1	0.25D	Vc m/min	25	35	45	50	50	50	55	55	55	60	60	60
			fz mm/tooth	0.016	0.016	0.021	0.024	0.03	0.046	0.054	0.07	0.081	0.091	0.1	0.111
			rpm obr/min	3979	3714	3581	3183	2653	1989	1751	1459	1251	1194	1061	955
			feed posuw mm/min	127	119	150	153	159	183	189	204	203	217	212	212
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	40	0.25D	Vc m/min	55	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.023	0.023	0.031	0.04	0.06	0.08	0.1	0.12	0.128	0.141	0.148	0.158
			rpm obr/min	8754	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	403	390	444	484	700	796	859	955	931	898	890	880
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX13

2 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UCX86

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○														

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UCX86004002A04002050	0,2	0,4	4	0,7	2	50	0,37
UCX86005003A04002050	0,25	0,5	4	0,75	2	50	0,45
UCX86005003A04004050	0,25	0,5	4	0,75	4	50	0,45
UCX86005003A04006050	0,25	0,5	4	0,75	6	50	0,45
UCX86006003A04002050	0,3	0,6	4	0,9	2	50	0,55
UCX86006003A04004050	0,3	0,6	4	0,9	4	50	0,55
UCX86006003A04006050	0,3	0,6	4	0,9	6	50	0,55
UCX86008004A04004050	0,4	0,8	4	1,2	4	50	0,75
UCX86008004A04006050	0,4	0,8	4	1,2	6	50	0,75
UCX86008004A04008050	0,4	0,8	4	1,2	8	50	0,75
UCX86010005A04006050	0,5	1	4	1,5	6	50	0,95
UCX86010005A04008050	0,5	1	4	1,5	8	50	0,95
UCX86010005A04010050	0,5	1	4	1,5	10	50	0,95
UCX86010005A04012050	0,5	1	4	1,5	12	50	0,95
UCX86012006A04008050	0,6	1,2	4	1,8	8	50	1,15
UCX86012006A04012050	0,6	1,2	4	1,8	12	50	1,15
UCX86014007A04016050	0,7	1,4	4	2,1	16	50	1,35
UCX86015008A04006050	0,75	1,5	4	2,3	6	50	1,45
UCX86015008A04008050	0,75	1,5	4	2,3	8	50	1,45
UCX86015008A04010050	0,75	1,5	4	2,3	10	50	1,45
UCX86015008A04012050	0,75	1,5	4	2,3	12	50	1,45
UCX86015008A04016050	0,75	1,5	4	2,3	16	50	1,45
UCX86015008A04020050	0,75	1,5	4	2,3	20	50	1,45
UCX86016008A04008050	0,8	1,6	4	2,4	8	50	1,55
UCX86016008A04012050	0,8	1,6	4	2,4	12	50	1,55
UCX86016008A04016050	0,8	1,6	4	2,4	16	50	1,55
UCX86016008A04020050	0,8	1,6	4	2,4	20	50	1,55
UCX86020010A04008050	1	2	4	3	8	50	1,95
UCX86020010A04010050	1	2	4	3	10	50	1,95
UCX86020010A04012050	1	2	4	3	12	50	1,95
UCX86020010A04014050	1	2	4	3	14	50	1,95
UCX86020010A04016050	1	2	4	3	16	50	1,95
UCX86020010A04020050	1	2	4	3	20	50	1,95
UCX86030015A06010050	1,5	3	6	4,5	10	50	2,85
UCX86030015A06012050	1,5	3	6	4,5	12	50	2,85
UCX86030015A06016060	1,5	3	6	4,5	16	60	2,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX86

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○															

CODE	RE	DC	DCON	APMX	LU	OAL	DN
UCX86030015A06020060	1,5	3	6	4,5	20	60	2,85
UCX86030015A06025075	1,5	3	6	4,5	25	75	2,85
UCX86040020A06012050	2	4	6	6	12	50	3,85
UCX86040020A06016060	2	4	6	6	16	60	3,85
UCX86040020A06020075	2	4	6	6	20	75	3,85
UCX86040020A06025075	2	4	6	6	25	75	3,85
UCX86040020A06030075	2	4	6	6	30	75	3,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX86

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	DC	0.4	0.5	0.6	0.8	1.0
P	1-4	1.0D	Vc m/min	33~43	41~53	50~64	66~85	77~97
			fz mm/tooth	0.003~0.006	0.003~0.006	0.004~0.008	0.004~0.008	0.004~0.010
			rpm obr/min	26350~34000	26350~34000	26350~34000	26350~34000	24650~31000
			feed posuw mm/min	150~415	150~415	190~535	190~535	210~595
			Ap mm	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090
	5	1.0D	Vc m/min	24~30	30~38	36~46	48~61	55~69
			fz mm/tooth	0.002~0.005	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.007
			rpm obr/min	19100~24200	19100~24200	19100~24200	19100~24200	17400~22100
			feed posuw mm/min	75~230	75~230	95~300	95~300	105~330
			Ap mm	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090
	6-7	1.0D	Vc m/min	33~43	41~53	50~64	66~85	77~97
			fz mm/tooth	0.003~0.006	0.003~0.006	0.004~0.008	0.004~0.008	0.004~0.010
			rpm obr/min	26350~34000	26350~34000	26350~34000	26350~34000	24650~31000
			feed posuw mm/min	150~415	150~415	190~535	190~535	210~595
			Ap mm	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090
	8-9	1.0D	Vc m/min	24~30	30~38	36~46	48~61	55~69
			fz mm/tooth	0.002~0.005	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.007
			rpm obr/min	19100~24200	19100~24200	19100~24200	19100~24200	17400~22100
			feed posuw mm/min	75~230	75~230	95~300	95~300	105~330
			Ap mm	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090
	10	1.0D	Vc m/min	33~43	41~53	50~64	66~85	77~97
			fz mm/tooth	0.003~0.006	0.003~0.006	0.004~0.008	0.004~0.008	0.004~0.010
			rpm obr/min	26350~34000	26350~34000	26350~34000	26350~34000	24650~31000
			feed posuw mm/min	150~415	150~415	190~535	190~535	210~595
			Ap mm	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090
	11.1 - 11.2	1.0D	Vc m/min	24~30	30~38	36~46	48~61	55~69
			fz mm/tooth	0.002~0.005	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.007
			rpm obr/min	19100~24200	19100~24200	19100~24200	19100~24200	17400~22100
			feed posuw mm/min	75~230	75~230	95~300	95~300	105~330
			Ap mm	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090

ISO	VDI 3323	Ae mm	DC	1.2	1.4	1.5	1.6	1.8	2.0	3.0	4.0
P	1-4	1.0D	Vc m/min	77~98	79~97	75~97	78~101	82~103	82~101	85~104	90~117
			fz mm/tooth	0.005~0.013	0.006~0.015	0.007~0.016	0.007~0.017	0.007~0.018	0.008~0.021	0.012~0.030	0.015~0.036
			rpm obr/min	20500~26000	18000~22000	16000~20500	15500~20000	14500~18200	13000~16000	9000~11000	7200~9350
			feed posuw mm/min	210~665	210~665	210~665	210~665	210~665	210~665	210~665	210~665
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360
	5	1.0D	Vc m/min	55~69	56~67	54~70	56~70	58~72	59~72	57~108	63~83
			fz mm/tooth	0.004~0.009	0.004~0.011	0.005~0.011	0.005~0.012	0.005~0.013	0.006~0.014	0.009~0.014	0.011~0.025
			rpm obr/min	14500~18300	12800~15300	11500~14900	11200~14000	10200~12800	9400~11500	6000~11500	5000~6600
			feed posuw mm/min	105~330	105~330	105~330	105~330	105~330	105~330	105~330	105~330
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360
	6-7	1.0D	Vc m/min	77~98	79~97	75~97	78~101	82~103	82~101	85~104	90~117
			fz mm/tooth	0.005~0.013	0.006~0.015	0.007~0.016	0.007~0.017	0.007~0.018	0.008~0.021	0.012~0.030	0.015~0.036
			rpm obr/min	20500~26000	18000~22000	16000~20500	15500~20000	14500~18200	13000~16000	9000~11000	7200~9350
			feed posuw mm/min	210~665	210~665	210~665	210~665	210~665	210~665	210~665	210~665
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360
	8-9	1.0D	Vc m/min	55~69	56~67	54~70	56~70	58~72	59~72	57~108	63~83
			fz mm/tooth	0.004~0.009	0.004~0.011	0.005~0.011	0.005~0.012	0.005~0.013	0.006~0.014	0.009~0.014	0.011~0.025
			rpm obr/min	14500~18300	12800~15300	11500~14900	11200~14000	10200~12800	9400~11500	6000~11500	5000~6600
			feed posuw mm/min	105~330	105~330	105~330	105~330	105~330	105~330	105~330	105~330
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360
	10	1.0D	Vc m/min	77~98	79~97	75~97	78~101	82~103	82~101	85~104	90~117
			fz mm/tooth	0.005~0.013	0.006~0.015	0.007~0.016	0.007~0.017	0.007~0.018	0.008~0.021	0.012~0.030	0.015~0.036
			rpm obr/min	20500~26000	18000~22000	16000~20500	15500~20000	14500~18200	13000~16000	9000~11000	7200~9350
			feed posuw mm/min	210~665	210~665	210~665	210~665	210~665	210~665	210~665	210~665
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360
	11.1 - 11.2	1.0D	Vc m/min	55~69	56~67	54~70	56~70	58~72	59~72	57~108	63~83
			fz mm/tooth	0.004~0.009	0.004~0.011	0.005~0.011	0.005~0.012	0.005~0.013	0.006~0.014	0.009~0.014	0.011~0.025
			rpm obr/min	14500~18300	12800~15300	11500~14900	11200~14000	10200~12800	9400~11500	6000~11500	5000~6600
			feed posuw mm/min	105~330	105~330	105~330	105~330	105~330	105~330	105~330	105~330
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.135~0.270	0.180~0.360

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX15

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX15020010A06004048	1	2	6	4	48
UCX15030015A06004048	1,5	3	6	4	48
UCX15040020A06006050	2	4	6	6	50
UCX15050025A06007051	2,5	5	6	7	51
UCX15060030A06007051	3	6	6	7	51
UCX15080040A08009059	4	8	8	9	59
UCX15100050A10010060	5	10	10	10	60
UCX15120060A12014071	6	12	12	14	71
UCX15140070A14014071	7	14	14	14	71
UCX15160080A16016076	8	16	16	16	76
UCX15180090A18018076	9	18	18	18	76
UCX15200100A20020082	10	20	20	20	82

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX15

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE BALL NOSE / FREZ KULOWY O 4 ZĘBACH

ISO	VDI 3323	Ae mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	1-4	0.2D	Vc m/min	85	110	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.013	0.019	0.027	0.033	0.046	0.068	0.089	0.112	0.124	0.136	0.14	0.15
			rpm obr/min	13528	11671	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	703	887	945	1050	1318	1677	1926	2258	2255	2219	2129	2149
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	5	0.2D	Vc m/min	65	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.01	0.017	0.024	0.03	0.046	0.06	0.076	0.089	0.099	0.108	0.111	0.119
			rpm obr/min	10345	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	414	577	688	726	1074	1194	1306	1416	1441	1375	1335	1326
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	6-7	0.2D	Vc m/min	85	110	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.013	0.019	0.027	0.033	0.046	0.068	0.089	0.112	0.124	0.136	0.14	0.15
			rpm obr/min	13528	11671	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	703	887	945	1050	1318	1677	1926	2258	2255	2219	2129	2149
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	8-9	0.2D	Vc m/min	65	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.01	0.017	0.024	0.03	0.046	0.06	0.076	0.089	0.099	0.108	0.111	0.119
			rpm obr/min	10345	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	414	577	688	726	1074	1194	1306	1416	1441	1375	1335	1326
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	10	0.2D	Vc m/min	85	110	110	125	135	155	170	190	200	205	215	225
			fz mm/tooth	0.013	0.019	0.027	0.033	0.046	0.068	0.089	0.112	0.124	0.136	0.14	0.15
			rpm obr/min	13528	11671	8754	7958	7162	6167	5411	5040	4547	4078	3802	3581
			feed posuw mm/min	703	887	945	1050	1318	1677	1926	2258	2255	2219	2129	2149
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	11.1 - 11.2	0.2D	Vc m/min	65	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.01	0.017	0.024	0.03	0.046	0.06	0.076	0.089	0.099	0.108	0.111	0.119
			rpm obr/min	10345	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	414	577	688	726	1074	1194	1306	1416	1441	1375	1335	1326
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
K	15-20	0.7D	Vc m/min	65	65	65	65	65	65	65	65	60	65	60	65
			fz mm/tooth	0.008	0.012	0.021	0.03	0.04	0.068	0.083	0.097	0.125	0.135	0.159	0.15
			rpm obr/min	10345	6897	5173	4138	3448	2586	2069	1724	1364	1293	1061	1035
			feed posuw mm/min	331	331	434	497	552	703	687	669	682	698	675	621
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
N	21-22	0.7D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.005	0.007	0.01	0.015	0.017	0.026	0.033	0.046	0.055	0.053	0.06	0.069
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	621	579	621	726	703	828	819	952	950	822	806	813
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	23-25	0.7D	Vc m/min	195	195	195	190	195	200	195	195	190	195	190	185
			fz mm/tooth	0.005	0.007	0.01	0.015	0.017	0.026	0.033	0.046	0.055	0.053	0.06	0.069
			rpm obr/min	31035	20690	15518	12096	10345	7958	6207	5173	4320	3879	3360	2944
			feed posuw mm/min	621	579	621	726	703	828	819	952	950	822	806	813
			Ap mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
H	38.1	0.2D	Vc m/min	25	35	45	50	50	55	55	55	55	55	60	60
			fz mm/tooth	0.008	0.012	0.016	0.019	0.022	0.034	0.041	0.053	0.062	0.073	0.076	0.084
			rpm obr/min	3979	3714	3581	3183	2653	2188	1751	1459	1251	1094	1061	955
			feed posuw mm/min	127	178	229	242	233	298	287	309	310	320	323	321
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	40	0.2D	Vc m/min	65	80	90	95	110	125	135	150	160	160	170	175
			fz mm/tooth	0.01	0.017	0.024	0.03	0.046	0.06	0.076	0.089	0.099	0.108	0.111	0.119
			rpm obr/min	10345	8488	7162	6048	5836	4974	4297	3979	3638	3183	3006	2785
			feed posuw mm/min	414	577	688	726	1074	1194	1306	1416	1441	1375	1335	1326
			Ap mm	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX18

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○												○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX18020002A04004050	0,2	2	4	4	50
UCX18020003A04004050	0,3	2	4	4	50
UCX18020005A04004050	0,5	2	4	4	50
UCX18025002A04005050	0,2	2,5	4	5	50
UCX18025003A04005050	0,3	2,5	4	5	50
UCX18025005A04005050	0,5	2,5	4	5	50
UCX18030002A04006050	0,2	3	4	6	50
UCX18030003A04006050	0,3	3	4	6	50
UCX18030005A04006050	0,5	3	4	6	50
UCX18030010A04006050	1	3	4	6	50
UCX18040002A04008050	0,2	4	4	8	50
UCX18040003A04008050	0,3	4	4	8	50
UCX18040005A04008050	0,5	4	4	8	50
UCX18040010A04008050	1	4	4	8	50
UCX18050002A06010050	0,2	5	6	10	50
UCX18050003A06010050	0,3	5	6	10	50
UCX18050005A06010050	0,5	5	6	10	50
UCX18050010A06010050	1	5	6	10	50
UCX18060002A06012050	0,2	6	6	12	50
UCX18060003A06012050	0,3	6	6	12	50
UCX18060005A06012050	0,5	6	6	12	50
UCX18060010A06012050	1	6	6	12	50

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX18

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	30	35	35	35	35	35	35
				fz mm/tooth	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058
				rpm obr/min	3979	3183	2785	2228	1857	1393	1114	928
				feed posuw mm/min	72	102	139	138	149	148	131	108
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	55	55	60	55
				fz mm/tooth	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102
				rpm obr/min	9549	5836	4775	3501	2918	2188	1910	1459
				feed posuw mm/min	229	210	229	210	251	276	294	298
N	21-22	1.0D	1.0D	Vc m/min	140	145	140	145	145	145	145	140
				fz mm/tooth	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065
				rpm obr/min	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	446	462	468	462	492	496	489	483
	23-25	1.0D	1.0D	Vc m/min	140	145	140	145	145	145	145	140
				fz mm/tooth	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065
				rpm obr/min	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	446	462	468	462	492	496	489	483
	26-28	1.0D	1.0D	Vc m/min	105	105	110	105	105	110	105	105
				fz mm/tooth	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066
				rpm obr/min	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	334	334	333	334	368	376	368	368
	29.1	1.0D	1.0D	Vc m/min	105	105	110	105	105	110	105	105
				fz mm/tooth	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066
				rpm obr/min	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	334	334	333	334	368	376	368	368
H	40	1.0D	1.0D	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX18

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○												○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX18080005A08016060	0,5	8	8	16	60
UCX18080010A08016060	1	8	8	16	60
UCX18080015A08016060	1,5	8	8	16	60
UCX18080020A08016060	2	8	8	16	60
UCX18080025A08016060	2,5	8	8	16	60
UCX18100005A10020075	0,5	10	10	20	75
UCX18100010A10020075	1	10	10	20	75
UCX18100015A10020075	1,5	10	10	20	75
UCX18100020A10020075	2	10	10	20	75
UCX18100025A10020075	2,5	10	10	20	75
UCX18120005A12024075	0,5	12	12	24	75
UCX18120010A12024075	1	12	12	24	75
UCX18120015A12024075	1,5	12	12	24	75
UCX18120020A12024075	2	12	12	24	75
UCX18120025A12024075	2,5	12	12	24	75

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX18

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	30	35	35	35	35	35	35
				fz mm/tooth	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058
				rpm obr/min	3979	3183	2785	2228	1857	1393	1114	928
				feed posuw mm/min	72	102	139	138	149	148	131	108
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	55	55	60	55
				fz mm/tooth	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102
				rpm obr/min	9549	5836	4775	3501	2918	2188	1910	1459
				feed posuw mm/min	229	210	229	210	251	276	294	298
N	21-22	1.0D	1.0D	Vc m/min	140	145	140	145	145	145	145	140
				fz mm/tooth	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065
				rpm obr/min	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	446	462	468	462	492	496	489	483
	23-25	1.0D	1.0D	Vc m/min	140	145	140	145	145	145	145	140
				fz mm/tooth	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065
				rpm obr/min	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	446	462	468	462	492	496	489	483
	26-28	1.0D	1.0D	Vc m/min	105	105	110	105	105	110	105	105
				fz mm/tooth	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066
				rpm obr/min	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	334	334	333	334	368	376	368	368
	29.1	1.0D	1.0D	Vc m/min	105	105	110	105	105	110	105	105
				fz mm/tooth	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066
				rpm obr/min	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	334	334	333	334	368	376	368	368
H	40	1.0D	1.0D	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX18

R 2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○												○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX18030005A04006075	0,5	3	4	6	75
UCX18030010A04006075	1	3	4	6	75
UCX18040005A04008075	0,5	4	4	8	75
UCX18040010A04008075	1	4	4	8	75
UCX18050005A06010075	0,5	5	6	10	75
UCX18050010A06010075	1	5	6	10	75
UCX18060005A06012075	0,5	6	6	12	75
UCX18060010A06012075	1	6	6	12	75
UCX18080005A08016100	0,5	8	8	16	100
UCX18080010A08016100	1	8	8	16	100
UCX18080015A08016100	1,5	8	8	16	100
UCX18080020A08016100	2	8	8	16	100
UCX18080025A08016100	2,5	8	8	16	100
UCX18100005A10020100	0,5	10	10	20	100
UCX18100010A10020100	1	10	10	20	100
UCX18100015A10020100	1,5	10	10	20	100
UCX18100020A10020100	2	10	10	20	100
UCX18100025A10020100	2,5	10	10	20	100
UCX18120005A12024100	0,5	12	12	24	100
UCX18120010A12024100	1	12	12	24	100
UCX18120015A12024100	1,5	12	12	24	100
UCX18120020A12024100	2	12	12	24	100
UCX18120025A12024100	2,5	12	12	24	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX18

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS SLOTTING / FREZ PROMIENIOWY O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	50	55	65	70	70	70	70	70
				fz mm/tooth	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065
				rpm obr/min	7958	5836	5173	4456	3714	2785	2228	1857
				feed posuw mm/min	159	175	259	276	290	318	285	241
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	30	35	35	35	35	35	35
				fz mm/tooth	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058
				rpm obr/min	3979	3183	2785	2228	1857	1393	1114	928
				feed posuw mm/min	72	102	139	138	149	148	131	108
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	55	55	60	55
				fz mm/tooth	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102
				rpm obr/min	9549	5836	4775	3501	2918	2188	1910	1459
				feed posuw mm/min	229	210	229	210	251	276	294	298
N	21-22	1.0D	1.0D	Vc m/min	140	145	140	145	145	145	145	140
				fz mm/tooth	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065
				rpm obr/min	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	446	462	468	462	492	496	489	483
	23-25	1.0D	1.0D	Vc m/min	140	145	140	145	145	145	145	140
				fz mm/tooth	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065
				rpm obr/min	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	446	462	468	462	492	496	489	483
	26-28	1.0D	1.0D	Vc m/min	105	105	110	105	105	110	105	105
				fz mm/tooth	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066
				rpm obr/min	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	334	334	333	334	368	376	368	368
	29.1	1.0D	1.0D	Vc m/min	105	105	110	105	105	110	105	105
				fz mm/tooth	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066
				rpm obr/min	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	334	334	333	334	368	376	368	368
H	40	1.0D	1.0D	Vc m/min	30	35	40	40	45	45	40	45
				fz mm/tooth	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048
				rpm obr/min	4775	3714	3183	2546	2387	1790	1273	1194
				feed posuw mm/min	95	119	159	158	196	179	127	115

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX19

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○												○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX19020002A04004050	0,2	2	4	4	50
UCX19020003A04004050	0,3	2	4	4	50
UCX19020005A04004050	0,5	2	4	4	50
UCX19025002A04005050	0,2	2,5	4	5	50
UCX19025003A04005050	0,3	2,5	4	5	50
UCX19025005A04005050	0,5	2,5	4	5	50
UCX19030002A04006050	0,2	3	4	6	50
UCX19030003A04006050	0,3	3	4	6	50
UCX19030005A04006050	0,5	3	4	6	50
UCX19030010A04006050	1	3	4	6	50
UCX19040002A04008050	0,2	4	4	8	50
UCX19040003A04008050	0,3	4	4	8	50
UCX19040005A04008050	0,5	4	4	8	50
UCX19040010A04008050	1	4	4	8	50
UCX19050002A06010050	0,2	5	6	10	50
UCX19050003A06010050	0,3	5	6	10	50
UCX19050005A06010050	0,5	5	6	10	50
UCX19050010A06010050	1	5	6	10	50
UCX19060002A06012050	0,2	6	6	12	50
UCX19060003A06012050	0,3	6	6	12	50
UCX19060005A06012050	0,5	6	6	12	50
UCX19060010A06012050	1	6	6	12	50
UCX19080005A08016060	0,5	8	8	16	60
UCX19080010A08016060	1	8	8	16	60
UCX19080015A08016060	1,5	8	8	16	60
UCX19080020A08016060	2	8	8	16	60
UCX19080025A08016060	2,5	8	8	16	60
UCX19100005A10020075	0,5	10	10	20	75
UCX19100010A10020075	1	10	10	20	75
UCX19100015A10020075	1,5	10	10	20	75
UCX19100020A10020075	2	10	10	20	75
UCX19100025A10020075	2,5	10	10	20	75
UCX19120005A12024075	0,5	12	12	24	75
UCX19120010A12024075	1	12	12	24	75
UCX19120015A12024075	1,5	12	12	24	75
UCX19120020A12024075	2	12	12	24	75
UCX19120025A12024075	2,5	12	12	24	75

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX19

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX19

R 4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○											○	

CODE	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX19030005A04006075	0,5	3	4	6	75
UCX19030010A04006075	1	3	4	6	75
UCX19040005A04008075	0,5	4	4	8	75
UCX19040010A04008075	1	4	4	8	75
UCX19050005A06010075	0,5	5	6	10	75
UCX19050010A06010075	1	5	6	10	75
UCX19060005A06012075	0,5	6	6	12	75
UCX19060010A06012075	1	6	6	12	75
UCX19080005A08016100	0,5	8	8	16	100
UCX19080010A08016100	1	8	8	16	100
UCX19080015A08016100	1,5	8	8	16	100
UCX19080020A08016100	2	8	8	16	100
UCX19080025A08016100	2,5	8	8	16	100
UCX19100005A10020100	0,5	10	10	20	100
UCX19100010A10020100	1	10	10	20	100
UCX19100015A10020100	1,5	10	10	20	100
UCX19100020A10020100	2	10	10	20	100
UCX19100025A10020100	2,5	10	10	20	100
UCX19120005A12024100	0,5	12	12	24	100
UCX19120010A12024100	1	12	12	24	100
UCX19120015A12024100	1,5	12	12	24	100
UCX19120020A12024100	2	12	12	24	100
UCX19120025A12024100	2,5	12	12	24	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX19

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER RADIUS SIDE CUTTING / FREZ PROMIENIOWY O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	
																															○	○	○	○	○	○	○				

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX10010000A04003040	1	4	3	40
UCX10015000A04005040	1,5	4	4,5	40
UCX10020000A02008032	2	2	8	32
UCX10025000A02508032	2,5	2,5	8	32
UCX10030000A03012032	3	3	12	32
UCX10035000A03512032	3,5	3,5	12	32
UCX10040000A04012040	4	4	12	40
UCX10045000A04514050	4,5	4,5	14	50
UCX10050000A05014050	5	5	14	50
UCX10055000A05516050	5,5	5,5	16	50
UCX10060000A06016050	6	6	16	50
UCX10070000A07020060	7	7	20	60
UCX10080000A08020060	8	8	20	60
UCX10090000A09020060	9	9	20	60
UCX10100000A1002207	10	10	22	70
UCX10120000A12022070	12	12	22	70
UCX10140000A14025075	14	14	25	75
UCX10160000A16025075	16	16	25	75
UCX10200000A20032100	20	20	32	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX1003000CA03012032	3	3	12	32	0,1
UCX1004000CA04012040	4	4	12	40	0,1
UCX1005000CA05014050	5	5	14	50	0,1
UCX1006000CA06016050	6	6	16	50	0,1
UCX1008000CA08020060	8	8	20	60	0,13
UCX1010000CA10022070	10	10	22	70	0,13
UCX1012000CA12022070	12	12	22	70	0,18
UCX1014000CA14025075	14	14	25	75	0,18
UCX1016000CA16025075	16	16	25	75	0,18
UCX1020000CA20032100	20	20	32	100	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

2 Finish Medium

<Ø 3mm ≥Ø 3mm

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX10010000A03003039	1	3	3	39
UCX10015000A03005039	1,5	3	5	39
UCX10020000A03007039	2	3	7	39
UCX10025000A03007039	2,5	3	7	39
UCX10030000A03009039	3	3	9	39
UCX10040000A04014051	4	4	14	51
UCX10050000A05016051	5	5	16	51
UCX10060000A06019064	6	6	19	64
UCX10080000A08021064	8	8	21	64
UCX10100000A10022070	10	10	22	70
UCX10120000A12025076	12	12	25	76
UCX10160000A16032089	16	16	32	89
UCX10200000A20038102	20	20	38	102

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX10020000B06003050	2	6	3	50
UCX10030000B06004050	3	6	4	50
UCX10035000B06004050	3,5	6	4	50
UCX10040000B06005054	4	6	5	54
UCX10045000B06005054	4,5	6	5	54
UCX10050000B06006054	5	6	6	54
UCX10060000B06007054	6	6	7	54
UCX10070000B08008058	7	8	8	58
UCX10080000B08009058	8	8	9	58
UCX10090000B10010066	9	10	10	66
UCX10100000B10011066	10	10	11	66
UCX10120000B12012073	12	12	12	73
UCX10140000B14014075	14	14	14	75
UCX10160000B16016082	16	16	16	82
UCX10180000B18018084	18	18	18	84
UCX10200000B20020092	20	20	20	92

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	
																															○	○	○	○	○	○	○				

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX10035000A03507050	3,5	3,5	7	50
UCX10040000A04008050	4	4	8	50
UCX10045000A04508050	4,5	4,5	8	50
UCX10050000A05010050	5	5	10	50
UCX10055000A05510057	5,5	5,5	10	57
UCX10060000A06010057	6	6	10	57
UCX10065000A06513060	6,5	6,5	13	60
UCX10070000A07013060	7	7	13	60
UCX10075000A07516063	7,5	7,5	16	63
UCX10080000A08016063	8	8	16	63
UCX10085000A08516067	8,5	8,5	16	67
UCX10090000A09016067	9	9	16	67
UCX10095000A09519072	9,5	9,5	19	72
UCX10100000A10019072	10	10	19	72
UCX10110000A11022083	11	11	22	83
UCX10120000A12022083	12	12	22	83
UCX10130000A13022083	13	13	22	83
UCX10140000A14022083	14	14	22	83
UCX10150000A15026092	15	15	26	92
UCX10160000A16026092	16	16	26	92
UCX10180000A18026092	18	18	26	92
UCX10200000A20032104	20	20	32	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

2 Finish Medium

<Ø 2mm ≥Ø 2mm

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX10020000A03006038	2	3 (WITH PLAIN SHANK)	6	38
UCX10028000B06007057	2,8	6	7	57
UCX10030000B06007057	3	6	7	57
UCX10035000B06007057	3,5	6	7	57
UCX10038000B06008057	3,8	6	8	57
UCX10040000B06008057	4	6	8	57
UCX10045000B06008057	4,5	6	8	57
UCX10048000B06010057	4,8	6	10	57
UCX10050000B06010057	5	6	10	57
UCX10058000B06010057	5,8	6	10	57
UCX10060000B06010057	6	6	10	57
UCX10068000B08013063	6,8	8	13	63
UCX10070000B08013063	7	8	13	63
UCX10078000B08016063	7,8	8	16	63
UCX10080000B08016063	8	8	16	63
UCX10087000B10016072	8,7	10	16	72
UCX10090000B10016072	9	10	16	72
UCX10097000B10019072	9,7	10	19	72
UCX10100000B10019072	10	10	19	72
UCX10117000B12022083	11,7	12	22	83
UCX10120000B12022083	12	12	22	83
UCX10137000B14022083	13,7	14	22	83
UCX10140000B14022083	14	14	22	83
UCX10157000B16026092	15,7	16	26	92
UCX10160000B16026092	16,0	16	26	92
UCX10177000B18026092	17,7	18	26	92
UCX10180000B18026092	18,0	18	26	92
UCX10197000B20032104	19,7	20	32	104
UCX10200000B20032104	20,0	20	32	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX1003000CB06007057	3	6	7	57	0,1
UCX1004000CB06008057	4	6	8	57	0,1
UCX1005000CB06010057	5	6	10	57	0,1
UCX1006000CB06010057	6	6	10	57	0,1
UCX1008000CB08016063	8	8	16	63	0,13
UCX1010000CB10019072	10	10	19	72	0,13
UCX1012000CB12022083	12	12	22	83	0,18
UCX1014000CB14022083	14	14	22	83	0,18
UCX1016000CB16026092	16	16	26	92	0,18
UCX1020000CB20032104	20	20	32	104	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX10

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX10030000A03020060	3	3	20	60
UCX10030000A03030075	3	3	30	75
UCX10040000A04020060	4	4	20	60
UCX10040000A04030075	4	4	30	75
UCX10050000A05025075	5	5	25	75
UCX10050000A05040100	5	5	40	100
UCX10060000A06030075	6	6	30	75
UCX10060000A06050150	6	6	50	150
UCX10080000A08030075	8	8	30	75
UCX10080000A08050150	8	8	50	150
UCX10100000A10040100	10	10	40	100
UCX10100000A10060150	10	10	60	150
UCX10120000A12045100	12	12	45	100
UCX10120000A12075150	12	12	75	150
UCX10140000A14045100	14	14	45	100
UCX10140000A14065150	14	14	65	150
UCX10160000A16045100	16	16	45	100
UCX10160000A16065150	16	16	65	150
UCX10180000A18045100	18	18	45	100
UCX10180000A18065150	18	18	65	150
UCX10200000A20045100	20	20	45	100
UCX10200000A20065150	20	20	65	150

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	45	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.004	0.008	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	0.063	0.062	0.063
				rpm obr/min	14324	9549	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	115	153	159	175	259	276	290	318	285	241	215	185	140
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.003	0.007	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	0.059	0.068	0.064
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	74	72	102	139	138	149	148	131	108	94	95	71
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.005	0.008	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	0.119	0.145	0.189
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	191	187	229	210	229	210	251	276	294	298	298	317	331
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.004	0.007	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065	0.073	0.085	0.11
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	357	386	446	462	468	462	492	496	489	483	481	490	490
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.004	0.007	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	0.078	0.085	0.11
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	204	282	334	334	333	334	368	376	368	368	372	372	368
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.004	0.008	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	0.048	0.05	0.05
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	64	85	95	119	159	158	196	179	127	115	98	99	72

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX83

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○														

CODE	DC	DCON	APMX	LU	OAL	DN
UCX83004000A04002050	0,4	4	0,7	2	50	0,37
UCX83004000A04004050	0,4	4	0,7	4	50	0,37
UCX83005000A04002050	0,5	4	0,75	2	50	0,45
UCX83005000A04004050	0,5	4	0,75	4	50	0,45
UCX83005000A04006050	0,5	4	0,75	6	50	0,45
UCX83006000A04002050	0,6	4	0,9	2	50	0,55
UCX83006000A04004050	0,6	4	0,9	4	50	0,55
UCX83006000A04006050	0,6	4	0,9	6	50	0,55
UCX83007000A04004050	0,7	4	1,1	4	50	0,65
UCX83007000A04006050	0,7	4	1,1	6	50	0,65
UCX83008000A04004050	0,8	4	1,2	4	50	0,75
UCX83008000A04006050	0,8	4	1,2	6	50	0,75
UCX83008000A04008050	0,8	4	1,2	8	50	0,75
UCX83009000A04006050	0,9	4	1,4	6	50	0,85
UCX83009000A04008050	0,9	4	1,4	8	50	0,85
UCX83009000A04010050	0,9	4	1,4	10	50	0,85
UCX83010000A04006050	1	4	1,5	6	50	0,95
UCX83010000A04008050	1	4	1,5	8	50	0,95
UCX83010000A04010050	1	4	1,5	10	50	0,95
UCX83010000A04012050	1	4	1,5	12	50	0,95
UCX83012000A04006050	1,2	4	1,8	6	50	1,15
UCX83012000A04008050	1,2	4	1,8	8	50	1,15
UCX83012000A04010050	1,2	4	1,8	10	50	1,15
UCX83012000A04012050	1,2	4	1,8	12	50	1,15
UCX83015000A04006050	1,5	4	2,3	6	50	1,45
UCX83015000A04008050	1,5	4	2,3	8	50	1,45
UCX83015000A04010050	1,5	4	2,3	10	50	1,45
UCX83015000A04012050	1,5	4	2,3	12	50	1,45
UCX83015000A04014050	1,5	4	2,3	14	50	1,45
UCX83015000A04016050	1,5	4	2,3	16	50	1,45
UCX83015000A04018050	1,5	4	2,3	18	50	1,45
UCX83015000A04020050	1,5	4	2,3	20	50	1,45
UCX83020000A04006050	2	4	3	6	50	1,95
UCX83020000A04008050	2	4	3	8	50	1,95
UCX83020000A04010050	2	4	3	10	50	1,95
UCX83020000A04012050	2	4	3	12	50	1,95

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX83

2 Finish Medium

HSM Vmax A min AIR

ISO	P											M			K							N												S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21													15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100				200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○														

CODE	DC	DCON	APMX	LU	OAL	DN
UCX83020000A04014050	2	4	3	14	50	1,95
UCX83020000A04016050	2	4	3	16	50	1,95
UCX83020000A04018050	2	4	3	18	50	1,95
UCX83020000A04020050	2	4	3	20	50	1,95
UCX83025000A04008050	2,5	4	3,7	8	50	2,4
UCX83025000A04012050	2,5	4	3,7	12	50	2,4
UCX83025000A04016050	2,5	4	3,7	16	50	2,4
UCX83025000A04020050	2,5	4	3,7	20	50	2,4
UCX83030000A06008050	3	6	4,5	8	50	2,85
UCX83030000A06012050	3	6	4,5	12	50	2,85
UCX83030000A06016060	3	6	4,5	16	60	2,85
UCX83030000A06020060	3	6	4,5	20	60	2,85
UCX83030000A06025075	3	6	4,5	25	75	2,85
UCX83040000A06012050	4	6	6	12	50	3,85
UCX83040000A06016060	4	6	6	16	60	3,85
UCX83040000A06020075	4	6	6	20	75	3,85
UCX83040000A06025075	4	6	6	25	75	3,85
UCX83040000A06030075	4	6	6	30	75	3,85
UCX83040000A06035075	4	6	6	35	75	3,85

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX83

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	DC	0.4	0.5	0.6	0.7	0.8	0.9	1.0
P	1-4	1.0D	Vc m/min	33~43	42~53	50~64	58~75	58~75	61~76	60~75
			fz mm/tooth	0.003~0.005	0.003~0.005	0.004~0.007	0.004~0.007	0.005~0.009	0.006~0.011	0.006~0.014
			rpm obr/min	26500~34000	26500~34000	26500~34000	26500~34000	23000~30000	21500~27000	19000~24000
			feed posuw mm/min	170~370	170~370	210~485	210~485	240~535	240~610	240~690
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090
	5	1.0D	Vc m/min	24~30	30~38	36~45	42~53	41~53	42~54	42~53
			fz mm/tooth	0.002~0.006	0.002~0.006	0.003~0.008	0.003~0.008	0.003~0.010	0.005~0.012	0.006~0.015
			rpm obr/min	19000~24000	19000~24000	19000~24000	19000~24000	16500~21000	15000~19000	13500~17000
			feed posuw mm/min	72~290	72~290	95~365	95~365	100~410	135~460	160~510
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090
	6-7	1.0D	Vc m/min	33~43	42~53	50~64	58~75	58~75	61~76	60~75
			fz mm/tooth	0.003~0.005	0.003~0.005	0.004~0.007	0.004~0.007	0.005~0.009	0.006~0.011	0.006~0.014
			rpm obr/min	26500~34000	26500~34000	26500~34000	26500~34000	23000~30000	21500~27000	19000~24000
			feed posuw mm/min	170~370	170~370	210~485	210~485	240~535	240~610	240~690
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090
	8-9	1.0D	Vc m/min	24~30	30~38	36~45	42~53	41~53	42~54	42~53
			fz mm/tooth	0.002~0.006	0.002~0.006	0.003~0.008	0.003~0.008	0.003~0.010	0.005~0.012	0.006~0.015
			rpm obr/min	19000~24000	19000~24000	19000~24000	19000~24000	16500~21000	15000~19000	13500~17000
			feed posuw mm/min	72~290	72~290	95~365	95~365	100~410	135~460	160~510
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090
	10	1.0D	Vc m/min	33~43	42~53	50~64	58~75	58~75	61~76	60~75
			fz mm/tooth	0.003~0.005	0.003~0.005	0.004~0.007	0.004~0.007	0.005~0.009	0.006~0.011	0.006~0.014
			rpm obr/min	26500~34000	26500~34000	26500~34000	26500~34000	23000~30000	21500~27000	19000~24000
			feed posuw mm/min	170~370	170~370	210~485	210~485	240~535	240~610	240~690
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090
	11.1 - 11.2	1.0D	Vc m/min	24~30	30~38	36~45	42~53	41~53	42~54	42~53
			fz mm/tooth	0.002~0.006	0.002~0.006	0.003~0.008	0.003~0.008	0.003~0.010	0.005~0.012	0.006~0.015
			rpm obr/min	19000~24000	19000~24000	19000~24000	19000~24000	16500~21000	15000~19000	13500~17000
			feed posuw mm/min	72~290	72~290	95~365	95~365	100~410	135~460	160~510
			Ap mm	0.007~0.018	0.009~0.022	0.011~0.026	0.012~0.031	0.014~0.035	0.030~0.060	0.045~0.090

ISO	VDI 3323	Ae mm	DC	1.2	1.4	1.5	1.6	1.8	2.0	2.5	3.0	4.0
P	1-4	1.0D	Vc m/min	58~72	60~75	59~73	60~75	62~79	63~79	63~79	64~80	64~82
			fz mm/tooth	0.008~0.020	0.009~0.023	0.010~0.025	0.010~0.026	0.011~0.027	0.012~0.031	0.015~0.038	0.018~0.045	0.024~0.059
			rpm obr/min	15500~19000	13600~17000	12500~15500	12000~15000	11000~14000	10000~12500	8000~10000	6800~8500	5100~6500
			feed posuw mm/min	240~765	240~765	240~765	240~765	240~765	240~765	240~765	240~765	240~765
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360
	5	1.0D	Vc m/min	41~53	43~53	42~54	44~55	44~55	44~56	45~57	44~57	44~57
			fz mm/tooth	0.007~0.018	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026	0.011~0.028	0.014~0.035	0.017~0.043	0.023~0.057
			rpm obr/min	11000~14000	9800~12000	8950~11500	8700~10900	7800~9800	7000~8950	5700~7200	4700~6000	3500~4500
			feed posuw mm/min	160~510	160~510	160~510	160~510	160~510	160~510	160~510	160~510	160~510
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360
	6-7	1.0D	Vc m/min	58~72	60~75	59~73	60~75	62~79	63~79	63~79	64~80	64~82
			fz mm/tooth	0.008~0.020	0.009~0.023	0.010~0.025	0.010~0.026	0.011~0.027	0.012~0.031	0.015~0.038	0.018~0.045	0.024~0.059
			rpm obr/min	15500~19000	13600~17000	12500~15500	12000~15000	11000~14000	10000~12500	8000~10000	6800~8500	5100~6500
			feed posuw mm/min	240~765	240~765	240~765	240~765	240~765	240~765	240~765	240~765	240~765
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360
	8-9	1.0D	Vc m/min	41~53	43~53	42~54	44~55	44~55	44~56	45~57	44~57	44~57
			fz mm/tooth	0.007~0.018	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026	0.011~0.028	0.014~0.035	0.017~0.043	0.023~0.057
			rpm obr/min	11000~14000	9800~12000	8950~11500	8700~10900	7800~9800	7000~8950	5700~7200	4700~6000	3500~4500
			feed posuw mm/min	160~510	160~510	160~510	160~510	160~510	160~510	160~510	160~510	160~510
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360
	10	1.0D	Vc m/min	58~72	60~75	59~73	60~75	62~79	63~79	63~79	64~80	64~82
			fz mm/tooth	0.008~0.020	0.009~0.023	0.010~0.025	0.010~0.026	0.011~0.027	0.012~0.031	0.015~0.038	0.018~0.045	0.024~0.059
			rpm obr/min	15500~19000	13600~17000	12500~15500	12000~15000	11000~14000	10000~12500	8000~10000	6800~8500	5100~6500
			feed posuw mm/min	240~765	240~765	240~765	240~765	240~765	240~765	240~765	240~765	240~765
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360
	11.1 - 11.2	1.0D	Vc m/min	41~53	43~53	42~54	44~55	44~55	44~56	45~57	44~57	44~57
			fz mm/tooth	0.007~0.018	0.008~0.021	0.009~0.022	0.009~0.023	0.010~0.026	0.011~0.028	0.014~0.035	0.017~0.043	0.023~0.057
			rpm obr/min	11000~14000	9800~12000	8950~11500	8700~10900	7800~9800	7000~8950	5700~7200	4700~6000	3500~4500
			feed posuw mm/min	160~510	160~510	160~510	160~510	160~510	160~510	160~510	160~510	160~510
			Ap mm	0.055~0.100	0.062~0.125	0.070~0.135	0.075~0.145	0.080~0.160	0.090~0.180	0.112~0.235	0.135~0.270	0.180~0.360

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

PLAIN	FLAT	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX95005000A03002038	-	0,5	3	1,5	38
UCX95006000A03002038	-	0,6	3	1,5	38
UCX95008000A03002038	-	0,8	3	2	38
UCX95010000A03002038	-	1	3	2	38
UCX95012000A03002038	-	1,2	3	2	38
UCX95015000A03002038	-	1,5	3	2	38
UCX95018000A03002038	-	1,8	3	2	38
-	UCX95020000B06004035	2	6	4	35
-	UCX95025000B06005036	2,5	6	5	36
-	UCX95030000B06005036	3	6	5	36
-	UCX95035000B06006037	3,5	6	6	37
-	UCX95040000B06007038	4	6	7	38
-	UCX95045000B06008038	4,5	6	8	38
-	UCX95050000B06008039	5	6	8	39
-	UCX95055000B06008039	5,5	6	8	39
-	UCX95058000B06008039	5,8	6	8	39
-	UCX95060000B06008039	6	6	8	39
-	UCX95068000B08010042	6,8	8	10	42
-	UCX95070000B08010042	7	8	10	42
-	UCX95078000B08010042	7,8	8	10	42
-	UCX95080000B08011043	8	8	11	43
-	UCX95087000B10011048	8,7	10	11	48
-	UCX95090000B10011048	9	10	11	48
-	UCX95097000B10011048	9,7	10	11	48
-	UCX95100000B10013050	10	10	13	50
-	UCX95120000B12015055	12	12	15	55
-	UCX95140000B14015058	14	14	15	58
-	UCX95160000B16018062	16	16	18	62
-	UCX95180000B18020070	18	18	20	70
-	UCX95200000B20022075	20	20	22	75

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX9503000CB06005036	3	6	5	36	0,1
UCX9504000CB06007038	4	6	7	38	0,1
UCX9505000CB06008039	5	6	8	39	0,1
UCX9506000CB06008039	6	6	8	39	0,1
UCX9508000CB08011043	8	8	11	43	0,13
UCX9510000CB10013050	10	10	13	50	0,13
UCX9512000CB12015055	12	12	15	55	0,18
UCX9514000CB14015058	14	14	15	58	0,18
UCX9516000CB16018062	16	16	18	62	0,18
UCX9520000CB20022075	20	20	22	75	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX95010000A04003040	1	4	3	40
UCX95015000A04005040	1,5	4	4,5	40
UCX95020000A02008032	2	2	8	32
UCX95025000A02508032	2,5	3	8	32
UCX95030000A03012032	3	3	12	32
UCX95035000A03512032	3,5	4	12	32
UCX95040000A04012040	4	4	12	40
UCX95045000A04514050	4,5	5	14	50
UCX95050000A05014050	5	5	14	50
UCX95055000A05516050	5,5	6	16	50
UCX95060000A06016050	6	6	16	50
UCX95070000A07020060	7	7	20	60
UCX95080000A08020060	8	8	20	60
UCX95090000A09020060	9	9	20	60
UCX95100000A10022070	10	10	22	70
UCX95120000A12022070	12	12	22	70
UCX95140000A14025075	14	14	25	75
UCX95160000A16025075	16	16	25	75
UCX95200000A20032100	20	20	32	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX9503000CA03012032	3	3	12	32	0,1
UCX9504000CA04012040	4	4	12	40	0,1
UCX9505000CA05014050	5	5	14	50	0,1
UCX9506000CA06016050	6	6	16	50	0,1
UCX9508000CA08020060	8	8	20	60	0,13
UCX9510000CA10022070	10	10	22	70	0,13
UCX9512000CA12022070	12	12	22	70	0,18
UCX9514000CA14025075	14	14	25	75	0,18
UCX9516000CA16025075	16	16	25	75	0,18
UCX9520000CA20032100	20	20	32	100	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX95020000B06003050	2	6	3	50
UCX95030000B06004050	3	6	4	50
UCX95035000B06004050	3,5	6	4	50
UCX95040000B06005054	4	6	5	54
UCX95045000B06005054	4,5	6	5	54
UCX95050000B06006054	5	6	6	54
UCX95060000B06007054	6	6	7	54
UCX95070000B08008058	7	8	8	58
UCX95080000B08009058	8	8	9	58
UCX95090000B10010066	9	10	10	66
UCX95100000B10011066	10	10	11	66
UCX95120000B12012073	12	12	12	73
UCX95140000B14014075	14	14	14	75
UCX95160000B16016082	16	16	16	82
UCX95180000B18018084	18	18	18	84
UCX95200000B20020092	20	20	20	92

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX95035000A03507050	3,5	3,5	7	50
UCX95040000A04008050	4	4	8	50
UCX95045000A04508050	4,5	4,5	8	50
UCX95050000A05010050	5	5	10	50
UCX95055000A05510057	5,5	5,5	10	57
UCX95060000A06010057	6	6	10	57
UCX95065000A06513060	6,5	6,5	13	60
UCX95070000A07013060	7	7	13	60
UCX95075000A07516063	7,5	7,5	16	63
UCX95080000A08016063	8	8	16	63
UCX95085000A08516067	8,5	8,5	16	67
UCX95090000A09016067	9	9	16	67
UCX95095000A09519072	9,5	9,5	19	72
UCX95100000A10019072	10	10	19	72
UCX95110000A11022083	11	11	22	83
UCX95120000A12022083	12	12	22	83
UCX95130000A13022083	13	13	22	83
UCX95140000A14022083	14	14	22	83
UCX95150000A15026092	15	15	26	92
UCX95160000A16026092	16	16	26	92
UCX95180000A18026092	18	18	26	92
UCX95200000A20032104	20	20	32	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P											M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX95030000B06007057	3	6	7	57
UCX95040000B06008057	4	6	8	57
UCX95050000B06010057	5	6	10	57
UCX95060000B06010057	6	6	10	57
UCX95080000B08016063	8	8	16	63
UCX95090000B10016072	9	10	16	72
UCX95100000B10019072	10	10	19	72
UCX95120000B12022083	12	12	22	83
UCX95140000B14022083	14	14	22	83
UCX95160000B16026092	16	16	26	92
UCX95180000B18026092	18	18	26	92
UCX95200000B20032104	20	20	32	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX9503000CB06007057	3	6	7	57	0,1
UCX9504000CB06008057	4	6	8	57	0,1
UCX9505000CB06010057	5	6	10	57	0,1
UCX9506000CB06010057	6	6	10	57	0,1
UCX9508000CB08016063	8	8	16	63	0,13
UCX9510000CB10019072	10	10	19	72	0,13
UCX9512000CB12022083	12	12	22	83	0,18
UCX9514000CB14022083	14	14	22	83	0,18
UCX9516000CB16026092	16	16	26	92	0,18
UCX9520000CB20032104	20	20	32	104	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX96

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX96030000B06007057	3	6	7	57
UCX96035000B06007057	3,5	6	7	57
UCX96040000B06008057	4	6	8	57
UCX96045000B06008057	4,5	6	8	57
UCX96050000B06010057	5	6	10	57
UCX96060000B06010057	6	6	10	57
UCX96070000B08013063	7	8	13	63
UCX96080000B08016063	8	8	16	63
UCX96090000B10016072	9	10	16	72
UCX96100000B10019072	10	10	19	72
UCX96120000B12022083	12	12	22	83
UCX96140000B14022083	14	14	22	83
UCX96160000B16026092	16	16	26	92
UCX96180000B18026092	18	18	26	92
UCX96200000B20032104	20	20	32	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX96

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX96

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX96

3 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX9603000CB06007057	3	6	7	57	0,1
UCX9604000CB06008057	4	6	8	57	0,1
UCX9605000CB06010057	5	6	10	57	0,1
UCX9606000CB06010057	6	6	10	57	0,1
UCX9608000CB08016063	8	8	16	63	0,13
UCX9610000CB10019072	10	10	19	72	0,13
UCX9612000CB12022083	12	12	22	83	0,18
UCX9614000CB14022083	14	14	22	83	0,18
UCX9616000CB16026092	16	16	26	92	0,18
UCX9620000CB20032104	20	20	32	104	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX96

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	5	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	6-7	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	8-9	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
	10	1.0D	0.5D (up to 3:0.2)	Vc m/min	45	60	50	55	65	70	70	70	70	70	75	75	70
				fz mm/tooth	0.002	0.003	0.005	0.007	0.012	0.015	0.018	0.027	0.03	0.031	0.029	0.029	0.029
				rpm obr/min	14324	12732	7958	5836	5173	4456	3714	2785	2228	1857	1705	1492	1114
				feed posuw mm/min	86	115	119	123	186	201	201	226	201	173	148	130	97
	11.1 - 11.2	1.0D	0.5D (up to 3:0.2)	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52
M	14.1	1.0D	0.5D (up to 3:0.2)	Vc m/min	20	25	25	30	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.003	0.004	0.007	0.011	0.015	0.019	0.025	0.028	0.026	0.027	0.031	0.03
				rpm obr/min	6366	5305	3979	3183	2785	2228	1857	1393	1114	928	796	696	557
				feed posuw mm/min	38	48	48	67	92	100	106	104	94	72	64	65	50
K	15-20	1.0D	1.0D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.003	0.005	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.073	0.086	0.115
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	172	175	201	193	186	189	228	236	264	276	274	282	302
N	21-22	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	23-25	1.0D	1.0D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.002	0.004	0.006	0.009	0.013	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.065
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	267	331	401	415	434	415	438	450	443	423	425	433	434
	26-28	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
	29.1	1.0D	1.0D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.002	0.004	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.039	0.046	0.05	0.065
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	153	242	301	301	315	301	334	328	321	326	329	328	326
H	40	1.0D	1.0D	Vc m/min	25	25	30	35	40	40	45	45	40	45	45	50	45
				fz mm/tooth	0.002	0.004	0.005	0.007	0.012	0.014	0.02	0.024	0.023	0.022	0.022	0.023	0.024
				rpm obr/min	7958	5305	4775	3714	3183	2546	2387	1790	1273	1194	1023	995	716
				feed posuw mm/min	48	64	72	78	115	107	143	129	88	79	68	69	52

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX96

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	105	175	172	201	363	390	430	451	381	337	289	272	202
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	45	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.03	0.042	0.045	0.045	0.044	0.048	0.048
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	895	716
				feed posuw mm/min	48	89	100	100	172	183	215	226	193	161	135	129	103
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.064	0.093	0.115	0.154	0.181	0.22	0.285
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	458	455	487	455	501	462	560	611	659	674	679	722	748
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.01	0.016	0.021	0.031	0.037	0.048	0.064	0.08	0.098	0.111	0.129	0.167
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	802	828	1070	969	1036	1025	1108	1108	1108	1092	1098	1116	1116
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.023	0.029	0.037	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	458	665	802	769	762	742	802	827	812	802	824	821	812
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.037
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	57	89	115	129	227	229	271	249	200	162	139	136	97

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX11

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX11010000A04003040	1	4	3	40
UCX11015000A04005040	1,5	4	4,5	40
UCX11020000A02008032	2	2	8	32
UCX11025000A02508032	2,5	2,5	8	32
UCX11030000A03012032	3	3	12	32
UCX11035000A03512032	3,5	3,5	12	32
UCX11040000A04012040	4	4	12	40
UCX11045000A04514050	4,5	4,5	14	50
UCX11050000A05014050	5	5	14	50
UCX11055000A05516050	5,5	5,5	16	50
UCX11060000A06016050	6	6	16	50
UCX11070000A07020060	7	7	20	60
UCX11080000A08020060	8	8	20	60
UCX11090000A09020060	9	9	20	60
UCX1110000A10022070	10	10	22	70
UCX11120000A12022070	12	12	22	70
UCX11140000A14025075	14	14	25	75
UCX11160000A16025075	16	16	25	75
UCX11200000A20032100	20	20	32	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	50	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	0.045	0.045	0.046
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	995	716
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215	184	179	132
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	0.182	0.22	0.288
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905	910	963	1008
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX11

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX1103000CA03012032	3	3	12	32	0,1
UCX1104000CA04012040	4	4	12	40	0,1
UCX1105000CA05014050	5	5	14	50	0,1
UCX1106000CA06016050	6	6	16	50	0,1
UCX1108000CA08020060	8	8	20	60	0,13
UCX111000CA10022070	10	10	22	70	0,13
UCX1112000CA12022070	12	12	22	70	0,18
UCX1114000CA14025075	14	14	25	75	0,18
UCX1116000CA16025075	16	16	25	75	0,18
UCX1120000CA20032100	20	20	32	100	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	50	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	0.045	0.045	0.046
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	995	716
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215	184	179	132
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	0.182	0.22	0.288
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905	910	963	1008
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX11

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX11010000A03003039	1	3	3	39
UCX11015000A03005039	1,5	3	5	39
UCX11020000A03007039	2	3	7	39
UCX11025000A03007039	2,5	3	7	39
UCX11030000A03009039	3	3	10	39
UCX11040000A04014051	4	4	14	51
UCX11050000A05016051	5	5	16	51
UCX11060000A06019064	6	6	19	64
UCX11080000A08021064	8	8	21	64
UCX11100000A10022070	10	10	22	70
UCX11120000A12025076	12	12	25	76
UCX11160000A16032089	16	16	32	89
UCX11200000A20038102	20	20	38	102

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	50	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	0.045	0.045	0.046
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	995	716
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215	184	179	132
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	0.182	0.22	0.288
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905	910	963	1008
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX11

4 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UCX11

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX11035000A03510050	3,5	3,5	10	50
UCX11040000A04011050	4	4	11	50
UCX11045000A04511050	4,5	4,5	11	50
UCX11050000A05013050	5	5	13	50
UCX11055000A05513057	5,5	5,5	13	57
UCX11060000A06013057	6	6	13	57
UCX11065000A06516060	6,5	6,5	16	60
UCX11070000A07016060	7	7	16	60
UCX11075000A07519063	7,5	7,5	19	63
UCX11080000A08019063	8	8	19	63
UCX11085000A08519067	8,5	8,5	19	67
UCX11090000A09019067	9	9	19	67
UCX11095000A09522072	9,5	9,5	22	72
UCX11100000A10022072	10	10	22	72
UCX11110000A11026083	11	11	26	83
UCX11120000A12026083	12	12	26	83
UCX11130000A13026083	13	13	26	83
UCX11140000A14026083	14	14	26	83
UCX11150000A15032092	15	15	32	92
UCX11160000A16032092	16	16	32	92
UCX11180000A18032092	18	18	32	92
UCX11200000A20038104	20	20	38	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	50	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	0.045	0.045	0.046
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	995	716
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215	184	179	132
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	0.182	0.22	0.288
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905	910	963	1008
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX11

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX11020000A03007038	2	3 (WITH PLAIN SHANK)	7	38
UCX11030000B06008057	3	6	8	57
UCX11035000B06010057	3,5	6	10	57
UCX11040000B06011057	4	6	11	57
UCX11045000B06011057	4,5	6	11	57
UCX11050000B06013057	5	6	13	57
UCX11060000B06013057	6	6	13	57
UCX11070000B08016063	7	8	16	63
UCX11080000B08019063	8	8	19	63
UCX11090000B10019072	9	10	19	72
UCX11100000B10022072	10	10	22	72
UCX11120000B12026083	12	12	26	83
UCX11140000B14026083	14	14	26	83
UCX11160000B16032092	16	16	32	92
UCX11180000B18032092	18	18	32	92
UCX11200000B20038104	20	20	38	104

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	50	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	0.045	0.045	0.046
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	995	716
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215	184	179	132
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	0.182	0.22	0.288
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905	910	963	1008
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX11

4 Finish Medium

HSM Vmax A min AIR

ISO																																																
	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
UCX1103000CB06008057	3	6	8	57	0,1
UCX1104000CB06011057	4	6	11	57	0,1
UCX1105000CB06013057	5	6	13	57	0,1
UCX1106000CB06013057	6	6	13	57	0,1
UCX1108000CB08019063	8	8	19	63	0,13
UCX1110000CB10022072	10	10	22	72	0,13
UCX1112000CB12026083	12	12	26	83	0,18
UCX1114000CB14026083	14	14	26	83	0,18
UCX1116000CB16032092	16	16	32	92	0,18
UCX1120000CB20038104	20	20	38	104	0,23

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	50	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	0.045	0.045	0.046
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	995	716
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215	184	179	132
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	0.182	0.22	0.288
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905	910	963	1008
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX11

4 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX11030000A03020060	3	3	20	60
UCX11030000A03030075	3	3	30	75
UCX11040000A04020060	4	4	20	60
UCX11040000A04030075	4	4	30	75
UCX11050000A05025075	5	5	25	75
UCX11050000A05040100	5	5	40	100
UCX11060000A06030075	6	6	30	75
UCX11060000A06050150	6	6	50	150
UCX11080000A08030075	8	8	30	75
UCX11080000A08050150	8	8	50	150
UCX11100000A10040100	10	10	40	100
UCX11100000A10060150	10	10	60	150
UCX11120000A12045100	12	12	45	100
UCX11120000A12075150	12	12	75	150
UCX11140000A14045100	14	14	45	100
UCX11160000A16045100	16	16	45	100
UCX11160000A16065150	16	16	65	150
UCX11180000A18045100	18	18	45	100
UCX11200000A20045100	20	20	45	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

UCX11

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-4	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	5	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	6-7	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	8-9	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
	10	0.1D	1.0D	Vc m/min	55	55	60	70	80	85	90	90	85	90	90	95	90
				fz mm/tooth	0.002	0.005	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	0.047	0.047	0.047
				rpm obr/min	17507	11671	9549	7427	6366	5411	4775	3581	2706	2387	2046	1890	1432
				feed posuw mm/min	140	233	229	267	484	519	554	616	509	449	385	355	269
	11.1 - 11.2	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133
M	14.1	0.1D	1.0D	Vc m/min	25	35	35	35	40	40	45	45	45	45	45	50	45
				fz mm/tooth	0.002	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	0.045	0.045	0.046
				rpm obr/min	7958	7427	5570	3714	3183	2546	2387	1790	1432	1194	1023	995	716
				feed posuw mm/min	64	119	134	134	229	244	277	301	252	215	184	179	132
K	15-20	0.1D	1.5D	Vc m/min	60	55	60	55	60	55	55	55	60	55	55	55	55
				fz mm/tooth	0.008	0.013	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	0.182	0.22	0.288
				rpm obr/min	19099	11671	9549	5836	4775	3501	2918	2188	1910	1459	1251	1094	875
				feed posuw mm/min	611	607	649	607	668	616	759	814	886	905	910	963	1008
N	21-22	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	23-25	0.1D	1.5D	Vc m/min	140	130	140	145	140	145	145	145	145	140	145	145	140
				fz mm/tooth	0.006	0.011	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095	0.108	0.125	0.163
				rpm obr/min	44563	27587	22282	15385	11141	9231	7692	5769	4615	3714	3297	2885	2228
				feed posuw mm/min	1070	1214	1337	1292	1337	1329	1446	1454	1440	1411	1424	1442	1453
	26-28	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
	29.1	0.1D	1.5D	Vc m/min	80	95	105	105	110	105	105	110	105	105	105	110	105
				fz mm/tooth	0.006	0.011	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	0.115	0.125	0.162
				rpm obr/min	25465	20160	16711	11141	8754	6685	5570	4377	3342	2785	2387	2188	1671
				feed posuw mm/min	611	887	1070	1070	1015	1016	1070	1103	1083	1070	1098	1094	1083
H	40	0.1D	1.0D	Vc m/min	30	35	40	45	50	50	55	55	55	55	55	60	55
				fz mm/tooth	0.002	0.004	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.038	0.037	0.038
				rpm obr/min	9549	7427	6366	4775	3979	3183	2918	2188	1751	1459	1251	1194	875
				feed posuw mm/min	76	119	153	172	302	306	362	333	266	216	190	177	133

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX32

4-6 Finish Medium

HSM Vmax A min AIR

| ISO | | |

UCX14

3-5 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○			○	

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
UCX14060000B06016057	6	6	16	57	3	0,6
UCX14080000B08016063	8	8	16	63	3	0,6
UCX14100000B10022072	10	10	22	72	4	0,6
UCX14120000B12026083	12	12	26	83	4	0,74
UCX14140000B14026083	14	14	26	83	4	0,94
UCX14160000B16032092	16	16	32	92	4	0,94
UCX14180000B18032092	18	18	32	92	4	0,94
UCX14200000B20038104	20	20	38	104	4	0,94
UCX14250000B25045121	25	25	45	121	5	0,94

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM				
	1-3	3-6	6-10	10-18	18-30
h10	0	0	0	0	0
	-40	-48	-58	-70	-84
h5	0	0	0	0	0
	-4	-5	-6	-8	-9

UCX14

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SIDE CUTTING / FREZ O WIELU ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	0.3D	1.5D	Vc m/min	250	250	245	255	255	255	250	260	285
				fz mm/tooth	0.05	0.067	0.063	0.075	0.088	0.1	0.112	0.112	0.1
				rpm obr/min	13263	9947	7799	6764	5798	5073	4421	4138	3629
				feed posuw mm/min	1989	1999	1965	2029	2041	2029	1981	1854	1814
	5	0.3D	1.5D	Vc m/min	200	195	205	190	195	205	210	190	210
				fz mm/tooth	0.022	0.023	0.028	0.033	0.04	0.04	0.041	0.039	0.039
				rpm obr/min	10610	7759	6525	5040	4434	4078	3714	3024	2674
				feed posuw mm/min	700	535	731	665	709	653	609	472	521
	6-7	0.3D	1.5D	Vc m/min	250	250	245	255	255	255	250	260	285
				fz mm/tooth	0.05	0.067	0.063	0.075	0.088	0.1	0.112	0.112	0.1
				rpm obr/min	13263	9947	7799	6764	5798	5073	4421	4138	3629
				feed posuw mm/min	1989	1999	1965	2029	2041	2029	1981	1854	1814
	8-9	0.3D	1.5D	Vc m/min	200	195	205	190	195	205	210	190	210
				fz mm/tooth	0.022	0.023	0.028	0.033	0.04	0.04	0.041	0.039	0.039
				rpm obr/min	10610	7759	6525	5040	4434	4078	3714	3024	2674
				feed posuw mm/min	700	535	731	665	709	653	609	472	521
	10	0.3D	1.5D	Vc m/min	250	250	245	255	255	255	250	260	285
				fz mm/tooth	0.05	0.067	0.063	0.075	0.088	0.1	0.112	0.112	0.1
				rpm obr/min	13263	9947	7799	6764	5798	5073	4421	4138	3629
				feed posuw mm/min	1989	1999	1965	2029	2041	2029	1981	1854	1814
	11.1 - 11.2	0.3D	1.5D	Vc m/min	200	195	205	190	195	205	210	190	210
				fz mm/tooth	0.022	0.023	0.028	0.033	0.04	0.04	0.041	0.039	0.039
				rpm obr/min	10610	7759	6525	5040	4434	4078	3714	3024	2674
				feed posuw mm/min	700	535	731	665	709	653	609	472	521
M	14.1	0.05D	1.0D	Vc m/min	135	135	135	135	135	140	130	130	145
				fz mm/tooth	0.022	0.022	0.028	0.034	0.039	0.038	0.039	0.038	0.038
				rpm obr/min	7162	5371	4297	3581	3069	2785	2299	2069	1846
				feed posuw mm/min	473	355	481	487	479	423	359	314	351
S	31-35	0.05D	1.0D	Vc m/min	40	40	35	40	35	35	35	35	40
				fz mm/tooth	0.026	0.024	0.036	0.04	0.037	0.032	0.038	0.041	0.06
				rpm obr/min	2122	1592	1114	1061	796	696	619	557	509
				feed posuw mm/min	166	115	160	170	118	89	94	91	153
H	40	0.3D	1.5D	Vc m/min	200	195	205	190	195	205	210	190	210
				fz mm/tooth	0.022	0.023	0.028	0.033	0.04	0.04	0.041	0.039	0.039
				rpm obr/min	10610	7759	6525	5040	4434	4078	3714	3024	2674
				feed posuw mm/min	700	535	731	665	709	653	609	472	521

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

UCX34

2 Finish Medium

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○																

CODE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
UCX34030000A04006050	3	4	6	50
UCX34040000A05008050	4	5	8	50
UCX34050000A06010050	5	6	10	50
UCX34060000A08012060	6	8	12	60
UCX34080000A10016070	8	10	16	70
UCX34100000A12018070	10	12	18	70
UCX34120000A12020070	12	12	20	70
UCX34140000A14024080	14	14	24	80
UCX34160000A16026080	16	16	26	80
UCX34200000A20032100	20	20	32	100

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
3-10: h9 12-20: d9	h5

UCX34

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE DRILL MILLS CHAMFERING / FREZ O 2 ZĘBACH FAZOWANIE

ISO	VDI 3323	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-2	Vc m/min	60	65	65	60	60	65	70	70	85
		fz mm/tooth	0.025	0.031	0.04	0.052	0.071	0.083	0.1	0.125	0.137
		rpm obr/min	6366	5173	4138	3183	2387	2069	1857	1393	1353
		feed posuw mm/min	318	321	331	331	339	343	371	348	371
	3-4	Vc m/min	45	55	55	55	55	55	60	65	65
		fz mm/tooth	0.023	0.027	0.036	0.043	0.058	0.073	0.091	0.105	0.14
		rpm obr/min	4775	4377	3501	2918	2188	1751	1592	1293	1035
		feed posuw mm/min	220	236	252	251	254	256	290	272	290
	5	Vc m/min	40	45	45	40	40	50	50	50	55
		fz mm/tooth	0.023	0.028	0.035	0.044	0.06	0.066	0.083	0.115	0.134
		rpm obr/min	4244	3581	2865	2122	1592	1592	1326	995	875
		feed posuw mm/min	195	201	201	187	191	210	220	229	235
	6	Vc m/min	60	65	65	60	60	65	70	70	85
		fz mm/tooth	0.025	0.031	0.04	0.052	0.071	0.083	0.1	0.125	0.137
		rpm obr/min	6366	5173	4138	3183	2387	2069	1857	1393	1353
		feed posuw mm/min	318	321	331	331	339	343	371	348	371
	7	Vc m/min	45	55	55	55	55	55	60	65	65
		fz mm/tooth	0.023	0.027	0.036	0.043	0.058	0.073	0.091	0.105	0.14
		rpm obr/min	4775	4377	3501	2918	2188	1751	1592	1293	1035
		feed posuw mm/min	220	236	252	251	254	256	290	272	290
	8-9	Vc m/min	40	45	45	40	40	50	50	50	55
		fz mm/tooth	0.023	0.028	0.035	0.044	0.06	0.066	0.083	0.115	0.134
		rpm obr/min	4244	3581	2865	2122	1592	1592	1326	995	875
		feed posuw mm/min	195	201	201	187	191	210	220	229	235
	10	Vc m/min	60	65	65	60	60	65	70	70	85
		fz mm/tooth	0.025	0.031	0.04	0.052	0.071	0.083	0.1	0.125	0.137
		rpm obr/min	6366	5173	4138	3183	2387	2069	1857	1393	1353
		feed posuw mm/min	318	321	331	331	339	343	371	348	371
	11.1 - 11.2	Vc m/min	40	45	45	40	40	50	50	50	55
		fz mm/tooth	0.023	0.028	0.035	0.044	0.06	0.066	0.083	0.115	0.134
		rpm obr/min	4244	3581	2865	2122	1592	1592	1326	995	875
		feed posuw mm/min	195	201	201	187	191	210	220	229	235
M	14.1	Vc m/min	30	35	40	35	35	40	40	40	45
		fz mm/tooth	0.021	0.025	0.029	0.037	0.055	0.064	0.078	0.11	0.122
		rpm obr/min	3183	2785	2546	1857	1393	1273	1061	796	716
		feed posuw mm/min	134	139	148	137	153	163	166	175	175
N	21-22	Vc m/min	145	160	150	150	155	175	185	195	195
		fz mm/tooth	0.025	0.032	0.045	0.057	0.075	0.085	0.1	0.134	0.175
		rpm obr/min	15385	12732	9549	7958	6167	5570	4907	3879	3104
		feed posuw mm/min	769	815	859	907	925	947	981	1040	1086
	23-25	Vc m/min	145	160	150	150	155	175	185	195	195
		fz mm/tooth	0.025	0.032	0.045	0.057	0.075	0.085	0.1	0.134	0.175
		rpm obr/min	15385	12732	9549	7958	6167	5570	4907	3879	3104
		feed posuw mm/min	769	815	859	907	925	947	981	1040	1086

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

P M K N S H

POWDER END MILLS PMT for high productivity on conventional milling machines for materials up to 40 HRC.

FREZY PROSZKOWE PMT przeznaczone są do wysokowydajnej obróbki materiałów >40 HRC na obrabiarkach konwencjonalnych.

POWDER END MILLS
FREZY PROSZKOWE

POWDER METAL END MILLS PMT for high productivity on conventional milling machines for materials up to HRC40.

FREZY WALCOWO-CZOŁOWE PMT proszkowe do wysokowydajnej obróbki materiałów do 40 HRC na obrabiarkach konwencjonalnych.

- PM-T END MILLS are #1 choice power milling!! High productivity!! For conventional milling machine.
- Frezy walcowo-czołowe PMT są podstawowym wyborem dla wydajnego frezowania!! Wysoka wydajność!! Do stosowania na obrabiarkach konwencjonalnych.

Group					ISO	PAGE
PMT50			2		P M K N S H	519
PMT51			2		P M K N S H	521
PMT64			3		P M K N S H	523
PMT52			4		P M K N S H	526
PMT53			4		P M K N S H	528
PMT54			4		P M K N S H	531
PMT55		R	4-5		P M K N S H	533
PMT56			3-5		P M K N S H	535
PMT58			3-5		P M K N S H	539
PMT60			2		P M K N S H	541
PMT62			2		P M K N S H	544
PMT66			2		P M K N S H	547
PMT69			2		P M K N S H	550
PMT82			3		P M K N S H	553
PMT84			3		P M K N S H	558
PMT88			4		P M K N S H	563
PMT61			4		P M K N S H	566
PMT81			3-5		P M K N S H	569
PMT85			3-5		P M K N S H	572
PMT26			3-6		P M K N S H	575

Group					ISO	PAGE
PMT83			3-5		P M K N S H	578
PMT74			3-5		P M K N S H	581
PMT77			4-5		P M K N S H	584

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

PMT50

2 Medium Rough

HSM Vmax A B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

PLAIN	FLAT	RE	DC	DCON	APMX	OAL
PMT50010005A06003047	PMT50010005B06003047	0,5	1	6	2,5	47
PMT50020010A06004048	PMT50020010B06004048	1	2	6	4	48
PMT50030015A06005049	PMT50030015B06005049	1,5	3	6	5	49
PMT50040020A06007051	PMT50040020B06007051	2	4	6	7	51
PMT50050025A06008052	PMT50050025B06008052	2,5	5	6	8	52
PMT50060030A06008052	PMT50060030B06008052	3	6	6	8	52
PMT50070035A08010060	PMT50070035B08010060	3,5	7	8	10	60
PMT50080040A08011061	PMT50080040B08011061	4	8	8	11	61
PMT50090045A10011061	PMT50090045B10011061	4,5	9	10	11	61
PMT50100050A10013063	PMT50100050B10013063	5	10	10	13	63
PMT50120060A12016073	PMT50120060B12016073	6	12	12	16	73
PMT50140070A12016073	PMT50140070B12016073	7	14	12	16	73
PMT50160080A16019079	PMT50160080B16019079	8	16	16	19	79
PMT50180090A16019079	PMT50180090B16019079	9	18	16	19	79
PMT50200100A20022088	PMT50200100B20022088	10	20	20	22	88
PMT50250125A25026102	PMT50250125B25026102	12,5	25	25	26	102

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

PMT50

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.5D	0.2D	Vc m/min	83	90	100	101	104	104	103	102	90
				fz mm/tooth	0.023	0.036	0.054	0.079	0.109	0.115	0.141	0.156	0.162
				rpm obr/min	8807	7162	5305	4019	3310	2759	2049	1623	1146
				feed posuw mm/min	405	516	573	635	722	634	578	506	371
	2	0.5D	0.2D	Vc m/min	66	70	79	78	79	81	78	75	70
				fz mm/tooth	0.020	0.032	0.046	0.067	0.095	0.097	0.123	0.140	0.140
				rpm obr/min	7003	5570	4191	3104	2515	2149	1552	1194	891
				feed posuw mm/min	280	357	386	416	478	417	382	334	250
	3-4	0.5D	0.2D	Vc m/min	44	45	52	54	53	54	54	52	44
				fz mm/tooth	0.016	0.026	0.039	0.056	0.082	0.083	0.1	0.11	0.125
				rpm obr/min	4669	3581	2759	2149	1687	1432	1074	828	560
				feed posuw mm/min	149	186	215	241	277	238	215	182	140
	5	0.5D	0.2D	Vc m/min	23	24	27	27	26	26	27	27	24
				fz mm/tooth	0.014	0.023	0.035	0.047	0.073	0.071	0.090	0.099	0.100
				rpm obr/min	2440	1910	1432	1074	828	690	537	430	306
				feed posuw mm/min	68	88	100	101	121	98	97	85	61
	6	0.5D	0.2D	Vc m/min	66	70	79	78	79	81	78	75	70
				fz mm/tooth	0.020	0.032	0.046	0.067	0.095	0.097	0.123	0.140	0.140
				rpm obr/min	7003	5570	4191	3104	2515	2149	1552	1194	891
				feed posuw mm/min	280	357	386	416	478	417	382	334	250
	7	0.5D	0.2D	Vc m/min	44	45	52	54	53	54	54	52	44
				fz mm/tooth	0.016	0.026	0.039	0.056	0.082	0.083	0.1	0.11	0.125
				rpm obr/min	4669	3581	2759	2149	1687	1432	1074	828	560
				feed posuw mm/min	149	186	215	241	277	238	215	182	140
	8-9	0.5D	0.2D	Vc m/min	23	24	27	27	26	26	27	27	24
				fz mm/tooth	0.014	0.023	0.035	0.047	0.073	0.071	0.090	0.099	0.100
				rpm obr/min	2440	1910	1432	1074	828	690	537	430	306
				feed posuw mm/min	68	88	100	101	121	98	97	85	61
	10	0.5D	0.2D	Vc m/min	66	70	79	78	79	81	78	75	70
				fz mm/tooth	0.020	0.032	0.046	0.067	0.095	0.097	0.123	0.140	0.140
				rpm obr/min	7003	5570	4191	3104	2515	2149	1552	1194	891
				feed posuw mm/min	280	357	386	416	478	417	382	334	250
	11.1	0.5D	0.2D	Vc m/min	23	24	27	27	26	26	27	27	24
				fz mm/tooth	0.014	0.023	0.035	0.047	0.073	0.071	0.090	0.099	0.100
				rpm obr/min	2440	1910	1432	1074	828	690	537	430	306
				feed posuw mm/min	68	88	100	101	121	98	97	85	61
	11.2	0.5D	0.2D	Vc m/min	16	17	19	19	18	18	19	19	16
				fz mm/tooth	0.013	0.024	0.035	0.047	0.075	0.071	0.088	0.1	0.095
				rpm obr/min	1698	1353	1008	756	573	477	378	302	204
				feed posuw mm/min	44	65	71	71	86	68	67	60	39
M	14.1	0.5D	0.2D	Vc m/min	25	27	30	30	28	29	30	30	26
				fz mm/tooth	0.013	0.023	0.036	0.049	0.072	0.075	0.093	0.099	0.098
				rpm obr/min	2653	2149	1592	1194	891	769	597	477	331
				feed posuw mm/min	69	99	115	117	128	115	111	95	65
K	15-20	0.5D	0.2D	Vc m/min	66	70	79	78	79	81	78	75	70
				fz mm/tooth	0.02	0.032	0.046	0.067	0.095	0.097	0.123	0.14	0.14
				rpm obr/min	7003	5570	4191	3104	2515	2149	1552	1194	891
				feed posuw mm/min	280	357	386	416	478	417	382	334	250
H	40	0.3D	0.2D	Vc m/min	16	17	19	19	18	18	19	19	16
				fz mm/tooth	0.013	0.024	0.035	0.047	0.075	0.071	0.088	0.1	0.095
				rpm obr/min	1698	1353	1008	756	573	477	378	302	204
				feed posuw mm/min	44	65	71	71	86	68	67	60	39

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT51

2 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

PLAIN	FLAT	DC	DCON	APMX	OAL
PMT51010000A06003047	PMT51010000B06003047	1	6	2,5	47
PMT51020000A06004048	PMT51020000B06004048	2	6	4	48
PMT51030000A06005049	PMT51030000B06005049	3	6	5	49
PMT51040000A06007051	PMT51040000B06007051	4	6	7	51
PMT51050000A06008052	PMT51050000B06008052	5	6	8	52
PMT51060000A06008052	PMT51060000B06008052	6	6	8	52
PMT51070000A08010060	PMT51070000B08010060	7	8	10	60
PMT51080000A08011061	PMT51080000B08011061	8	8	11	61
PMT51090000A10011061	PMT51090000B10011061	9	10	11	61
PMT51100000A10013063	PMT51100000B10013063	10	10	13	63
PMT51120000A12016073	PMT51120000B12016073	12	12	16	73
PMT51140000A12016073	PMT51140000B12016073	14	12	16	73
PMT51160000A16019079	PMT51160000B16019079	16	16	19	79
PMT51180000A16019079	PMT51180000B16019079	18	16	19	79
PMT51200000A20022088	PMT51200000B20022088	20	20	22	88
PMT51220000A20022088	PMT51220000B20022088	22	20	22	88
PMT51250000A25026102	PMT51250000B25026102	25	25	26	102

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

PMT51

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	53	57	65	74	79	78	79	81	84	81	78	72	70	71
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.099	0.105	0.116	0.109	0.103
				rpm obr/min	8435	6048	5173	4711	4191	3104	2515	2149	1910	1611	1379	1146	1013	904
				feed posuw mm/min	135	194	279	311	319	329	357	327	317	319	290	266	221	186
	2	1.0D	0.5D	Vc m/min	44	46	54	61	66	66	68	66	66	69	64	59	59	60
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.083	0.085	0.103	0.106	0.106	0.112
				rpm obr/min	7003	4881	4297	3883	3501	2626	2165	1751	1501	1373	1132	939	854	764
				feed posuw mm/min	112	156	206	241	252	289	320	291	249	233	233	199	181	171
	3-4	1.0D	0.5D	Vc m/min	37	38	48	49	52	54	55	52	53	54	54	53	50	46
				fz mm/tooth	0.008	0.017	0.025	0.035	0.042	0.056	0.079	0.091	0.098	0.1	0.1	0.107	0.104	0.119
				rpm obr/min	5889	4032	3820	3119	2759	2149	1751	1379	1205	1074	955	844	723	586
				feed posuw mm/min	94	137	191	218	232	241	277	251	236	215	191	181	150	139
	5	1.0D	0.5D	Vc m/min	24	26	30	32	33	35	34	34	33	34	34	33	33	34
				fz mm/tooth	0.011	0.017	0.023	0.029	0.037	0.051	0.069	0.079	0.086	0.09	0.1	0.104	0.099	0.105
				rpm obr/min	3820	2759	2387	2037	1751	1393	1082	902	750	676	601	525	477	433
				feed posuw mm/min	84	94	110	118	130	142	149	142	129	122	120	109	95	91
	6	1.0D	0.5D	Vc m/min	44	46	54	61	66	66	68	66	66	69	64	59	59	60
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.083	0.085	0.103	0.106	0.106	0.112
				rpm obr/min	7003	4881	4297	3883	3501	2626	2165	1751	1501	1373	1132	939	854	764
				feed posuw mm/min	112	156	206	241	252	289	320	291	249	233	233	199	181	171
	7	1.0D	0.5D	Vc m/min	37	38	48	49	52	54	55	52	53	54	54	53	50	46
				fz mm/tooth	0.008	0.017	0.025	0.035	0.042	0.056	0.079	0.091	0.098	0.1	0.1	0.107	0.104	0.119
				rpm obr/min	5889	4032	3820	3119	2759	2149	1751	1379	1205	1074	955	844	723	586
				feed posuw mm/min	94	137	191	218	232	241	277	251	236	215	191	181	150	139
	8	1.0D	0.5D	Vc m/min	24	26	30	32	33	35	34	34	33	34	34	33	33	34
				fz mm/tooth	0.011	0.017	0.023	0.029	0.037	0.051	0.069	0.079	0.086	0.09	0.1	0.104	0.099	0.105
				rpm obr/min	3820	2759	2387	2037	1751	1393	1082	902	750	676	601	525	477	433
				feed posuw mm/min	84	94	110	118	130	142	149	142	129	122	120	109	95	91
	9	1.0D	0.3D	Vc m/min	15	20	24	25	26	27	26	26	26	27	27	27	26	24
				fz mm/tooth	0.01	0.017	0.023	0.028	0.036	0.047	0.071	0.071	0.079	0.09	0.094	0.099	0.086	0.1
				rpm obr/min	2387	2122	1910	1592	1379	1074	828	690	591	537	477	430	376	306
				feed posuw mm/min	48	72	88	89	99	101	118	98	93	97	90	85	65	61
	10	1.0D	0.5D	Vc m/min	44	46	54	61	66	66	68	66	66	69	64	59	59	60
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.083	0.085	0.103	0.106	0.106	0.112
				rpm obr/min	7003	4881	4297	3883	3501	2626	2165	1751	1501	1373	1132	939	854	764
				feed posuw mm/min	112	156	206	241	252	289	320	291	249	233	233	199	181	171
	11.1	1.0D	0.5D	Vc m/min	24	26	30	32	33	35	34	34	33	34	34	33	33	34
				fz mm/tooth	0.011	0.017	0.023	0.029	0.037	0.051	0.069	0.079	0.086	0.09	0.1	0.104	0.099	0.105
				rpm obr/min	3820	2759	2387	2037	1751	1393	1082	902	750	676	601	525	477	433
				feed posuw mm/min	84	94	110	118	130	142	149	142	129	122	120	109	95	91
	11.2	1.0D	0.3D	Vc m/min	11	14	17	18	18	19	19	18	18	19	19	19	19	16
				fz mm/tooth	0.01	0.018	0.024	0.029	0.036	0.047	0.072	0.071	0.077	0.088	0.096	0.1	0.083	0.095
				rpm obr/min	1751	1485	1353	1146	955	756	605	477	409	378	336	302	275	204
				feed posuw mm/min	35	53	65	66	69	71	87	68	63	67	65	60	46	39
M	14.1	1.0D	0.5D	Vc m/min	17	22	27	28	29	30	29	29	29	29	30	30	29	26
				fz mm/tooth	0.01	0.018	0.024	0.028	0.036	0.047	0.071	0.071	0.08	0.091	0.094	0.101	0.083	0.098
				rpm obr/min	2706	2334	2149	1783	1538	1194	923	769	659	577	531	477	420	331
				feed posuw mm/min	54	84	103	100	111	112	131	109	105	105	100	96	70	65
K	15-20	1.0D	0.5D	Vc m/min	44	46	54	61	66	66	68	66	66	69	64	59	59	60
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.083	0.085	0.103	0.106	0.106	0.112
				rpm obr/min	7003	4881	4297	3883	3501	2626	2165	1751	1501	1373	1132	939	854	764
				feed posuw mm/min	112	156	206	241	252	289	320	291	249	233	233	199	181	171
H	40	1.0D	0.3D	Vc m/min	11	14	17	18	18	19	19	18	18	19	19	19	19	16
				fz mm/tooth	0.01	0.018	0.024	0.029	0.036	0.047	0.072	0.071	0.077	0.088	0.096	0.1	0.083	0.095
				rpm obr/min	1751	1485	1353	1146	955	756	605	477	409	378	336	302	275	204
				feed posuw mm/min	35	53	65	66	69	71	87	68	63	67	65	60	46	39

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT64

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

CODE	DC	DCON	APMX	OAL
PMT64010000B06003047	1.0	6	3	47
PMT64020000B06007051	2.0	6	7	51
PMT64030000B06008052	3.0	6	8	52
PMT64040000B06011055	4.0	6	11	55
PMT64050000B06013057	5.0	6	13	57
PMT64060000B06013057	6.0	6	13	57
PMT64070000B08016066	7.0	8	16	66
PMT64080000B08019069	8.0	8	19	69
PMT64090000B10019069	9.0	10	19	69
PMT64100000B10022072	10.0	10	22	72
PMT64120000B12026083	12.0	12	26	83
PMT64140000B12026083	14.0	12	26	83
PMT64160000B16032091	16.0	16	32	92
PMT64180000B16032092	18.0	16	32	92
PMT64200000B20038104	20.0	20	38	104
PMT64220000B20038104	22.0	20	38	104
PMT64250000B25045121	25.0	25	45	121

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

PMT64

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING / FREZ O 3 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	49	52	65	72	76	78	79	81	84	81	78	72	70	71
				fz mm/tooth	0.004	0.007	0.011	0.014	0.023	0.031	0.04	0.051	0.052	0.06	0.07	0.08	0.091	0.107
				rpm obr/min	7799	5517	5173	4584	4032	3104	2515	2149	1910	1611	1379	1146	1013	904
				feed posuw mm/min	94	116	171	193	278	289	302	329	298	290	290	275	276	290
	2	1.0D	0.5D	Vc m/min	41	44	54	60	63	66	68	66	71	69	61	60	61	60
				fz mm/tooth	0.003	0.007	0.011	0.013	0.023	0.032	0.039	0.053	0.055	0.06	0.072	0.081	0.089	0.11
				rpm obr/min	6525	4669	4297	3820	3342	2626	2165	1751	1614	1373	1079	955	883	764
				feed posuw mm/min	59	98	142	149	231	252	253	278	266	247	233	232	236	252
	3-4	1.0D	0.5D	Vc m/min	36	38	45	49	52	54	53	54	53	54	54	53	50	46
				fz mm/tooth	0.003	0.005	0.009	0.012	0.021	0.028	0.038	0.047	0.053	0.056	0.063	0.067	0.083	0.107
				rpm obr/min	5730	4032	3581	3119	2759	2149	1687	1432	1205	1074	955	844	723	586
				feed posuw mm/min	52	60	97	112	174	180	192	202	192	180	180	170	180	188
	5	1.0D	0.5D	Vc m/min	23	25	29	32	33	35	34	34	35	34	34	33	33	34
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.029	0.044	0.052	0.055	0.06	0.064	0.069	0.08	0.093
				rpm obr/min	3661	2653	2308	2037	1751	1393	1082	902	796	676	601	525	477	433
				feed posuw mm/min	44	56	62	73	110	121	143	141	131	122	115	109	115	121
	6	1.0D	0.5D	Vc m/min	41	44	54	60	63	66	68	66	71	69	61	60	61	60
				fz mm/tooth	0.003	0.007	0.011	0.013	0.023	0.032	0.039	0.053	0.055	0.06	0.072	0.081	0.089	0.11
				rpm obr/min	6525	4669	4297	3820	3342	2626	2165	1751	1614	1373	1079	955	883	764
				feed posuw mm/min	59	98	142	149	231	252	253	278	266	247	233	232	236	252
	7	1.0D	0.5D	Vc m/min	36	38	45	49	52	54	53	54	53	54	54	53	50	46
				fz mm/tooth	0.003	0.005	0.009	0.012	0.021	0.028	0.038	0.047	0.053	0.056	0.063	0.067	0.083	0.107
				rpm obr/min	5730	4032	3581	3119	2759	2149	1687	1432	1205	1074	955	844	723	586
				feed posuw mm/min	52	60	97	112	174	180	192	202	192	180	180	170	180	188
	8	1.0D	0.5D	Vc m/min	23	25	29	32	33	35	34	34	35	34	34	33	33	34
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.029	0.044	0.052	0.055	0.06	0.064	0.069	0.08	0.093
				rpm obr/min	3661	2653	2308	2037	1751	1393	1082	902	796	676	601	525	477	433
				feed posuw mm/min	44	56	62	73	110	121	143	141	131	122	115	109	115	121
	9	1.0D	0.3D	Vc m/min	14	20	23	25	25	27	26	26	26	27	27	27	26	24
				fz mm/tooth	0.005	0.008	0.012	0.014	0.023	0.031	0.045	0.052	0.056	0.063	0.066	0.074	0.088	0.111
				rpm obr/min	2228	2122	1830	1592	1326	1074	828	690	591	537	477	430	376	306
				feed posuw mm/min	33	51	66	67	92	100	112	108	99	102	95	95	99	102
	10	1.0D	0.5D	Vc m/min	41	44	54	60	63	66	68	66	71	69	61	60	61	60
				fz mm/tooth	0.003	0.007	0.011	0.013	0.023	0.032	0.039	0.053	0.055	0.06	0.072	0.081	0.089	0.11
				rpm obr/min	6525	4669	4297	3820	3342	2626	2165	1751	1614	1373	1079	955	883	764
				feed posuw mm/min	59	98	142	149	231	252	253	278	266	247	233	232	236	252
	11.1	1.0D	0.5D	Vc m/min	23	25	29	32	33	35	34	34	35	34	34	33	33	34
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.029	0.044	0.052	0.055	0.06	0.064	0.069	0.08	0.093
				rpm obr/min	3661	2653	2308	2037	1751	1393	1082	902	796	676	601	525	477	433
				feed posuw mm/min	44	56	62	73	110	121	143	141	131	122	115	109	115	121
	11.2	1.0D	0.3D	Vc m/min	10	14	16	17	17	19	18	18	18	19	19	19	19	16
				fz mm/tooth	0.005	0.009	0.012	0.014	0.024	0.031	0.044	0.051	0.056	0.063	0.064	0.072	0.086	0.111
				rpm obr/min	1592	1485	1273	1082	902	756	573	477	409	378	336	302	275	204
				feed posuw mm/min	24	40	46	45	65	70	76	73	69	71	65	65	71	68
M	14.1	1.0D	0.5D	Vc m/min	41	44	54	60	63	66	68	66	71	69	61	60	61	60
				fz mm/tooth	0.003	0.007	0.011	0.013	0.023	0.032	0.039	0.053	0.055	0.06	0.072	0.081	0.089	0.11
				rpm obr/min	6525	4669	4297	3820	3342	2626	2165	1751	1614	1373	1079	955	883	764
				feed posuw mm/min	59	98	142	149	231	252	253	278	266	247	233	232	236	252
K	15-20	1.0D	0.5D	Vc m/min	41	44	54	60	63	66	68	66	71	69	61	60	61	60
				fz mm/tooth	0.003	0.007	0.011	0.013	0.023	0.032	0.039	0.053	0.055	0.06	0.072	0.081	0.089	0.11
				rpm obr/min	6525	4669	4297	3820	3342	2626	2165	1751	1614	1373	1079	955	883	764
				feed posuw mm/min	59	98	142	149	231	252	253	278	266	247	233	232	236	252
H	40	1.0D	0.3D	Vc m/min	10	14	16	17	17	19	18	18	18	19	19	19	19	16
				fz mm/tooth	0.005	0.009	0.012	0.014	0.024	0.031	0.044	0.051	0.056	0.063	0.064	0.072	0.086	0.111
				rpm obr/min	1592	1485	1273	1082	902	756	573	477	409	378	336	302	275	204
				feed posuw mm/min	24	40	46	45	65	70	76	73	69	71	65	65	71	68

$Vc = \frac{\pi d n}{1000}$ (m/min)

$n = \frac{1000 \times Vc}{\pi d}$ (rpm)

$f_z = \frac{f}{zn}$ (mm/tooth)

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT64

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING / FREZ O 3 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	62	66	78	89	95	97	94	95	95	97	92	94	95	94
				fz mm/tooth	0.004	0.008	0.012	0.015	0.024	0.034	0.047	0.056	0.065	0.069	0.076	0.08	0.089	0.11
				rpm obr/min	9868	7003	6207	5666	5040	3860	2992	2520	2160	1930	1627	1496	1375	1197
				feed posuw mm/min	118	168	223	255	363	394	422	423	421	399	371	359	367	395
	2	0.1D	1.5D	Vc m/min	51	54	66	75	81	78	79	81	79	78	78	79	79	79
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.094	0.109
				rpm obr/min	8117	5730	5252	4775	4297	3104	2515	2149	1796	1552	1379	1257	1143	1006
				feed posuw mm/min	97	138	189	215	297	326	347	361	339	331	319	306	322	329
	3-4	0.1D	1.5D	Vc m/min	41	43	53	55	59	60	60	63	61	60	61	59	62	60
				fz mm/tooth	0.004	0.007	0.01	0.014	0.025	0.033	0.043	0.055	0.06	0.067	0.073	0.082	0.088	0.11
				rpm obr/min	6525	4562	4218	3501	3130	2387	1910	1671	1387	1194	1079	939	897	764
				feed posuw mm/min	78	96	127	147	235	236	246	276	250	240	236	231	237	252
	5	0.1D	1.5D	Vc m/min	29	31	35	38	41	39	38	41	41	40	40	39	39	39
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.072	0.074	0.081	0.092	0.107
				rpm obr/min	4615	3289	2785	2419	2175	1552	1210	1088	932	796	707	621	564	497
				feed posuw mm/min	55	79	92	102	150	168	181	183	168	172	157	151	156	159
	6	0.1D	1.5D	Vc m/min	51	54	66	75	81	78	79	81	79	78	78	79	79	79
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.094	0.109
				rpm obr/min	8117	5730	5252	4775	4297	3104	2515	2149	1796	1552	1379	1257	1143	1006
				feed posuw mm/min	97	138	189	215	297	326	347	361	339	331	319	306	322	329
	7	0.1D	1.5D	Vc m/min	41	43	53	55	59	60	60	63	61	60	61	59	62	60
				fz mm/tooth	0.004	0.007	0.01	0.014	0.025	0.033	0.043	0.055	0.06	0.067	0.073	0.082	0.088	0.11
				rpm obr/min	6525	4562	4218	3501	3130	2387	1910	1671	1387	1194	1079	939	897	764
				feed posuw mm/min	78	96	127	147	235	236	246	276	250	240	236	231	237	252
	8	0.1D	1.5D	Vc m/min	29	31	35	38	41	39	38	41	41	40	40	39	39	39
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.072	0.074	0.081	0.092	0.107
				rpm obr/min	4615	3289	2785	2419	2175	1552	1210	1088	932	796	707	621	564	497
				feed posuw mm/min	55	79	92	102	150	168	181	183	168	172	157	151	156	159
	9	0.05D	1.5D	Vc m/min	18	25	29	32	34	33	34	34	33	33	34	33	33	34
				fz mm/tooth	0.006	0.01	0.013	0.015	0.022	0.035	0.047	0.056	0.064	0.071	0.072	0.082	0.09	0.112
				rpm obr/min	2865	2653	2308	2037	1804	1313	1082	902	750	657	601	525	477	433
				feed posuw mm/min	52	80	90	92	119	138	153	152	144	140	130	129	129	145
	10	0.1D	1.5D	Vc m/min	51	54	66	75	81	78	79	81	79	78	78	79	79	79
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.094	0.109
				rpm obr/min	8117	5730	5252	4775	4297	3104	2515	2149	1796	1552	1379	1257	1143	1006
				feed posuw mm/min	97	138	189	215	297	326	347	361	339	331	319	306	322	329
	11.1	0.1D	1.5D	Vc m/min	29	31	35	38	41	39	38	41	41	40	40	39	39	39
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.072	0.074	0.081	0.092	0.107
				rpm obr/min	4615	3289	2785	2419	2175	1552	1210	1088	932	796	707	621	564	497
				feed posuw mm/min	55	79	92	102	150	168	181	183	168	172	157	151	156	159
	11.2	0.05D	1.5D	Vc m/min	13	17	20	22	24	23	24	23	23	23	24	23	23	24
				fz mm/tooth	0.006	0.01	0.014	0.015	0.022	0.036	0.047	0.056	0.063	0.072	0.071	0.081	0.088	0.111
				rpm obr/min	2069	1804	1592	1401	1273	915	764	610	523	458	424	366	333	306
				feed posuw mm/min	37	54	67	63	84	99	108	102	99	99	90	89	88	102
M	14.1	0.1D	1.5D	Vc m/min	20	27	32	35	37	36	37	37	37	37	37	36	37	37
				fz mm/tooth	0.006	0.01	0.013	0.015	0.022	0.036	0.047	0.056	0.063	0.071	0.073	0.083	0.091	0.113
				rpm obr/min	3183	2865	2546	2228	1963	1432	1178	981	841	736	654	573	535	471
				feed posuw mm/min	57	86	99	100	130	155	166	165	159	157	143	143	146	160
K	15-20	0.1D	1.5D	Vc m/min	51	54	66	75	81	78	79	81	79	78	78	79	79	79
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.094	0.109
				rpm obr/min	8117	5730	5252	4775	4297	3104	2515	2149	1796	1552	1379	1257	1143	1006
				feed posuw mm/min	97	138	189	215	297	326	347	361	339	331	319	306	322	329
H	40	0.05D	1.5D	Vc m/min	13	17	20	22	24	23	24	23	23	23	24	23	23	24
				fz mm/tooth	0.006	0.01	0.014	0.015	0.022	0.036	0.047	0.056	0.063	0.072	0.071	0.081	0.088	0.111
				rpm obr/min	2069	1804	1592	1401	1273	915	764	610	523	458	424	366	333	306
				feed posuw mm/min	37	54	67	63	84	99	108	102	99	99	90	89	88	102

$Vc = \frac{\pi d n}{1000}$ (m/min)

$n = \frac{1000 \times Vc}{\pi d}$ (rpm)

$f_z = \frac{f}{zn}$ (mm/tooth)

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT52

4 Medium Rough

HSM Vmax | A | min | AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

PLAIN	FLAT	DC	DCON	APMX	OAL
PMT52010000A06003049	PMT52010000B06003049	1	6	3	49
PMT52020000A06007051	PMT52020000B06007051	2	6	7	51
PMT52030000A06008052	PMT52030000B06008052	3	6	8	52
PMT52040000A06011055	PMT52040000B06011055	4	6	11	55
PMT52050000A06013057	PMT52050000B06013057	5	6	13	57
PMT52060000A06013057	PMT52060000B06013057	6	6	13	57
PMT52070000A08016066	PMT52070000B08016066	7	8	16	66
PMT52080000A08019069	PMT52080000B08019069	8	8	19	69
PMT52090000A10019069	PMT52090000B10019069	9	10	19	69
PMT52100000A10022072	PMT52100000B10022072	10	10	22	72
PMT52120000A12026083	PMT52120000B12026083	12	12	26	83
PMT52140000A12026083	PMT52140000B12026083	14	12	26	83
PMT52160000A16032092	PMT52160000B16032092	16	16	32	92
PMT52180000A16032092	PMT52180000B16032092	18	16	32	92
PMT52200000A20038104	PMT52200000B20038104	20	20	38	104
PMT52220000A20038104	PMT52220000B20038104	22	20	38	104
PMT52250000A25045121	PMT52250000B25045121	25	25	45	121

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

PMT52

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	69	75	80	83	88	93	87	90	95	97	102	94	87	94
				fz mm/tooth	0.008	0.015	0.023	0.029	0.035	0.046	0.068	0.071	0.076	0.079	0.076	0.088	0.097	0.093
				rpm obr/min	10982	7958	6366	5284	4669	3700	2769	2387	2160	1930	1804	1496	1259	1197
				feed posuw mm/min	351	477	586	613	654	681	753	678	657	610	548	527	488	445
	2	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
	3-4	0.1D	1.5D	Vc m/min	46	50	54	55	59	60	60	63	58	60	61	59	57	60
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.086	0.088	0.093	0.09
				rpm obr/min	7321	5305	4297	3501	3130	2387	1910	1671	1319	1194	1079	939	825	764
				feed posuw mm/min	205	297	361	392	401	439	451	441	422	406	371	331	307	275
	5	0.1D	1.5D	Vc m/min	31	31	35	38	41	42	38	40	42	41	43	40	39	39
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.067	0.068	0.072	0.081	0.077	0.082	0.085	0.09
				rpm obr/min	4934	3289	2785	2419	2175	1671	1210	1061	955	816	760	637	564	497
				feed posuw mm/min	158	224	245	271	278	287	324	289	275	264	234	209	192	179
	6	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
	7	0.1D	1.5D	Vc m/min	46	50	54	55	59	60	60	63	58	60	61	59	57	60
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.086	0.088	0.093	0.09
				rpm obr/min	7321	5305	4297	3501	3130	2387	1910	1671	1319	1194	1079	939	825	764
				feed posuw mm/min	205	297	361	392	401	439	451	441	422	406	371	331	307	275
	8	0.1D	1.5D	Vc m/min	31	31	35	38	41	42	38	40	42	41	43	40	39	39
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.067	0.068	0.072	0.081	0.077	0.082	0.085	0.09
				rpm obr/min	4934	3289	2785	2419	2175	1671	1210	1061	955	816	760	637	564	497
				feed posuw mm/min	158	224	245	271	278	287	324	289	275	264	234	209	192	179
	9	0.05D	1.5D	Vc m/min	25	27	30	32	33	35	34	32	33	33	34	33	33	34
				fz mm/tooth	0.006	0.013	0.019	0.023	0.031	0.04	0.056	0.064	0.067	0.076	0.075	0.08	0.081	0.087
				rpm obr/min	3979	2865	2387	2037	1751	1393	1082	849	750	657	601	525	477	433
				feed posuw mm/min	95	149	181	187	217	223	242	217	201	200	180	168	155	151
	10	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
	11.1	0.1D	1.5D	Vc m/min	31	31	35	38	41	42	38	40	42	41	43	40	39	39
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.067	0.068	0.072	0.081	0.077	0.082	0.085	0.09
				rpm obr/min	4934	3289	2785	2419	2175	1671	1210	1061	955	816	760	637	564	497
				feed posuw mm/min	158	224	245	271	278	287	324	289	275	264	234	209	192	179
	11.2	0.05D	1.5D	Vc m/min	17	19	21	22	23	24	24	23	23	23	24	23	23	24
				fz mm/tooth	0.006	0.013	0.019	0.024	0.031	0.04	0.057	0.065	0.068	0.076	0.074	0.081	0.081	0.088
				rpm obr/min	2706	2016	1671	1401	1220	955	764	610	523	458	424	366	333	306
				feed posuw mm/min	65	105	127	134	151	153	174	159	142	139	126	119	108	108
M	14.1	0.1D	1.5D	Vc m/min	27	30	33	35	36	38	37	36	37	37	37	36	37	37
				fz mm/tooth	0.006	0.013	0.019	0.023	0.031	0.039	0.056	0.063	0.067	0.075	0.076	0.08	0.08	0.088
				rpm obr/min	4297	3183	2626	2228	1910	1512	1178	955	841	736	654	573	535	471
				feed posuw mm/min	103	166	200	205	237	236	264	241	225	221	199	183	171	166
K	15-20	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
H	40	0.05D	1.5D	Vc m/min	17	19	21	22	23	24	24	23	23	23	24	23	23	24
				fz mm/tooth	0.006	0.013	0.019	0.024	0.031	0.04	0.057	0.065	0.068	0.076	0.074	0.081	0.081	0.088
				rpm obr/min	2706	2016	1671	1401	1220	955	764	610	523	458	424	366	333	306
				feed posuw mm/min	65	105	127	134	151	153	174	159	142	139	126	119	108	108

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT53

4 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

CODE	DC	DCON	APMX	OAL	CHAMFER
PMT53030000B06008052	3	6	8	52	0,1
PMT53040000B06011055	4	6	11	55	0,1
PMT53050000B06013057	5	6	13	57	0,1
PMT53060000B06013057	6	6	13	57	0,1
PMT53070000B08016066	7	8	16	66	0,1
PMT53080000B08019069	8	8	19	69	0,1
PMT53090000B10019069	9	10	19	69	0,1
PMT53100000B10022072	10	10	22	72	0,1
PMT53120000B12026083	12	12	26	83	0,1
PMT53140000B12026083	14	12	26	83	0,2
PMT53160000B16032092	16	16	32	92	0,2
PMT53180000B16032092	18	16	32	92	0,2
PMT53200000B20038104	20	20	38	104	0,2
PMT53220000B20038104	22	20	38	104	0,2
PMT53250000B25045121	25	25	45	121	0,2

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

PMT53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SLOTTING / FREZ O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-2	1.0D	0.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
	3-4	1.0D	0.5D	Vc m/min	64	63	63	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	6791	5013	4011	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	136	160	176	217	285	348	349	312	295	292	290	225
	5	1.0D	0.5D	Vc m/min	44	44	44	44	44	49	49	49	49	49	49	49
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				rpm obr/min	4669	3501	2801	2334	1751	1560	1300	1114	975	867	780	624
				feed posuw mm/min	93	112	123	149	196	237	244	223	203	204	206	162
	6	1.0D	0.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
	7	1.0D	0.5D	Vc m/min	64	63	63	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	6791	5013	4011	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	136	160	176	217	285	348	349	312	295	292	290	225
	8	1.0D	0.5D	Vc m/min	44	44	44	44	44	49	49	49	49	49	49	49
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				rpm obr/min	4669	3501	2801	2334	1751	1560	1300	1114	975	867	780	624
				feed posuw mm/min	93	112	123	149	196	237	244	223	203	204	206	162
	9	1.0D	0.3D	Vc m/min	27	27	27	27	27	30	29	29	30	29	30	29
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.032	0.04	0.041	0.044	0.05	0.056	0.054
				rpm obr/min	2865	2149	1719	1432	1074	955	769	659	597	513	477	369
				feed posuw mm/min	46	60	69	80	103	122	123	108	105	103	107	80
	10	1.0D	0.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
	11.1	1.0D	0.5D	Vc m/min	44	44	44	44	44	49	49	49	49	49	49	49
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				rpm obr/min	4669	3501	2801	2334	1751	1560	1300	1114	975	867	780	624
				feed posuw mm/min	93	112	123	149	196	237	244	223	203	204	206	162
	11.2	1.0D	0.3D	Vc m/min	27	27	27	27	27	30	29	29	30	29	30	29
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.032	0.04	0.041	0.044	0.05	0.056	0.054
				rpm obr/min	2865	2149	1719	1432	1074	955	769	659	597	513	477	369
				feed posuw mm/min	46	60	69	80	103	122	123	108	105	103	107	80
M	14.1	1.0D	0.5D	Vc m/min	48	48	48	48	48	48	48	48	48	48	48	48
				fz mm/tooth	0.005	0.008	0.013	0.018	0.029	0.048	0.056	0.06	0.063	0.071	0.077	0.078
				rpm obr/min	5093	3820	3056	2546	1910	1528	1273	1091	955	849	764	611
				feed posuw mm/min	102	122	159	183	222	293	285	262	241	241	235	191
K	15-20	1.0D	0.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
H	40	1.0D	0.3D	Vc m/min	27	27	27	27	27	30	29	29	30	29	30	29
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.032	0.04	0.041	0.044	0.05	0.056	0.054
				rpm obr/min	2865	2149	1719	1432	1074	955	769	659	597	513	477	369
				feed posuw mm/min	46	60	69	80	103	122	123	108	105	103	107	80

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SLOTTING / FREZ O 4 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-2	0.3D	1.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
	3-4	0.3D	1.5D	Vc m/min	64	63	63	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	6791	5013	4011	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	136	160	176	217	285	348	349	312	295	292	290	225
	5	0.3D	1.5D	Vc m/min	44	44	44	44	44	49	49	49	49	49	49	49
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				rpm obr/min	4669	3501	2801	2334	1751	1560	1300	1114	975	867	780	624
				feed posuw mm/min	93	112	123	149	196	237	244	223	203	204	206	162
	6	0.3D	1.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
	7	0.3D	1.5D	Vc m/min	64	63	63	64	64	70	70	70	70	70	70	70
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	6791	5013	4011	3395	2546	2228	1857	1592	1393	1238	1114	891
				feed posuw mm/min	136	160	176	217	285	348	349	312	295	292	290	225
	8	0.3D	1.5D	Vc m/min	44	44	44	44	44	49	49	49	49	49	49	49
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				rpm obr/min	4669	3501	2801	2334	1751	1560	1300	1114	975	867	780	624
				feed posuw mm/min	93	112	123	149	196	237	244	223	203	204	206	162
	9	0.15D	1.5D	Vc m/min	27	27	27	27	27	30	29	29	30	29	30	29
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.032	0.04	0.041	0.044	0.05	0.056	0.054
				rpm obr/min	2865	2149	1719	1432	1074	955	769	659	597	513	477	369
				feed posuw mm/min	46	60	69	80	103	122	123	108	105	103	107	80
	10	0.3D	1.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
	11.1	0.3D	1.5D	Vc m/min	44	44	44	44	44	49	49	49	49	49	49	49
				fz mm/tooth	0.005	0.008	0.011	0.016	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				rpm obr/min	4669	3501	2801	2334	1751	1560	1300	1114	975	867	780	624
				feed posuw mm/min	93	112	123	149	196	237	244	223	203	204	206	162
	11.2	0.15D	1.5D	Vc m/min	27	27	27	27	27	30	29	29	30	29	30	29
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.032	0.04	0.041	0.044	0.05	0.056	0.054
				rpm obr/min	2865	2149	1719	1432	1074	955	769	659	597	513	477	369
				feed posuw mm/min	46	60	69	80	103	122	123	108	105	103	107	80
M	14.1	0.3D	1.5D	Vc m/min	48	48	48	48	48	48	48	48	48	48	48	48
				fz mm/tooth	0.005	0.008	0.013	0.018	0.029	0.048	0.056	0.06	0.063	0.071	0.077	0.078
				rpm obr/min	5093	3820	3056	2546	1910	1528	1273	1091	955	849	764	611
				feed posuw mm/min	102	122	159	183	222	293	285	262	241	241	235	191
K	15-20	0.3D	1.5D	Vc m/min	70	70	70	70	70	77	77	77	77	77	77	77
				fz mm/tooth	0.005	0.008	0.012	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				rpm obr/min	7427	5570	4456	3714	2785	2451	2042	1751	1532	1362	1225	980
				feed posuw mm/min	149	178	214	238	312	382	384	343	325	321	319	247
H	40	0.15D	1.5D	Vc m/min	27	27	27	27	27	30	29	29	30	29	30	29
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.032	0.04	0.041	0.044	0.05	0.056	0.054
				rpm obr/min	2865	2149	1719	1432	1074	955	769	659	597	513	477	369
				feed posuw mm/min	46	60	69	80	103	122	123	108	105	103	107	80

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT54

4 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

PLAIN	FLAT	DC	DCON	APMX	OAL
PMT54020000A06010054	PMT54020000B06010054	2	6	10	54
PMT54030000A06012056	PMT54030000B06012056	3	6	12	56
PMT54040000A06019063	PMT54040000B06019063	4	6	19	63
PMT54050000A06024068	PMT54050000B06024068	5	6	24	68
PMT54060000A06024068	PMT54060000B06024068	6	6	24	68
PMT54070000A08030080	PMT54070000B08030080	7	8	30	80
PMT54080000A08038088	PMT54080000B08038088	8	8	38	88
PMT54090000A10038088	PMT54090000B10038088	9	10	38	88
PMT54100000A10045095	PMT54100000B10045095	10	10	45	95
PMT54120000A12053110	PMT54120000B12053110	12	12	53	110
PMT54140000A12053110	PMT54140000B12053110	14	12	53	110
PMT54160000A16063123	PMT54160000B16063123	16	16	63	123
PMT54180000A16063123	PMT54180000B16063123	18	16	63	123
PMT54200000A20075141	PMT54200000B20075141	20	20	75	141
PMT54220000A20075141	PMT54220000B20075141	22	20	75	141
PMT54250000A25090166	PMT54250000B25090166	25	25	90	166

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h5

PMT54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	69	75	80	83	88	93	87	90	95	97	102	94	87	94
				fz mm/tooth	0.008	0.015	0.023	0.029	0.035	0.046	0.068	0.071	0.076	0.079	0.076	0.088	0.097	0.093
				rpm obr/min	10982	7958	6366	5284	4669	3700	2769	2387	2160	1930	1804	1496	1259	1197
				feed posuw mm/min	351	477	586	613	654	681	753	678	657	610	548	527	488	445
	2	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
	3-4	0.1D	1.5D	Vc m/min	46	50	54	55	59	60	60	63	58	60	61	59	57	60
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.086	0.088	0.093	0.09
				rpm obr/min	7321	5305	4297	3501	3130	2387	1910	1671	1319	1194	1079	939	825	764
				feed posuw mm/min	205	297	361	392	401	439	451	441	422	406	371	331	307	275
	5	0.1D	1.5D	Vc m/min	31	31	35	38	41	42	38	40	42	41	43	40	39	39
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.067	0.068	0.072	0.081	0.077	0.082	0.085	0.09
				rpm obr/min	4934	3289	2785	2419	2175	1671	1210	1061	955	816	760	637	564	497
				feed posuw mm/min	158	224	245	271	278	287	324	289	275	264	234	209	192	179
	6	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
	7	0.1D	1.5D	Vc m/min	46	50	54	55	59	60	60	63	58	60	61	59	57	60
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.086	0.088	0.093	0.09
				rpm obr/min	7321	5305	4297	3501	3130	2387	1910	1671	1319	1194	1079	939	825	764
				feed posuw mm/min	205	297	361	392	401	439	451	441	422	406	371	331	307	275
	8	0.1D	1.5D	Vc m/min	31	31	35	38	41	42	38	40	42	41	43	40	39	39
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.067	0.068	0.072	0.081	0.077	0.082	0.085	0.09
				rpm obr/min	4934	3289	2785	2419	2175	1671	1210	1061	955	816	760	637	564	497
				feed posuw mm/min	158	224	245	271	278	287	324	289	275	264	234	209	192	179
	9	0.05D	1.5D	Vc m/min	25	27	30	32	33	35	34	32	33	33	34	33	33	34
				fz mm/tooth	0.006	0.013	0.019	0.023	0.031	0.04	0.056	0.064	0.067	0.076	0.075	0.08	0.081	0.087
				rpm obr/min	3979	2865	2387	2037	1751	1393	1082	849	750	657	601	525	477	433
				feed posuw mm/min	95	149	181	187	217	223	242	217	201	200	180	168	155	151
	10	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
	11.1	0.1D	1.5D	Vc m/min	31	31	35	38	41	42	38	40	42	41	43	40	39	39
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.067	0.068	0.072	0.081	0.077	0.082	0.085	0.09
				rpm obr/min	4934	3289	2785	2419	2175	1671	1210	1061	955	816	760	637	564	497
				feed posuw mm/min	158	224	245	271	278	287	324	289	275	264	234	209	192	179
	11.2	0.05D	1.5D	Vc m/min	17	19	21	22	23	24	24	23	23	23	24	23	23	24
				fz mm/tooth	0.006	0.013	0.019	0.024	0.031	0.04	0.057	0.065	0.068	0.076	0.074	0.081	0.081	0.088
				rpm obr/min	2706	2016	1671	1401	1220	955	764	610	523	458	424	366	333	306
				feed posuw mm/min	65	105	127	134	151	153	174	159	142	139	126	119	108	108
M	14.1	0.1D	1.5D	Vc m/min	27	30	33	35	36	38	37	36	37	37	37	36	37	37
				fz mm/tooth	0.006	0.013	0.019	0.023	0.031	0.039	0.056	0.063	0.067	0.075	0.076	0.08	0.08	0.088
				rpm obr/min	4297	3183	2626	2228	1910	1512	1178	955	841	736	654	573	535	471
				feed posuw mm/min	103	166	200	205	237	236	264	241	225	221	199	183	171	166
K	15-20	0.1D	1.5D	Vc m/min	63	68	71	75	81	78	79	81	84	84	85	79	79	79
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.09
				rpm obr/min	10027	7215	5650	4775	4297	3104	2515	2149	1910	1671	1503	1257	1143	1006
				feed posuw mm/min	281	433	475	497	533	571	634	576	550	515	481	443	384	362
H	40	0.05D	1.5D	Vc m/min	17	19	21	22	23	24	24	23	23	23	24	23	23	24
				fz mm/tooth	0.006	0.013	0.019	0.024	0.031	0.04	0.057	0.065	0.068	0.076	0.074	0.081	0.081	0.088
				rpm obr/min	2706	2016	1671	1401	1220	955	764	610	523	458	424	366	333	306
				feed posuw mm/min	65	105	127	134	151	153	174	159	142	139	126	119	108	108

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT55

R 4-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

CODE	RE	DC	DCON	APMX	LU	OAL	#FLUTE
PMT55060005B06013057	0,5	6	6	13	-	57	4
PMT55070005B10016066	0,5	7	10	16	-	66	4
PMT55080005B10019069	0,5	8	10	19	-	69	4
PMT55090005B10019069	0,5	9	10	19	-	69	4
PMT55100005B10022072	0,5	10	10	22	31	72	4
PMT55120005B12026083	0,5	12	12	26	37	83	4
PMT55140010B12026083	1	14	12	26	-	83	5
PMT55160010B16032092	1	16	16	32	44	92	5
PMT55180010B16032092	1	18	16	32	-	92	5
PMT55200010B20038104	1	20	20	38	54	104	5
PMT55250010B25045121	1	25	25	45	63	121	5

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM		
	6-10	10-18	18-30
js12	± 75	± 90	± 105
h6	0	0	0
	-9	-11	-13

PMT55

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SIDE CUTTING / FREZ O WIELU ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1	0.5D	1.5D	Vc m/min	76	87	86	87	89	87	85	87	90
				fz mm/tooth	0.02	0.03	0.055	0.065	0.059	0.069	0.079	0.088	0.105
				rpm obr/min	4032	3462	2737	2308	2024	1731	1503	1385	1146
				feed posuw mm/min	323	415	602	600	597	597	594	609	602
	2	0.5D	1.5D	Vc m/min	60	69	68	65	66	69	72	68	68
				fz mm/tooth	0.021	0.03	0.053	0.069	0.063	0.069	0.074	0.087	0.106
				rpm obr/min	3183	2745	2165	1724	1501	1373	1273	1082	866
				feed posuw mm/min	267	329	459	476	473	474	471	471	459
	3-4	0.5D	1.5D	Vc m/min	43	51	47	49	48	48	50	48	47
				fz mm/tooth	0.018	0.028	0.046	0.063	0.061	0.069	0.075	0.086	0.107
				rpm obr/min	2281	2029	1496	1300	1091	955	884	764	598
				feed posuw mm/min	164	227	275	328	333	329	332	328	320
	5	0.5D	1.5D	Vc m/min	43	51	47	49	48	48	50	48	47
				fz mm/tooth	0.018	0.028	0.046	0.063	0.061	0.069	0.075	0.086	0.107
				rpm obr/min	2281	2029	1496	1300	1091	955	884	764	598
				feed posuw mm/min	164	227	275	328	266	264	265	263	256
	6	0.5D	1.5D	Vc m/min	35	38	40	40	40	40	40	40	41
				fz mm/tooth	0.02	0.03	0.045	0.061	0.057	0.066	0.073	0.081	0.1
				rpm obr/min	1857	1512	1273	1061	909	796	707	637	522
				feed posuw mm/min	149	181	229	259	259	263	258	258	261
	7	0.5D	1.5D	Vc m/min	60	69	68	65	66	69	72	68	68
				fz mm/tooth	0.021	0.03	0.053	0.069	0.063	0.069	0.074	0.087	0.106
				rpm obr/min	3183	2745	2165	1724	1501	1373	1273	1082	866
				feed posuw mm/min	267	329	459	476	473	474	471	471	459
	8	0.5D	1.5D	Vc m/min	43	51	47	49	48	48	50	48	47
				fz mm/tooth	0.018	0.028	0.046	0.063	0.061	0.069	0.075	0.086	0.107
				rpm obr/min	2281	2029	1496	1300	1091	955	884	764	598
				feed posuw mm/min	164	227	275	328	333	329	332	328	320
	9	0.5D	1.5D	Vc m/min	35	38	40	40	40	40	40	40	41
				fz mm/tooth	0.02	0.03	0.045	0.061	0.057	0.066	0.073	0.081	0.1
				rpm obr/min	1857	1512	1273	1061	909	796	707	637	522
				feed posuw mm/min	149	181	229	259	259	263	258	258	261
	10	0.5D	1.5D	Vc m/min	60	69	68	65	66	69	72	68	68
				fz mm/tooth	0.021	0.03	0.053	0.069	0.063	0.069	0.074	0.087	0.106
				rpm obr/min	3183	2745	2165	1724	1501	1373	1273	1082	866
				feed posuw mm/min	267	329	459	476	473	474	471	471	459
	11.1	0.5D	1.5D	Vc m/min	35	38	40	40	40	40	40	40	41
				fz mm/tooth	0.02	0.03	0.045	0.061	0.057	0.066	0.073	0.081	0.1
				rpm obr/min	1857	1512	1273	1061	909	796	707	637	522
				feed posuw mm/min	149	181	229	259	259	263	258	258	261
	11.2	0.3D	1.5D	Vc m/min	25	27	28	28	28	28	28	28	28
				fz mm/tooth	0.02	0.029	0.044	0.06	0.056	0.065	0.072	0.08	0.1
				rpm obr/min	1326	1074	891	743	637	557	495	446	357
				feed posuw mm/min	106	125	157	178	178	181	178	178	178
M	14.1	0.5D	1.5D	Vc m/min	39	43	43	43	44	43	45	44	44
				fz mm/tooth	0.019	0.03	0.045	0.064	0.059	0.069	0.075	0.084	0.104
				rpm obr/min	2069	1711	1369	1141	1000	855	796	700	560
				feed posuw mm/min	157	205	246	292	295	295	298	294	291
K	15-20	0.5D	1.5D	Vc m/min	60	69	68	65	66	69	72	68	68
				fz mm/tooth	0.021	0.03	0.053	0.069	0.063	0.069	0.074	0.087	0.106
				rpm obr/min	3183	2745	2165	1724	1501	1373	1273	1082	866
				feed posuw mm/min	267	329	459	476	473	474	471	471	459
H	40	0.3D	1.5D	Vc m/min	25	27	28	28	28	28	28	28	28
				fz mm/tooth	0.02	0.029	0.044	0.06	0.056	0.065	0.072	0.08	0.1
				rpm obr/min	1326	1074	891	743	637	557	495	446	357
				feed posuw mm/min	106	125	157	178	178	181	178	178	178

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT56

3-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

CODE	DC	DCON	APMX	OAL	#FLUTE	CHAMFER
PMT56060000B06013057	6	6	13	57	3	0,18
PMT56070000B10016066	7	10	16	66	3	0,18
PMT56080000B10019069	8	10	19	69	3	0,18
PMT56090000B10019069	9	10	19	69	3	0,18
PMT56100000B10022072	10	10	22	72	4	0,18
PMT56120000B12026083	12	12	26	83	4	0,18
PMT56140000B12026083	14	12	26	83	4	0,25
PMT56160000B16032092	16	16	32	92	4	0,25
PMT56180000B16032092	18	16	32	92	4	0,25
PMT56200000B20038104	20	20	38	104	4	0,25
PMT56250000B25045121	25	25	45	121	5	0,36

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM		
	6-10	10-18	18-30
js12	± 75	± 90	± 105
h6	0	0	0
	-9	-11	-13

PMT56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SIDE CUTTING / FREZ O WIELU ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1	0.5D	1.5D	Vc m/min	63	72	72	72	74	72	71	72	75
				fz mm/tooth	0.027	0.041	0.055	0.065	0.074	0.087	0.099	0.111	0.105
				rpm obr/min	3342	2865	2292	1910	1682	1432	1256	1146	955
				feed posuw mm/min	271	352	504	497	498	498	497	509	501
	2	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	3-4	0.5D	1.5D	Vc m/min	36	42	40	41	40	40	41	40	39
				fz mm/tooth	0.024	0.038	0.047	0.064	0.076	0.087	0.094	0.107	0.106
				rpm obr/min	1910	1671	1273	1088	909	796	725	637	497
				feed posuw mm/min	138	191	239	278	276	277	273	272	263
	5	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	6	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	7	0.5D	1.5D	Vc m/min	36	42	40	41	40	40	41	40	39
				fz mm/tooth	0.024	0.038	0.047	0.064	0.076	0.087	0.094	0.107	0.106
				rpm obr/min	1910	1671	1273	1088	909	796	725	637	497
				feed posuw mm/min	138	191	239	278	276	277	273	272	263
	8-9	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	10	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	11.1	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	11.2	0.3D	1.5D	Vc m/min	21	22	24	23	23	23	23	23	24
				fz mm/tooth	0.028	0.04	0.045	0.06	0.071	0.082	0.091	0.101	0.1
				rpm obr/min	1114	875	764	610	523	458	407	366	306
				feed posuw mm/min	94	105	138	146	149	150	148	148	153
M	14.1	0.5D	1.5D	Vc m/min	33	36	36	36	37	36	37	36	37
				fz mm/tooth	0.025	0.039	0.045	0.064	0.074	0.085	0.093	0.106	0.102
				rpm obr/min	1751	1432	1146	955	841	716	654	573	471
				feed posuw mm/min	131	168	206	244	249	244	243	243	240
K	15-20	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
H	40	0.3D	1.5D	Vc m/min	21	22	24	23	23	23	23	23	24
				fz mm/tooth	0.028	0.04	0.045	0.06	0.071	0.082	0.091	0.101	0.1
				rpm obr/min	1114	875	764	610	523	458	407	366	306
				feed posuw mm/min	94	105	138	146	149	150	148	148	153

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT56

3-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

CODE	DC	DCON	APMX	OAL	#FLUTE	CHAMFER
PMT56060000B06024068	6	6	24	68	3	0,18
PMT56070000B10030080	7	10	30	80	3	0,18
PMT56080000B10038088	8	10	38	88	3	0,18
PMT56090000B10038088	9	10	38	88	3	0,18
PMT56100000B10045095	10	10	45	95	4	0,18
PMT56120000B12053110	12	12	53	110	4	0,18
PMT56140000B12053110	14	12	53	110	4	0,25
PMT56160000B16063123	16	16	63	123	4	0,25
PMT56180000B16063123	18	16	63	123	4	0,25
PMT56200000B20075141	20	20	75	141	4	0,25
PMT56250000B25090166	25	25	90	166	5	0,36

TOLERANCE RANGE IN UM			
NOMINAL-DIAMETER IN UM			
	6-10	10-18	18-30
js12	± 75	± 90	± 105
h6	0	0	0
	-9	-11	-13

PMT56

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SIDE CUTTING / FREZ O WIELU ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1	0.5D	1.5D	Vc m/min	63	72	72	72	74	72	71	72	75
				fz mm/tooth	0.027	0.041	0.055	0.065	0.074	0.087	0.099	0.111	0.105
				rpm obr/min	3342	2865	2292	1910	1682	1432	1256	1146	955
				feed posuw mm/min	271	352	504	497	498	498	497	509	501
	2	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	3-4	0.5D	1.5D	Vc m/min	36	42	40	41	40	40	41	40	39
				fz mm/tooth	0.024	0.038	0.047	0.064	0.076	0.087	0.094	0.107	0.106
				rpm obr/min	1910	1671	1273	1088	909	796	725	637	497
				feed posuw mm/min	138	191	239	278	276	277	273	272	263
	5	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	6	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	7	0.5D	1.5D	Vc m/min	36	42	40	41	40	40	41	40	39
				fz mm/tooth	0.024	0.038	0.047	0.064	0.076	0.087	0.094	0.107	0.106
				rpm obr/min	1910	1671	1273	1088	909	796	725	637	497
				feed posuw mm/min	138	191	239	278	276	277	273	272	263
	8-9	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	10	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	11.1	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	11.2	0.3D	1.5D	Vc m/min	21	22	24	23	23	23	23	23	24
				fz mm/tooth	0.028	0.04	0.045	0.06	0.071	0.082	0.091	0.101	0.1
				rpm obr/min	1114	875	764	610	523	458	407	366	306
				feed posuw mm/min	94	105	138	146	149	150	148	148	153
M	14.1	0.5D	1.5D	Vc m/min	33	36	36	36	37	36	37	36	37
				fz mm/tooth	0.025	0.039	0.045	0.064	0.074	0.085	0.093	0.106	0.102
				rpm obr/min	1751	1432	1146	955	841	716	654	573	471
				feed posuw mm/min	131	168	206	244	249	244	243	243	240
K	15-20	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
H	40	0.3D	1.5D	Vc m/min	21	22	24	23	23	23	23	23	24
				fz mm/tooth	0.028	0.04	0.045	0.06	0.071	0.082	0.091	0.101	0.1
				rpm obr/min	1114	875	764	610	523	458	407	366	306
				feed posuw mm/min	94	105	138	146	149	150	148	148	153

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT58

3-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○												○	

CODE	DC	DCON	APMX	OAL	#FLUTE	CHAMFER
PMT58060000B06013057	6	6	13	57	3	0,25
PMT58070000B10016066	7	10	16	66	3	0,25
PMT58080000B10019069	8	10	19	69	3	0,25
PMT58090000B10019069	9	10	19	69	3	0,36
PMT58100000B10022072	10	10	22	72	4	0,36
PMT58120000B12026083	12	12	26	83	4	0,56
PMT58140000B12026083	14	12	26	83	4	0,6
PMT58160000B16032092	16	16	32	92	4	0,6
PMT58180000B16032092	18	16	32	92	4	0,6
PMT58200000B20038104	20	20	38	104	4	0,6
PMT58250000B25045121	25	25	45	121	5	0,6

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM			
	6-10	10-18	18-30
js12	± 75	± 90	± 105
h6	0	0	0
	-9	-11	-13

PMT58

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SIDE CUTTING / FREZ O WIELU ZĘBACH FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1	0.5D	1.5D	Vc m/min	63	72	72	72	74	72	71	72	75
				fz mm/tooth	0.027	0.041	0.055	0.065	0.074	0.087	0.099	0.111	0.105
				rpm obr/min	3342	2865	2292	1910	1682	1432	1256	1146	955
				feed posuw mm/min	271	352	504	497	498	498	497	509	501
	2	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	3-4	0.5D	1.5D	Vc m/min	36	42	40	41	40	40	41	40	39
				fz mm/tooth	0.024	0.038	0.047	0.064	0.076	0.087	0.094	0.107	0.106
				rpm obr/min	1910	1671	1273	1088	909	796	725	637	497
				feed posuw mm/min	138	191	239	278	276	277	273	272	263
	5	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	6	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	7	0.5D	1.5D	Vc m/min	36	42	40	41	40	40	41	40	39
				fz mm/tooth	0.024	0.038	0.047	0.064	0.076	0.087	0.094	0.107	0.106
				rpm obr/min	1910	1671	1273	1088	909	796	725	637	497
				feed posuw mm/min	138	191	239	278	276	277	273	272	263
	8-9	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	10	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
	11.1	0.5D	1.5D	Vc m/min	29	32	34	34	33	33	33	33	34
				fz mm/tooth	0.027	0.04	0.044	0.06	0.071	0.081	0.091	0.101	0.1
				rpm obr/min	1538	1273	1082	902	750	657	584	525	433
				feed posuw mm/min	125	153	190	216	213	213	212	212	216
	11.2	0.3D	1.5D	Vc m/min	21	22	24	23	23	23	23	23	24
				fz mm/tooth	0.028	0.04	0.045	0.06	0.071	0.082	0.091	0.101	0.1
				rpm obr/min	1114	875	764	610	523	458	407	366	306
				feed posuw mm/min	94	105	138	146	149	150	148	148	153
M	14.1	0.5D	1.5D	Vc m/min	33	36	36	36	37	36	37	36	37
				fz mm/tooth	0.025	0.039	0.045	0.064	0.074	0.085	0.093	0.106	0.102
				rpm obr/min	1751	1432	1146	955	841	716	654	573	471
				feed posuw mm/min	131	168	206	244	249	244	243	243	240
K	15-20	0.5D	1.5D	Vc m/min	50	57	57	54	55	57	61	57	57
				fz mm/tooth	0.027	0.04	0.053	0.069	0.078	0.087	0.092	0.109	0.106
				rpm obr/min	2653	2268	1814	1432	1251	1134	1079	907	726
				feed posuw mm/min	215	272	385	395	390	395	397	396	385
H	40	0.3D	1.5D	Vc m/min	21	22	24	23	23	23	23	23	24
				fz mm/tooth	0.028	0.04	0.045	0.06	0.071	0.082	0.091	0.101	0.1
				rpm obr/min	1114	875	764	610	523	458	407	366	306
				feed posuw mm/min	94	105	138	146	149	150	148	148	153

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT60

2 Medium Rough

HSM Vmax A min AIR

ISO																																													
	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○														

UNCOATED	TIALN BASED	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT60010005B06003047	PMT40010	0,5	1	6	2,5	47
PMT60020010B06004048	PMT40020	1	2	6	4	48
PMT60030015B06005049	PMT40030	1,5	3	6	5	49
PMT60040020B06007051	PMT40040	2	4	6	7	51
PMT60050025B06008052	PMT40050	2,5	5	6	8	52
PMT60060030B06008052	PMT40060	3	6	6	8	52
PMT60070035B10010060	PMT40070	3,5	7	10	10	60
PMT60080040B10011061	PMT40080	4	8	10	11	61
PMT60090045B10011061	PMT40090	4,5	9	10	11	61
PMT60100050B10013063	PMT40100	5	10	10	13	63
PMT60120060B12016073	PMT40120	6	12	12	16	73
PMT60140070B12016073	PMT40140	7	14	12	16	73
PMT60160080B16019079	PMT40160	8	16	16	19	79
PMT60180090B16019079	PMT40180	9	18	16	19	79
PMT60200100B20022088	PMT40200	10	20	20	22	88
PMT60220110B20022088	PMT40220	11	22	20	22	88
PMT60250125B25026102	PMT40250	12,5	25	25	26	102

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h6

PMT60

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE TIALN COATED/ FREZ KULOWY O 2 ZĘBACH POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.5D	0.2D	Vc m/min	70	75	85	85	85	85	85	85	75
				fz mm/tooth	0.023	0.036	0.055	0.079	0.109	0.115	0.141	0.156	0.163
				rpm obr/min	7427	5968	4509	3382	2706	2255	1691	1353	955
				feed posuw mm/min	342	430	496	534	590	519	477	422	311
	2	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217
	3-4	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	35
				fz mm/tooth	0.016	0.027	0.039	0.056	0.082	0.083	0.101	0.11	0.122
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	446
				feed posuw mm/min	119	172	186	201	235	198	181	158	109
	5	0.5D	0.2D	Vc m/min	20	20	25	20	20	20	20	25	20
				fz mm/tooth	0.014	0.023	0.035	0.048	0.075	0.073	0.091	0.097	0.104
				rpm obr/min	2122	1592	1326	796	637	531	398	398	255
				feed posuw mm/min	59	73	93	76	95	77	72	77	53
	6	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217
	7	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	35
				fz mm/tooth	0.016	0.027	0.039	0.056	0.082	0.083	0.101	0.11	0.122
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	446
				feed posuw mm/min	119	172	186	201	235	198	181	158	109
	8-9	0.5D	0.2D	Vc m/min	20	20	25	20	20	20	20	25	20
				fz mm/tooth	0.014	0.023	0.035	0.048	0.075	0.073	0.091	0.097	0.104
				rpm obr/min	2122	1592	1326	796	637	531	398	398	255
				feed posuw mm/min	59	73	93	76	95	77	72	77	53
	10	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217
	11.1	0.5D	0.2D	Vc m/min	20	20	25	20	20	20	20	25	20
				fz mm/tooth	0.014	0.023	0.035	0.048	0.075	0.073	0.091	0.097	0.104
				rpm obr/min	2122	1592	1326	796	637	531	398	398	255
				feed posuw mm/min	59	73	93	76	95	77	72	77	53
M	14.1	0.5D	0.2D	Vc m/min	20	20	25	25	25	25	25	25	20
				fz mm/tooth	0.014	0.023	0.036	0.048	0.073	0.074	0.092	0.1	0.1
				rpm obr/min	2122	1592	1326	995	796	663	497	398	255
				feed posuw mm/min	59	73	95	95	116	98	92	80	51
K	15-20	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT60

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE UNCOATED/ FREZ KULOWY O 2 ZĘBACH NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.5D	0.2D	Vc m/min	45	50	55	60	55	55	55	60	50
				fz mm/tooth	0.021	0.033	0.05	0.072	0.103	0.11	0.136	0.14	0.148
				rpm obr/min	4775	3979	2918	2387	1751	1459	1094	955	637
				feed posuw mm/min	201	263	292	344	361	321	298	267	188
	2	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132
	3-4	0.5D	0.2D	Vc m/min	25	25	30	30	30	30	30	30	25
				fz mm/tooth	0.015	0.024	0.034	0.052	0.07	0.076	0.092	0.099	0.103
				rpm obr/min	2653	1989	1592	1194	955	796	597	477	318
				feed posuw mm/min	80	95	108	124	134	121	110	95	66
	5	0.5D	0.2D	Vc m/min	10	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.023	0.034	0.046	0.068	0.069	0.083	0.094	0.086
				rpm obr/min	1061	1194	796	597	477	398	298	239	191
				feed posuw mm/min	28	55	54	55	65	55	50	45	33
	6	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132
	7	0.5D	0.2D	Vc m/min	25	25	30	30	30	30	30	30	25
				fz mm/tooth	0.015	0.024	0.034	0.052	0.07	0.076	0.092	0.099	0.103
				rpm obr/min	2653	1989	1592	1194	955	796	597	477	318
				feed posuw mm/min	80	95	108	124	134	121	110	95	66
	8-9	0.5D	0.2D	Vc m/min	10	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.023	0.034	0.046	0.068	0.069	0.083	0.094	0.086
				rpm obr/min	1061	1194	796	597	477	398	298	239	191
				feed posuw mm/min	28	55	54	55	65	55	50	45	33
	10	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132
	11.1	0.5D	0.2D	Vc m/min	10	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.023	0.034	0.046	0.068	0.069	0.083	0.094	0.086
				rpm obr/min	1061	1194	796	597	477	398	298	239	191
				feed posuw mm/min	28	55	54	55	65	55	50	45	33
M	14.1	0.5D	0.2D	Vc m/min	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.014	0.025	0.036	0.049	0.075	0.074	0.091	0.104	0.09
				rpm obr/min	1592	1194	796	597	477	398	298	239	191
				feed posuw mm/min	45	60	57	58	72	59	54	50	34
K	15-20	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT62

2 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	TIALN BASED	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT62020010B06007054	PMT32020	1	2	6	7	54
PMT62030015B06008056	PMT32030	1,5	3	6	8	56
PMT62040020B06011063	PMT32040	2	4	6	11	63
PMT62050025B06013068	PMT32050	2,5	5	6	13	68
PMT62060030B06013068	PMT32060	3	6	6	13	68
PMT62070035B10016080	PMT32070	3,5	7	10	16	80
PMT62080040B10019088	PMT32080	4	8	10	19	88
PMT62090045B10019088	PMT32090	4,5	9	10	19	88
PMT62100050B10022095	PMT32100	5	10	10	22	95
PMT62120060B12026110	PMT32120	6	12	12	26	110
PMT62140070B12026110	PMT32140	7	14	12	26	110
PMT62160080B16032123	PMT32160	8	16	16	32	123
PMT62180090B16032123	PMT32180	9	18	16	32	123
PMT62200100B20038141	PMT32200	10	20	20	38	141
PMT62220110B20038141	PMT32220	11	22	20	38	141
PMT62250125B25045166	PMT32250	12,5	25	25	45	166

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h6

PMT62

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE TIALN COATED/ FREZ KULOWY O 2 ZĘBACH POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.5D	0.2D	Vc m/min	70	75	85	85	85	85	85	85	75
				fz mm/tooth	0.023	0.036	0.055	0.079	0.109	0.115	0.141	0.156	0.163
				rpm obr/min	7427	5968	4509	3382	2706	2255	1691	1353	955
				feed posuw mm/min	342	430	496	534	590	519	477	422	311
	2	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217
	3-4	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	35
				fz mm/tooth	0.016	0.027	0.039	0.056	0.082	0.083	0.101	0.11	0.122
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	446
				feed posuw mm/min	119	172	186	201	235	198	181	158	109
	5	0.5D	0.2D	Vc m/min	20	20	25	20	20	20	20	25	20
				fz mm/tooth	0.014	0.023	0.035	0.048	0.075	0.073	0.091	0.097	0.104
				rpm obr/min	2122	1592	1326	796	637	531	398	398	255
				feed posuw mm/min	59	73	93	76	95	77	72	77	53
	6	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217
	7	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	35
				fz mm/tooth	0.016	0.027	0.039	0.056	0.082	0.083	0.101	0.11	0.122
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	446
				feed posuw mm/min	119	172	186	201	235	198	181	158	109
	8-9	0.5D	0.2D	Vc m/min	20	20	25	20	20	20	20	25	20
				fz mm/tooth	0.014	0.023	0.035	0.048	0.075	0.073	0.091	0.097	0.104
				rpm obr/min	2122	1592	1326	796	637	531	398	398	255
				feed posuw mm/min	59	73	93	76	95	77	72	77	53
	10	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217
	11.1	0.5D	0.2D	Vc m/min	20	20	25	20	20	20	20	25	20
				fz mm/tooth	0.014	0.023	0.035	0.048	0.075	0.073	0.091	0.097	0.104
				rpm obr/min	2122	1592	1326	796	637	531	398	398	255
				feed posuw mm/min	59	73	93	76	95	77	72	77	53
M	14.1	0.5D	0.2D	Vc m/min	20	20	25	25	25	25	25	25	20
				fz mm/tooth	0.014	0.023	0.036	0.048	0.073	0.074	0.092	0.1	0.1
				rpm obr/min	2122	1592	1326	995	796	663	497	398	255
				feed posuw mm/min	59	73	95	95	116	98	92	80	51
K	15-20	0.5D	0.2D	Vc m/min	55	60	65	65	65	70	65	65	60
				fz mm/tooth	0.02	0.031	0.046	0.067	0.095	0.097	0.123	0.14	0.142
				rpm obr/min	5836	4775	3448	2586	2069	1857	1293	1035	764
				feed posuw mm/min	233	296	317	347	393	360	318	290	217

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT62

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE UNCOATED/ FREZ KULOWY O 2 ZĘBACH NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.5D	0.2D	Vc m/min	45	50	55	60	55	55	55	60	50
				fz mm/tooth	0.021	0.033	0.05	0.072	0.103	0.11	0.136	0.14	0.148
				rpm obr/min	4775	3979	2918	2387	1751	1459	1094	955	637
				feed posuw mm/min	201	263	292	344	361	321	298	267	188
	2	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132
	3-4	0.5D	0.2D	Vc m/min	25	25	30	30	30	30	30	30	25
				fz mm/tooth	0.015	0.024	0.034	0.052	0.07	0.076	0.092	0.099	0.103
				rpm obr/min	2653	1989	1592	1194	955	796	597	477	318
				feed posuw mm/min	80	95	108	124	134	121	110	95	66
	5	0.5D	0.2D	Vc m/min	10	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.023	0.034	0.046	0.068	0.069	0.083	0.094	0.086
				rpm obr/min	1061	1194	796	597	477	398	298	239	191
				feed posuw mm/min	28	55	54	55	65	55	50	45	33
	6	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132
	7	0.5D	0.2D	Vc m/min	25	25	30	30	30	30	30	30	25
				fz mm/tooth	0.015	0.024	0.034	0.052	0.07	0.076	0.092	0.099	0.103
				rpm obr/min	2653	1989	1592	1194	955	796	597	477	318
				feed posuw mm/min	80	95	108	124	134	121	110	95	66
	8-9	0.5D	0.2D	Vc m/min	10	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.023	0.034	0.046	0.068	0.069	0.083	0.094	0.086
				rpm obr/min	1061	1194	796	597	477	398	298	239	191
				feed posuw mm/min	28	55	54	55	65	55	50	45	33
	10	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132
	11.1	0.5D	0.2D	Vc m/min	10	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.023	0.034	0.046	0.068	0.069	0.083	0.094	0.086
				rpm obr/min	1061	1194	796	597	477	398	298	239	191
				feed posuw mm/min	28	55	54	55	65	55	50	45	33
M	14.1	0.5D	0.2D	Vc m/min	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.014	0.025	0.036	0.049	0.075	0.074	0.091	0.104	0.09
				rpm obr/min	1592	1194	796	597	477	398	298	239	191
				feed posuw mm/min	45	60	57	58	72	59	54	50	34
K	15-20	0.5D	0.2D	Vc m/min	35	40	45	45	45	45	45	45	40
				fz mm/tooth	0.018	0.029	0.043	0.061	0.089	0.092	0.111	0.12	0.13
				rpm obr/min	3714	3183	2387	1790	1432	1194	895	716	509
				feed posuw mm/min	134	185	205	218	255	220	199	172	132

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT66

2 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●

ISO	N												S							H			
HRc													15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100					200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41		
						○	○	○															

UNCOATED	TIALN BASED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT66010000B06003047	PMT36010	1	6	2,5	47
PMT66020000B06004048	PMT36020	2	6	4	48
PMT66030000B06005049	PMT36030	3	6	5	49
PMT66040000B06007051	PMT36040	4	6	7	51
PMT66050000B06008052	PMT36050	5	6	8	52
PMT66060000B06008052	PMT36060	6	6	8	52
PMT66070000B10010060	PMT36070	7	10	10	60
PMT66080000B10011061	PMT36080	8	10	11	61
PMT66090000B10011061	PMT36090	9	10	11	61
PMT66100000B10013063	PMT36100	10	10	13	63
PMT66120000B12016073	PMT36120	12	12	16	73
PMT66140000B12016073	PMT36140	14	12	16	73
PMT66160000B16019079	PMT36160	16	16	19	79
PMT66180000B16019079	PMT36180	18	16	19	79
PMT66200000B20022088	PMT36200	20	20	22	88
PMT66220000B20022088	PMT36220	22	20	22	88
PMT66250000B25026102	PMT36250	25	25	26	102

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM				
	1-3	3-6	6-10	10-18	18-30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13

PMT66

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING TIALN COATED/ FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
	2	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	3-4	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.008	0.017	0.025	0.036	0.041	0.056	0.079	0.091	0.098	0.101	0.101	0.107	0.104	0.117
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	76	108	159	183	196	201	226	217	201	181	161	153	120	119
	5	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
	6	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	7	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.008	0.017	0.025	0.036	0.041	0.056	0.079	0.091	0.098	0.101	0.101	0.107	0.104	0.117
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	76	108	159	183	196	201	226	217	201	181	161	153	120	119
	8	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
	9	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	10	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	11.1	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
K	15-20	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT66

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING UNCOATED/ FREZ O 2 ZĘBACH ROWKOWANIE NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	30	30	35	40	45	45	45	45	50	45	45	40	40	40
				fz mm/tooth	0.007	0.015	0.024	0.031	0.035	0.047	0.064	0.071	0.073	0.089	0.094	0.102	0.096	0.093
				rpm obr/min	4775	3183	2785	2546	2387	1790	1432	1194	1137	895	796	637	579	509
				feed posuw mm/min	67	95	134	158	167	168	183	170	166	159	150	130	111	95
	2	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88
	3-4	1.0D	0.5D	Vc m/min	20	20	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.008	0.017	0.024	0.032	0.038	0.052	0.07	0.081	0.088	0.092	0.094	0.099	0.094	0.103
				rpm obr/min	3183	2122	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	51	72	95	122	121	124	134	129	120	110	100	95	82	66
	5	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.01	0.016	0.023	0.03	0.033	0.047	0.067	0.07	0.076	0.086	0.081	0.092	0.093	0.094
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	48	51	55	57	70	75	85	74	69	68	57	59	54	48
	6	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88
	7	1.0D	0.5D	Vc m/min	20	20	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.008	0.017	0.024	0.032	0.038	0.052	0.07	0.081	0.088	0.092	0.094	0.099	0.094	0.103
				rpm obr/min	3183	2122	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	51	72	95	122	121	124	134	129	120	110	100	95	82	66
	8	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.01	0.016	0.023	0.03	0.033	0.047	0.067	0.07	0.076	0.086	0.081	0.092	0.093	0.094
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	48	51	55	57	70	75	85	74	69	68	57	59	54	48
	9	1.0D	0.5D	Vc m/min	10	10	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.01	0.017	0.021	0.025	0.037	0.046	0.068	0.069	0.074	0.083	0.083	0.083	0.083	0.086
				rpm obr/min	1592	1061	1194	955	796	597	477	398	341	298	265	239	217	191
				feed posuw mm/min	32	36	50	48	59	55	65	55	50	50	44	40	36	33
	10	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.01	0.016	0.023	0.03	0.033	0.047	0.067	0.07	0.076	0.086	0.081	0.092	0.093	0.094
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	48	51	55	57	70	75	85	74	69	68	57	59	54	48
K	15-20	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT69

2 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	TIALN BASED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT69010000B06003047	PMT29010	1	6	3	47
PMT69020000B06007051	PMT29020	2	6	7	51
PMT69030000B06008052	PMT29030	3	6	8	52
PMT69040000B06011055	PMT29040	4	6	11	55
PMT69050000B06013057	PMT29050	5	6	13	57
PMT69060000B06013057	PMT29060	6	6	13	57
PMT69070000B10016066	PMT29070	7	10	16	66
PMT69080000B10019069	PMT29080	8	10	19	69
PMT69090000B10019069	PMT29090	9	10	19	69
PMT69100000B10022072	PMT29100	10	10	22	72
PMT69120000B12026083	PMT29120	12	12	26	83
PMT69140000B12026083	PMT29140	14	12	26	83
PMT69160000B16032092	PMT29160	16	16	32	92
PMT69180000B16032092	PMT29180	18	16	32	92
PMT69200000B20038104	PMT29200	20	20	38	104
PMT69220000B20038104	PMT29220	22	20	38	104
PMT69250000B25045121	PMT29250	25	25	45	121

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM				
	1-3	3-6	6-10	10-18	18-30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13

PMT69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING TIALN COATED/ FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
	2	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	3-4	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.008	0.017	0.025	0.036	0.041	0.056	0.079	0.091	0.098	0.101	0.101	0.107	0.104	0.117
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	76	108	159	183	196	201	226	217	201	181	161	153	120	119
	5	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
	6	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	7	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.008	0.017	0.025	0.036	0.041	0.056	0.079	0.091	0.098	0.101	0.101	0.107	0.104	0.117
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	76	108	159	183	196	201	226	217	201	181	161	153	120	119
	8	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
	9	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	10	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141
	11.1	1.0D	0.5D	Vc m/min	45	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.008	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.083	0.098	0.104	0.116	0.11	0.103
				rpm obr/min	7162	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	115	153	236	252	262	274	294	282	264	273	239	222	191	157
K	15-20	1.0D	0.5D	Vc m/min	35	40	45	50	55	55	55	55	55	60	55	50	50	50
				fz mm/tooth	0.008	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.084	0.085	0.103	0.106	0.106	0.111
				rpm obr/min	5570	4244	3581	3183	2918	2188	1751	1459	1251	1194	973	796	723	637
				feed posuw mm/min	89	136	172	197	210	241	259	242	210	203	200	169	153	141

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT69

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING UNCOATED/ FREZ O 2 ZĘBACH ROWKOWANIE NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	30	30	35	40	45	45	45	45	50	45	45	40	40	40
				fz mm/tooth	0.007	0.015	0.024	0.031	0.035	0.047	0.064	0.071	0.073	0.089	0.094	0.102	0.096	0.093
				rpm obr/min	4775	3183	2785	2546	2387	1790	1432	1194	1137	895	796	637	579	509
				feed posuw mm/min	67	95	134	158	167	168	183	170	166	159	150	130	111	95
	2	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88
	3-4	1.0D	0.5D	Vc m/min	20	20	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.008	0.017	0.024	0.032	0.038	0.052	0.07	0.081	0.088	0.092	0.094	0.099	0.094	0.103
				rpm obr/min	3183	2122	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	51	72	95	122	121	124	134	129	120	110	100	95	82	66
	5	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.01	0.016	0.023	0.03	0.033	0.047	0.067	0.07	0.076	0.086	0.081	0.092	0.093	0.094
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	48	51	55	57	70	75	85	74	69	68	57	59	54	48
	6	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88
	7	1.0D	0.5D	Vc m/min	20	20	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.008	0.017	0.024	0.032	0.038	0.052	0.07	0.081	0.088	0.092	0.094	0.099	0.094	0.103
				rpm obr/min	3183	2122	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	51	72	95	122	121	124	134	129	120	110	100	95	82	66
	8	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.01	0.016	0.023	0.03	0.033	0.047	0.067	0.07	0.076	0.086	0.081	0.092	0.093	0.094
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	48	51	55	57	70	75	85	74	69	68	57	59	54	48
	9	1.0D	0.5D	Vc m/min	10	10	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.01	0.017	0.021	0.025	0.037	0.046	0.068	0.069	0.074	0.083	0.083	0.083	0.083	0.086
				rpm obr/min	1592	1061	1194	955	796	597	477	398	341	298	265	239	217	191
				feed posuw mm/min	32	36	50	48	59	55	65	55	50	50	44	40	36	33
	10	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.01	0.016	0.023	0.03	0.033	0.047	0.067	0.07	0.076	0.086	0.081	0.092	0.093	0.094
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	48	51	55	57	70	75	85	74	69	68	57	59	54	48
K	15-20	1.0D	0.5D	Vc m/min	25	25	30	35	40	40	40	40	35	40	35	35	35	35
				fz mm/tooth	0.007	0.015	0.023	0.028	0.034	0.05	0.069	0.075	0.082	0.09	0.094	0.093	0.094	0.099
				rpm obr/min	3979	2653	2387	2228	2122	1592	1273	1061	796	796	619	557	506	446
				feed posuw mm/min	56	80	110	125	144	159	176	159	131	143	116	104	95	88

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT82

3 Medium Rough

<Ø 1mm ≥Ø 1mm

HSM Vmax A min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	TIALN BASED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT82010000B06003047	PMT42010	1	6	2,5	47
PMT82020000B06004048	PMT42020	2	6	4	48
PMT82030000B06005049	PMT42030	3	6	5	49
PMT82040000B06007051	PMT42040	4	6	7	51
PMT82050000B06008052	PMT42050	5	6	8	52
PMT82060000B06008052	PMT42060	6	6	8	52
PMT82070000B10010060	PMT42070	7	10	10	60
PMT82080000B10011061	PMT42080	8	10	11	61
PMT82090000B10011061	PMT42090	9	10	11	61
PMT82100000B10013063	PMT42100	10	10	13	63
PMT82120000B12016073	PMT42120	12	12	16	73
PMT82140000B12016073	PMT42140	14	12	16	73
PMT82160000B16019079	PMT42160	16	16	19	79
PMT82180000B16019079	PMT42180	18	16	19	79
PMT82200000B20022088	PMT42200	20	20	22	88
PMT82220000B20022088	PMT42220	22	20	22	88
PMT82250000B25026102	PMT42250	25	25	26	102

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM				
	1-3	3-6	6-10	10-18	18-30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13

PMT82

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING TIALN COATED/ FREZ O 3 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	40	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.004	0.007	0.011	0.014	0.023	0.031	0.033	0.051	0.052	0.059	0.07	0.081	0.091	0.107
				rpm obr/min	6366	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	76	100	144	160	238	241	205	284	248	246	241	232	237	245
	2	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212
	3-4	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.003	0.005	0.009	0.012	0.02	0.028	0.038	0.047	0.053	0.056	0.063	0.067	0.083	0.109
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	43	48	86	92	143	150	163	168	163	150	150	144	144	167
	5	1.0D	0.5D	Vc m/min	20	20	25	25	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.03	0.043	0.052	0.056	0.061	0.063	0.07	0.079	0.094
				rpm obr/min	3183	2122	1989	1592	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	38	45	54	57	84	107	123	124	115	109	100	100	103	108
	6	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212
	7	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.003	0.005	0.009	0.012	0.02	0.028	0.038	0.047	0.053	0.056	0.063	0.067	0.083	0.109
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	43	48	86	92	143	150	163	168	163	150	150	144	144	167
	8	1.0D	0.5D	Vc m/min	20	20	25	25	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.03	0.043	0.052	0.056	0.061	0.063	0.07	0.079	0.094
				rpm obr/min	3183	2122	1989	1592	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	38	45	54	57	84	107	123	124	115	109	100	100	103	108
	9	1.0D	0.5D	Vc m/min	10	15	20	20	20	20	20	20	20	20	25	25	20	20
				fz mm/tooth	0.005	0.008	0.012	0.014	0.023	0.032	0.045	0.053	0.057	0.064	0.067	0.074	0.09	0.113
				rpm obr/min	1592	1592	1592	1273	1061	796	637	531	455	398	442	398	289	255
				feed posuw mm/min	24	38	57	53	73	76	86	84	78	76	89	88	78	86
	10	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212
	11.1	1.0D	0.5D	Vc m/min	20	20	25	25	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.03	0.043	0.052	0.056	0.061	0.063	0.07	0.079	0.094
				rpm obr/min	3183	2122	1989	1592	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	38	45	54	57	84	107	123	124	115	109	100	100	103	108
K	15-20	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT82

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING UNCOATED/ FREZ O 3 ZĘBACH ROWKOWANIE NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	30	30	35	40	45	45	45	45	45	45	45	40	40	40
				fz mm/tooth	0.003	0.007	0.01	0.013	0.021	0.028	0.037	0.047	0.048	0.054	0.064	0.076	0.085	0.096
				rpm obr/min	4775	3183	2785	2546	2387	1790	1432	1194	1023	895	796	637	579	509
				feed posuw mm/min	43	67	84	99	150	150	159	168	147	145	153	145	148	147
	2	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135
	3-4	1.0D	0.5D	Vc m/min	20	30	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.003	0.003	0.008	0.01	0.018	0.026	0.035	0.043	0.049	0.052	0.06	0.059	0.077	0.098
				rpm obr/min	3183	3183	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	29	29	48	57	86	93	100	103	100	93	95	85	100	94
	5	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.009	0.012	0.018	0.028	0.038	0.047	0.048	0.057	0.057	0.061	0.074	0.09
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	21	33	32	34	57	67	73	75	65	68	60	58	64	69
	6	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135
	7	1.0D	0.5D	Vc m/min	20	30	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.003	0.003	0.008	0.01	0.018	0.026	0.035	0.043	0.049	0.052	0.06	0.059	0.077	0.098
				rpm obr/min	3183	3183	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	29	29	48	57	86	93	100	103	100	93	95	85	100	94
	8	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.009	0.012	0.018	0.028	0.038	0.047	0.048	0.057	0.057	0.061	0.074	0.09
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	21	33	32	34	57	67	73	75	65	68	60	58	64	69
	9	1.0D	0.5D	Vc m/min	10	10	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.005	0.008	0.012	0.013	0.02	0.03	0.042	0.049	0.053	0.061	0.062	0.068	0.085	0.108
				rpm obr/min	1592	1061	1194	955	796	597	477	398	341	298	265	239	217	191
				feed posuw mm/min	24	25	43	37	48	54	60	58	54	55	49	49	55	62
	10	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.009	0.012	0.018	0.028	0.038	0.047	0.048	0.057	0.057	0.061	0.074	0.09
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	21	33	32	34	57	67	73	75	65	68	60	58	64	69
K	15-20	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT82

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING TIALN COATED/ FREZ O 3 ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	50	55	65	75	80	80	80	80	80	80	75	80	80	80
				fz mm/tooth	0.004	0.008	0.012	0.015	0.024	0.034	0.047	0.056	0.065	0.069	0.077	0.08	0.09	0.11
				rpm obr/min	7958	5836	5173	4775	4244	3183	2546	2122	1819	1592	1326	1273	1157	1019
				feed posuw mm/min	95	140	186	215	306	325	359	357	355	329	306	306	313	336
	2	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	3-4	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	5	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	6	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	7	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	8	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	9	0.1D	1.5D	Vc m/min	15	20	25	25	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.006	0.01	0.013	0.015	0.022	0.035	0.047	0.056	0.063	0.07	0.073	0.083	0.092	0.111
				rpm obr/min	2387	2122	1989	1592	1592	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	43	64	78	72	105	125	135	134	129	125	116	119	120	127
	10	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	11.1	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
K	15-20	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT82

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING UNCOATED/ FREZ O 3 ZĘBACH FREZOWANIE BOKIEM NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	50	55	65	75	80	80	80	80	80	80	75	80	80	80
				fz mm/tooth	0.004	0.008	0.012	0.015	0.024	0.034	0.047	0.056	0.065	0.069	0.077	0.08	0.09	0.11
				rpm obr/min	7958	5836	5173	4775	4244	3183	2546	2122	1819	1592	1326	1273	1157	1019
				feed posuw mm/min	95	140	186	215	306	325	359	357	355	329	306	306	313	336
	2	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	3-4	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	5	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	6	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	7	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	8	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	9	0.1D	1.5D	Vc m/min	15	20	25	25	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.006	0.01	0.013	0.015	0.022	0.035	0.047	0.056	0.063	0.07	0.073	0.083	0.092	0.111
				rpm obr/min	2387	2122	1989	1592	1592	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	43	64	78	72	105	125	135	134	129	125	116	119	120	127
	10	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	11.1	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
K	15-20	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT84

3 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	TIALN BASED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT84010000B06003047	PMT30010	1	6	3	47
PMT84020000B06007051	PMT30020	2	6	7	51
PMT84030000B06008052	PMT30030	3	6	8	52
PMT84040000B06011055	PMT30040	4	6	11	55
PMT84050000B06013057	PMT30050	5	6	13	57
PMT84060000B06013057	PMT30060	6	6	13	57
PMT84070000B10016066	PMT30070	7	10	16	66
PMT84080000B10019069	PMT30080	8	10	19	69
PMT84090000B10019069	PMT30090	9	10	19	69
PMT84100000B10022072	PMT30100	10	10	22	72
PMT84120000B12026083	PMT30120	12	12	26	83
PMT84140000B12026083	PMT30140	14	12	26	83
PMT84160000B16032092	PMT30160	16	16	32	92
PMT84180000B16032092	PMT30180	18	16	32	92
PMT84200000B20038104	PMT30200	20	20	38	104
PMT84220000B20038104	PMT30220	22	20	38	104
PMT84250000B25045121	PMT30250	25	25	45	121

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM				
	1-3	3-6	6-10	10-18	18-30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13

PMT84

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING TIALN COATED/ FREZ O 3 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	40	45	55	60	65	65	65	70	70	70	65	60	60	60
				fz mm/tooth	0.004	0.007	0.011	0.014	0.023	0.031	0.033	0.051	0.052	0.059	0.07	0.081	0.091	0.107
				rpm obr/min	6366	4775	4377	3820	3448	2586	2069	1857	1592	1393	1149	955	868	764
				feed posuw mm/min	76	100	144	160	238	241	205	284	248	246	241	232	237	245
	2	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212
	3-4	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.003	0.005	0.009	0.012	0.02	0.028	0.038	0.047	0.053	0.056	0.063	0.067	0.083	0.109
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	43	48	86	92	143	150	163	168	163	150	150	144	144	167
	5	1.0D	0.5D	Vc m/min	20	20	25	25	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.03	0.043	0.052	0.056	0.061	0.063	0.07	0.079	0.094
				rpm obr/min	3183	2122	1989	1592	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	38	45	54	57	84	107	123	124	115	109	100	100	103	108
	6	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212
	7	1.0D	0.5D	Vc m/min	30	30	40	40	45	45	45	45	45	45	45	45	40	40
				fz mm/tooth	0.003	0.005	0.009	0.012	0.02	0.028	0.038	0.047	0.053	0.056	0.063	0.067	0.083	0.109
				rpm obr/min	4775	3183	3183	2546	2387	1790	1432	1194	1023	895	796	716	579	509
				feed posuw mm/min	43	48	86	92	143	150	163	168	163	150	150	144	144	167
	8	1.0D	0.5D	Vc m/min	20	20	25	25	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.03	0.043	0.052	0.056	0.061	0.063	0.07	0.079	0.094
				rpm obr/min	3183	2122	1989	1592	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	38	45	54	57	84	107	123	124	115	109	100	100	103	108
	9	1.0D	0.5D	Vc m/min	10	15	20	20	20	20	20	20	20	20	25	25	20	20
				fz mm/tooth	0.005	0.008	0.012	0.014	0.023	0.032	0.045	0.053	0.057	0.064	0.067	0.074	0.09	0.113
				rpm obr/min	1592	1592	1592	1273	1061	796	637	531	455	398	442	398	289	255
				feed posuw mm/min	24	38	57	53	73	76	86	84	78	76	89	88	78	86
	10	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212
	11.1	1.0D	0.5D	Vc m/min	20	20	25	25	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.004	0.007	0.009	0.012	0.021	0.03	0.043	0.052	0.056	0.061	0.063	0.07	0.079	0.094
				rpm obr/min	3183	2122	1989	1592	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	38	45	54	57	84	107	123	124	115	109	100	100	103	108
K	15-20	1.0D	0.5D	Vc m/min	35	35	45	50	55	55	55	55	60	60	50	50	50	50
				fz mm/tooth	0.003	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.054	0.061	0.071	0.08	0.089	0.111
				rpm obr/min	5570	3714	3581	3183	2918	2188	1751	1459	1364	1194	884	796	723	637
				feed posuw mm/min	50	78	118	134	201	210	205	232	221	218	188	191	193	212

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT84

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SLOTTING UNCOATED/ FREZ O 3 ZĘBACH ROWKOWANIE NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	1.0D	0.5D	Vc m/min	30	30	35	40	45	45	45	45	45	45	45	40	40	40
				fz mm/tooth	0.003	0.007	0.01	0.013	0.021	0.028	0.037	0.047	0.048	0.054	0.064	0.076	0.085	0.096
				rpm obr/min	4775	3183	2785	2546	2387	1790	1432	1194	1023	895	796	637	579	509
				feed posuw mm/min	43	67	84	99	150	150	159	168	147	145	153	145	148	147
	2	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135
	3-4	1.0D	0.5D	Vc m/min	20	30	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.003	0.003	0.008	0.01	0.018	0.026	0.035	0.043	0.049	0.052	0.06	0.059	0.077	0.098
				rpm obr/min	3183	3183	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	29	29	48	57	86	93	100	103	100	93	95	85	100	94
	5	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.009	0.012	0.018	0.028	0.038	0.047	0.048	0.057	0.057	0.061	0.074	0.09
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	21	33	32	34	57	67	73	75	65	68	60	58	64	69
	6	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135
	7	1.0D	0.5D	Vc m/min	20	30	25	30	30	30	30	30	30	30	30	30	30	25
				fz mm/tooth	0.003	0.003	0.008	0.01	0.018	0.026	0.035	0.043	0.049	0.052	0.06	0.059	0.077	0.098
				rpm obr/min	3183	3183	1989	1910	1592	1194	955	796	682	597	531	477	434	318
				feed posuw mm/min	29	29	48	57	86	93	100	103	100	93	95	85	100	94
	8	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.009	0.012	0.018	0.028	0.038	0.047	0.048	0.057	0.057	0.061	0.074	0.09
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	21	33	32	34	57	67	73	75	65	68	60	58	64	69
	9	1.0D	0.5D	Vc m/min	10	10	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.005	0.008	0.012	0.013	0.02	0.03	0.042	0.049	0.053	0.061	0.062	0.068	0.085	0.108
				rpm obr/min	1592	1061	1194	955	796	597	477	398	341	298	265	239	217	191
				feed posuw mm/min	24	25	43	37	48	54	60	58	54	55	49	49	55	62
	10	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.009	0.012	0.018	0.028	0.038	0.047	0.048	0.057	0.057	0.061	0.074	0.09
				rpm obr/min	2387	1592	1194	955	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	21	33	32	34	57	67	73	75	65	68	60	58	64	69
K	15-20	1.0D	0.5D	Vc m/min	25	25	30	35	35	40	40	40	40	40	35	35	35	35
				fz mm/tooth	0.003	0.007	0.01	0.012	0.021	0.029	0.036	0.048	0.048	0.056	0.066	0.075	0.08	0.101
				rpm obr/min	3979	2653	2387	2228	1857	1592	1273	1061	909	796	619	557	506	446
				feed posuw mm/min	36	56	72	80	117	138	138	153	131	134	123	125	122	135

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT84

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING TIALN COATED/ FREZ O 3 ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	50	55	65	75	80	80	80	80	80	80	75	80	80	80
				fz mm/tooth	0.004	0.008	0.012	0.015	0.024	0.034	0.047	0.056	0.065	0.069	0.077	0.08	0.09	0.11
				rpm obr/min	7958	5836	5173	4775	4244	3183	2546	2122	1819	1592	1326	1273	1157	1019
				feed posuw mm/min	95	140	186	215	306	325	359	357	355	329	306	306	313	336
	2	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	3-4	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	5	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	6	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	7	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	8	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	9	0.1D	1.5D	Vc m/min	15	20	25	25	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.006	0.01	0.013	0.015	0.022	0.035	0.047	0.056	0.063	0.07	0.073	0.083	0.092	0.111
				rpm obr/min	2387	2122	1989	1592	1592	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	43	64	78	72	105	125	135	134	129	125	116	119	120	127
	10	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	11.1	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
K	15-20	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT84

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE SIDE CUTTING UNCOATED/ FREZ O 3 ZĘBACH FRZOWANIE BOKIEM NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	50	55	65	75	80	80	80	80	80	80	75	80	80	80
				fz mm/tooth	0.004	0.008	0.012	0.015	0.024	0.034	0.047	0.056	0.065	0.069	0.077	0.08	0.09	0.11
				rpm obr/min	7958	5836	5173	4775	4244	3183	2546	2122	1819	1592	1326	1273	1157	1019
				feed posuw mm/min	95	140	186	215	306	325	359	357	355	329	306	306	313	336
	2	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	3-4	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	5	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	6	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	7	0.1D	1.5D	Vc m/min	35	35	45	45	50	50	50	55	50	50	50	50	50	50
				fz mm/tooth	0.004	0.007	0.01	0.014	0.024	0.033	0.044	0.055	0.061	0.067	0.073	0.081	0.088	0.111
				rpm obr/min	5570	3714	3581	2865	2653	1989	1592	1459	1137	995	884	796	723	637
				feed posuw mm/min	67	78	107	120	191	197	210	241	208	200	194	193	191	212
	8	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
	9	0.1D	1.5D	Vc m/min	15	20	25	25	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.006	0.01	0.013	0.015	0.022	0.035	0.047	0.056	0.063	0.07	0.073	0.083	0.092	0.111
				rpm obr/min	2387	2122	1989	1592	1592	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	43	64	78	72	105	125	135	134	129	125	116	119	120	127
	10	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271
	11.1	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.004	0.008	0.011	0.014	0.023	0.036	0.05	0.056	0.06	0.071	0.075	0.08	0.092	0.107
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	48	64	79	80	128	150	143	156	143	148	139	134	120	143
K	15-20	0.1D	1.5D	Vc m/min	45	45	55	65	70	65	65	70	65	65	65	65	65	65
				fz mm/tooth	0.004	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.063	0.071	0.077	0.081	0.093	0.109
				rpm obr/min	7162	4775	4377	4138	3714	2586	2069	1857	1478	1293	1149	1035	940	828
				feed posuw mm/min	86	115	158	186	256	272	286	312	279	275	266	251	262	271

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT88

4 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	TIALN BASED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT88010000A06003049	PMT38010000B06003049	1	6	3	49
PMT88020000B06007051	PMT38020000B06007051	2	6	7	51
PMT88030000B06008052	PMT38030000B06008052	3	6	8	52
PMT88040000B06011055	PMT38040000B06011055	4	6	11	55
PMT88050000B06013057	PMT38050000B06013057	5	6	13	57
PMT88060000B06013057	PMT38060000B06013057	6	6	13	57
PMT88070000B10016066	PMT38070000B10016066	7	10	16	66
PMT88080000B10019069	PMT38080000B10019069	8	10	19	69
PMT88090000B10019069	PMT38090000B10019069	9	10	19	69
PMT88100000B10022072	PMT38100000B10022072	10	10	22	72
PMT88120000B12026083	PMT38120000B12026083	12	12	26	83
PMT88140000B12026083	PMT38140000B12026083	14	12	26	83
PMT88160000B16032092	PMT38160000B16032092	16	16	32	92
PMT88180000B16032092	PMT38180000B16032092	18	16	32	92
PMT88200000B20038104	PMT38200000B20038104	20	20	38	104
PMT88220000B20038104	PMT38220000B20038104	22	20	38	104
PMT88250000B25045121	PMT38250000B25045121	25	25	45	121

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h6

PMT88

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING TIALN COATED / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	60	60	65	70	75	80	70	75	80	80	85	80	75	80
				fz mm/tooth	0.008	0.016	0.023	0.029	0.035	0.046	0.068	0.071	0.076	0.08	0.077	0.088	0.098	0.093
				rpm obr/min	9549	6366	5173	4456	3979	3183	2228	1989	1819	1592	1503	1273	1085	1019
				feed posuw mm/min	306	407	476	517	557	586	606	565	553	509	463	448	425	379
	2	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301
	3-4	0.1D	1.5D	Vc m/min	40	40	45	45	50	50	50	55	50	50	50	50	45	50
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.087	0.088	0.094	0.091
				rpm obr/min	6366	4244	3581	2865	2653	1989	1592	1459	1137	995	884	796	651	637
				feed posuw mm/min	178	238	301	321	340	366	376	385	364	338	308	280	245	232
	5	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.066	0.067	0.073	0.081	0.077	0.083	0.085	0.089
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	127	180	210	214	238	240	252	249	232	226	191	185	148	159
	6	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301
	7	0.1D	1.5D	Vc m/min	40	40	45	45	50	50	50	55	50	50	50	50	45	50
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.087	0.088	0.094	0.091
				rpm obr/min	6366	4244	3581	2865	2653	1989	1592	1459	1137	995	884	796	651	637
				feed posuw mm/min	178	238	301	321	340	366	376	385	364	338	308	280	245	232
	8	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.066	0.067	0.073	0.081	0.077	0.083	0.085	0.089
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	127	180	210	214	238	240	252	249	232	226	191	185	148	159
	9	0.1D	1.5D	Vc m/min	20	25	25	25	25	30	30	25	30	30	30	30	30	30
				fz mm/tooth	0.006	0.013	0.019	0.024	0.031	0.04	0.056	0.064	0.067	0.075	0.075	0.08	0.081	0.087
				rpm obr/min	3183	2653	1989	1592	1326	1194	955	663	682	597	531	477	434	382
				feed posuw mm/min	76	138	151	153	164	191	214	170	183	179	159	153	141	133
	10	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301
	11.1	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.066	0.067	0.073	0.081	0.077	0.083	0.085	0.089
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	127	180	210	214	238	240	252	249	232	226	191	185	148	159
K	15-20	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT88

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING UNCOATED / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	40	40	45	45	50	55	50	50	55	55	55	55	50	55
				fz mm/tooth	0.007	0.014	0.021	0.026	0.032	0.043	0.061	0.069	0.071	0.07	0.07	0.079	0.092	0.085
				rpm obr/min	6366	4244	3581	2865	2653	2188	1592	1326	1251	1094	973	875	723	700
				feed posuw mm/min	178	238	301	298	340	376	388	366	355	306	272	277	266	238
	2	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190
	3-4	0.1D	1.5D	Vc m/min	25	30	30	30	35	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.007	0.013	0.02	0.024	0.028	0.041	0.053	0.064	0.069	0.075	0.079	0.081	0.087	0.081
				rpm obr/min	3979	3183	2387	1910	1857	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	111	166	191	183	208	228	236	238	220	209	196	180	151	144
	5	0.1D	1.5D	Vc m/min	20	20	20	20	25	25	20	25	25	25	25	25	20	20
				fz mm/tooth	0.007	0.014	0.02	0.024	0.029	0.042	0.058	0.063	0.066	0.075	0.07	0.076	0.078	0.085
				rpm obr/min	3183	2122	1592	1273	1326	995	637	663	568	497	442	398	289	255
				feed posuw mm/min	89	119	127	122	154	167	148	167	150	149	124	121	90	87
	6	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190
	7	0.1D	1.5D	Vc m/min	25	30	30	30	35	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.007	0.013	0.02	0.024	0.028	0.041	0.053	0.064	0.069	0.075	0.079	0.081	0.087	0.081
				rpm obr/min	3979	3183	2387	1910	1857	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	111	166	191	183	208	228	236	238	220	209	196	180	151	144
	8	0.1D	1.5D	Vc m/min	20	20	20	20	25	25	20	25	25	25	25	25	20	20
				fz mm/tooth	0.007	0.014	0.02	0.024	0.029	0.042	0.058	0.063	0.066	0.075	0.07	0.076	0.078	0.085
				rpm obr/min	3183	2122	1592	1273	1326	995	637	663	568	497	442	398	289	255
				feed posuw mm/min	89	119	127	122	154	167	148	167	150	149	124	121	90	87
	9	0.1D	1.5D	Vc m/min	15	15	15	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.006	0.012	0.018	0.022	0.028	0.038	0.052	0.058	0.061	0.067	0.07	0.071	0.074	0.083
				rpm obr/min	2387	1592	1194	1273	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	57	76	86	112	119	121	132	123	111	107	99	90	86	85
	10	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	25	25	20	25	25	25	25	25	20	20
				fz mm/tooth	0.007	0.014	0.02	0.024	0.029	0.042	0.058	0.063	0.066	0.075	0.07	0.076	0.078	0.085
				rpm obr/min	3183	2122	1592	1273	1326	995	637	663	568	497	442	398	289	255
				feed posuw mm/min	89	119	127	122	154	167	148	167	150	149	124	121	90	87
K	15-20	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT61

4 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	TIALN BASED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
PMT61020000B06010054	PMT31020	2	6	10	54
PMT61030000B06012056	PMT31030	3	6	12	56
PMT61040000B06019063	PMT31040	4	6	19	63
PMT61050000B06024068	PMT31050	5	6	24	68
PMT61060000B06024068	PMT31060	6	6	24	68
PMT61070000B10030080	PMT31070	7	10	30	80
PMT61080000B10038088	PMT31080	8	10	38	88
PMT61090000B10038088	PMT31090	9	10	38	88
PMT61100000B10045095	PMT31100	10	10	45	95
PMT61120000B12053110	PMT31120	12	12	53	110
PMT61140000B12053110	PMT31140	14	12	53	110
PMT61160000B16063123	PMT31160	16	16	63	123
PMT61180000B16063123	PMT31180	18	16	63	123
PMT61200000B20075141	PMT31200	20	20	75	141
PMT61220000B20075141	PMT31220	22	20	75	141
PMT61250000B25090166	PMT31250	25	25	90	166

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h6

PMT61

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING TIALN COATED / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	60	60	65	70	75	80	70	75	80	80	85	80	75	80
				fz mm/tooth	0.008	0.016	0.023	0.029	0.035	0.046	0.068	0.071	0.076	0.08	0.077	0.088	0.098	0.093
				rpm obr/min	9549	6366	5173	4456	3979	3183	2228	1989	1819	1592	1503	1273	1085	1019
				feed posuw mm/min	306	407	476	517	557	586	606	565	553	509	463	448	425	379
	2	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301
	3-4	0.1D	1.5D	Vc m/min	40	40	45	45	50	50	50	55	50	50	50	50	45	50
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.087	0.088	0.094	0.091
				rpm obr/min	6366	4244	3581	2865	2653	1989	1592	1459	1137	995	884	796	651	637
				feed posuw mm/min	178	238	301	321	340	366	376	385	364	338	308	280	245	232
	5	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.066	0.067	0.073	0.081	0.077	0.083	0.085	0.089
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	127	180	210	214	238	240	252	249	232	226	191	185	148	159
	6	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301
	7	0.1D	1.5D	Vc m/min	40	40	45	45	50	50	50	55	50	50	50	50	45	50
				fz mm/tooth	0.007	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.08	0.085	0.087	0.088	0.094	0.091
				rpm obr/min	6366	4244	3581	2865	2653	1989	1592	1459	1137	995	884	796	651	637
				feed posuw mm/min	178	238	301	321	340	366	376	385	364	338	308	280	245	232
	8	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.066	0.067	0.073	0.081	0.077	0.083	0.085	0.089
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	127	180	210	214	238	240	252	249	232	226	191	185	148	159
	9	0.1D	1.5D	Vc m/min	20	25	25	25	25	30	30	25	30	30	30	30	30	30
				fz mm/tooth	0.006	0.013	0.019	0.024	0.031	0.04	0.056	0.064	0.067	0.075	0.075	0.08	0.081	0.087
				rpm obr/min	3183	2653	1989	1592	1326	1194	955	663	682	597	531	477	434	382
				feed posuw mm/min	76	138	151	153	164	191	214	170	183	179	159	153	141	133
	10	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301
	11.1	0.1D	1.5D	Vc m/min	25	25	30	30	35	35	30	35	35	35	35	35	30	35
				fz mm/tooth	0.008	0.017	0.022	0.028	0.032	0.043	0.066	0.067	0.073	0.081	0.077	0.083	0.085	0.089
				rpm obr/min	3979	2653	2387	1910	1857	1393	955	928	796	696	619	557	434	446
				feed posuw mm/min	127	180	210	214	238	240	252	249	232	226	191	185	148	159
K	15-20	0.1D	1.5D	Vc m/min	55	55	60	65	70	65	65	70	70	70	70	65	65	65
				fz mm/tooth	0.007	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.072	0.077	0.08	0.088	0.084	0.091
				rpm obr/min	8754	5836	4775	4138	3714	2586	2069	1857	1592	1393	1238	1035	940	828
				feed posuw mm/min	245	350	401	430	460	476	521	498	458	429	396	364	316	301

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT61

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING UNCOATED / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
P	1	0.1D	1.5D	Vc m/min	40	40	45	45	50	55	50	50	55	55	55	55	50	55
				fz mm/tooth	0.007	0.014	0.021	0.026	0.032	0.043	0.061	0.069	0.071	0.07	0.07	0.079	0.092	0.085
				rpm obr/min	6366	4244	3581	2865	2653	2188	1592	1326	1251	1094	973	875	723	700
				feed posuw mm/min	178	238	301	298	340	376	388	366	355	306	272	277	266	238
	2	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190
	3-4	0.1D	1.5D	Vc m/min	25	30	30	30	35	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.007	0.013	0.02	0.024	0.028	0.041	0.053	0.064	0.069	0.075	0.079	0.081	0.087	0.081
				rpm obr/min	3979	3183	2387	1910	1857	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	111	166	191	183	208	228	236	238	220	209	196	180	151	144
	5	0.1D	1.5D	Vc m/min	20	20	20	20	25	25	20	25	25	25	25	25	20	20
				fz mm/tooth	0.007	0.014	0.02	0.024	0.029	0.042	0.058	0.063	0.066	0.075	0.07	0.076	0.078	0.085
				rpm obr/min	3183	2122	1592	1273	1326	995	637	663	568	497	442	398	289	255
				feed posuw mm/min	89	119	127	122	154	167	148	167	150	149	124	121	90	87
	6	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190
	7	0.1D	1.5D	Vc m/min	25	30	30	30	35	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.007	0.013	0.02	0.024	0.028	0.041	0.053	0.064	0.069	0.075	0.079	0.081	0.087	0.081
				rpm obr/min	3979	3183	2387	1910	1857	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	111	166	191	183	208	228	236	238	220	209	196	180	151	144
	8	0.1D	1.5D	Vc m/min	20	20	20	20	25	25	20	25	25	25	25	25	20	20
				fz mm/tooth	0.007	0.014	0.02	0.024	0.029	0.042	0.058	0.063	0.066	0.075	0.07	0.076	0.078	0.085
				rpm obr/min	3183	2122	1592	1273	1326	995	637	663	568	497	442	398	289	255
				feed posuw mm/min	89	119	127	122	154	167	148	167	150	149	124	121	90	87
	9	0.1D	1.5D	Vc m/min	15	15	15	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.006	0.012	0.018	0.022	0.028	0.038	0.052	0.058	0.061	0.067	0.07	0.071	0.074	0.083
				rpm obr/min	2387	1592	1194	1273	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	57	76	86	112	119	121	132	123	111	107	99	90	86	85
	10	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	25	25	20	25	25	25	25	25	20	20
				fz mm/tooth	0.007	0.014	0.02	0.024	0.029	0.042	0.058	0.063	0.066	0.075	0.07	0.076	0.078	0.085
				rpm obr/min	3183	2122	1592	1273	1326	995	637	663	568	497	442	398	289	255
				feed posuw mm/min	89	119	127	122	154	167	148	167	150	149	124	121	90	87
K	15-20	0.1D	1.5D	Vc m/min	35	40	40	40	45	45	45	45	50	45	50	45	45	45
				fz mm/tooth	0.007	0.013	0.02	0.025	0.029	0.042	0.059	0.063	0.065	0.074	0.074	0.081	0.078	0.083
				rpm obr/min	5570	4244	3183	2546	2387	1790	1432	1194	1137	895	884	716	651	573
				feed posuw mm/min	156	221	255	255	277	301	338	301	296	265	262	232	203	190

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT81

3-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	COATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
PMT81060000B06013057	PMT41060	6	6	13	57	3	0,18
PMT81070000B10016066	PMT41070	7	10	16	66	3	0,18
PMT81080000B10019069	PMT41080	8	10	19	69	3	0,18
PMT81090000B10019069	PMT41090	9	10	19	69	3	0,18
PMT81100000B10022072	PMT41100	10	10	22	72	4	0,18
PMT81120000B12026083	PMT41120	12	12	26	83	4	0,18
PMT81140000B12026083	PMT41140	14	12	26	83	4	0,25
PMT81160000B16032092	PMT41160	16	16	32	92	4	0,25
PMT81180000B16032092	PMT41180	18	16	32	92	4	0,25
PMT81200000B20038104	PMT41200	20	20	38	104	4	0,25
PMT81220000B20038104	PMT41220	22	20	38	104	5	0,36
PMT81250000B25045121	PMT41250	25	25	45	121	5	0,36

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

PMT81

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING TIALN COATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	55	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.027	0.04	0.055	0.065	0.074	0.086	0.099	0.111	0.096	0.105
				rpm obr/min	2918	2387	1910	1592	1364	1194	1061	955	868	764
				feed posuw mm/min	236	286	420	414	404	411	420	424	417	401
	2	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	3-4	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	5	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	6	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	7	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	8-9	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	10	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	11.1	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
M	14.1	0.5D	1.5D	Vc m/min	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.025	0.039	0.045	0.064	0.074	0.085	0.093	0.107	0.095	0.103
				rpm obr/min	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	99	140	172	204	202	203	197	204	206	197
K	15-20	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT81

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE SIDE CUTTING UNCOATED / FREZ O 4 ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	35	40	40	40	40	40	40	40	40	40
				fz mm/tooth	0.018	0.028	0.05	0.059	0.056	0.063	0.061	0.067	0.072	0.08
				rpm obr/min	1857	1592	1273	1061	909	796	707	637	579	509
				feed posuw mm/min	100	134	255	250	204	201	173	171	208	204
	2	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	3-4	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	5	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	6	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	7	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	8-9	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	10	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	11.1	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
M	14.1	0.5D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.02	0.03	0.045	0.065	0.06	0.069	0.064	0.073	0.081	0.086
				rpm obr/min	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	64	72	115	138	109	110	91	93	117	109
K	15-20	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT85

3-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	COATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
PMT85060000B06024068	PMT35060	6	6	24	68	3	0,18
PMT85070000B10030080	PMT35070	7	10	30	80	3	0,18
PMT85080000B10038088	PMT35080	8	10	38	88	3	0,18
PMT85090000B10038088	PMT35090	9	10	38	88	3	0,18
PMT85100000B10045095	PMT35100	10	10	45	95	4	0,18
PMT85120000B12053110	PMT35120	12	12	53	110	4	0,18
PMT85140000B12053110	PMT35140	14	12	53	110	4	0,25
PMT85160000B16063123	PMT35160	16	16	63	123	4	0,25
PMT85180000B16063123	PMT35180	18	16	63	123	4	0,25
PMT85200000B20075141	PMT35200	20	20	75	141	4	0,25
PMT85220000B20075141	PMT35220	22	20	75	141	5	0,36
PMT85250000B25090166	PMT35250	25	25	90	166	5	0,36

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM

	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

PMT85

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING TIALN COATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	55	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.027	0.04	0.055	0.065	0.074	0.086	0.099	0.111	0.096	0.105
				rpm obr/min	2918	2387	1910	1592	1364	1194	1061	955	868	764
				feed posuw mm/min	236	286	420	414	404	411	420	424	417	401
	2	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	3-4	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	5	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	6	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	7	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	8-9	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	10	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	11.1	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
M	14.1	0.5D	1.5D	Vc m/min	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.025	0.039	0.045	0.064	0.074	0.085	0.093	0.107	0.095	0.103
				rpm obr/min	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	99	140	172	204	202	203	197	204	206	197
K	15-20	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT85

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING UNCOATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	35	40	40	40	40	40	40	40	40	40
				fz mm/tooth	0.018	0.028	0.05	0.059	0.056	0.063	0.061	0.067	0.072	0.08
				rpm obr/min	1857	1592	1273	1061	909	796	707	637	579	509
				feed posuw mm/min	100	134	255	250	204	201	173	171	208	204
	2	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	3-4	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	5	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	6	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	7	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	8-9	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	10	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	11.1	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
M	14.1	0.5D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.02	0.03	0.045	0.065	0.06	0.069	0.064	0.073	0.081	0.086
				rpm obr/min	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	64	72	115	138	109	110	91	93	117	109
K	15-20	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT26

3-6 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●

ISO	N												S							H			
HRc													15	30	25	38	34	400	1050	55	60	42	55
HB	60	100	75	90	130	110	90	100					200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41		
						○	○	○															

COATED	DC	DCON	APMX	LU	OAL	DN	#FLUTE	CHAMFER
PMT26040	4.0	6	11	-	57	-	3	0.1
PMT26050	5.0	6	13	-	57	-	4	0.13
PMT26060	6.0	6	13	-	57	-	4	0.15
PMT26070	7.0	10	16	-	66	-	4	0.15
PMT26080	8.0	10	19	-	69	-	4	0.18
PMT26090	9.0	10	19	-	69	-	4	0.18
PMT26100	10.0	10	22	31	72	9.5	4	0.20
PMT26120	12.0	12	26	37	83	11.5	4	0.20
PMT26140	14.0	12	26	-	83	-	5	0.20
PMT26160	16.0	16	32	44	92	15	5	0.20
PMT26180	18.0	16	32	-	92	-	6	0.20
PMT26200	20.0	20	38	54	104	19	6	0.20
PMT26250	25.0	25	45	63	121	24	6	0.20

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

PMT26

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING TIALN COATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	55	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.021	0.03	0.055	0.065	0.059	0.069	0.066	0.074	0.08	0.088
				rpm obr/min	2918	2387	1910	1592	1364	1194	1061	955	868	764
				feed posuw mm/min	245	286	420	414	402	412	420	424	417	403
	2	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.085	0.088
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	170	239	304	329	322	343	329	344	332	303
	3-4	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.018	0.029	0.046	0.064	0.061	0.07	0.063	0.072	0.082	0.087
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	162	205	238	243	244	234	241	214	233
	5	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.02	0.03	0.045	0.061	0.057	0.065	0.061	0.068	0.075	0.083
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	106	119	172	194	194	194	194	195	195	190
	6	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.085	0.088
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	170	239	304	329	322	343	329	344	332	303
	7	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.018	0.029	0.046	0.064	0.061	0.07	0.063	0.072	0.082	0.087
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	162	205	238	243	244	234	241	214	233
	8-9	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.02	0.03	0.045	0.061	0.057	0.065	0.061	0.068	0.075	0.083
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	106	119	172	194	194	194	194	195	195	190
	10	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.085	0.088
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	170	239	304	329	322	343	329	344	332	303
	11.1	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.02	0.03	0.045	0.061	0.057	0.065	0.061	0.068	0.075	0.083
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	106	119	172	194	194	194	194	195	195	190
M	14.1	0.5D	1.5D	Vc m/min	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.019	0.029	0.045	0.064	0.059	0.068	0.062	0.071	0.079	0.085
				rpm obr/min	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	101	138	172	204	201	203	197	203	206	195
K	15-20	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.085	0.088
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	170	239	304	329	322	343	329	344	332	303

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT26

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING UNCOATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	35	40	40	40	40	40	40	40	40	40
				fz mm/tooth	0.018	0.028	0.05	0.059	0.056	0.063	0.061	0.067	0.072	0.08
				rpm obr/min	1857	1592	1273	1061	909	796	707	637	579	509
				feed posuw mm/min	134	178	255	250	255	251	259	256	250	244
	2	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	115	150	187	201	198	191	208	192	203	186
	3-4	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	72	111	112	154	125	154	151	155	127	122
	5	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	57	86	107	117	116	117	119	117	118	116
	6	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	115	150	187	201	198	191	208	192	203	186
	7	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	72	111	112	154	125	154	151	155	127	122
	8-9	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	57	86	107	117	116	117	119	117	118	116
	10	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	115	150	187	201	198	191	208	192	203	186
	11.1	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	57	86	107	117	116	117	119	117	118	116
M	14.1	0.5D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.02	0.03	0.045	0.065	0.06	0.069	0.064	0.073	0.081	0.086
				rpm obr/min	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	85	95	115	138	136	137	136	139	141	131
K	15-20	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	115	150	187	201	198	191	208	192	203	186

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT83

3-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	COATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
PMT83060000B06013057	PMT33060	6	6	13	57	3	0,25
PMT83070000B10016066	PMT33070	7	10	16	66	3	0,25
PMT83080000B10019069	PMT33080	8	10	19	69	3	0,25
PMT83090000B10019069	PMT33090	9	10	19	69	3	0,36
PMT83100000B10022072	PMT33100	10	10	22	72	4	0,36
PMT83120000B12026083	PMT33120	12	12	26	83	4	0,5
PMT83140000B12026083	PMT33140	14	12	26	83	4	0,55
PMT83160000B16032092	PMT33160	16	16	32	92	4	0,55
PMT83180000B16032092	PMT33180	18	16	32	92	4	0,55
PMT83200000B20038104	PMT33200	20	20	38	104	4	0,55
PMT83220000B20038104	PMT33220	22	20	38	104	5	0,55
PMT83250000B25045121	PMT33250	25	25	45	121	5	0,55

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

PMT83

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING TIALN COATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	55	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.027	0.04	0.055	0.065	0.074	0.086	0.099	0.111	0.096	0.105
				rpm obr/min	2918	2387	1910	1592	1364	1194	1061	955	868	764
				feed posuw mm/min	236	286	420	414	404	411	420	424	417	401
	2	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	3-4	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	5	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	6	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	7	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	8-9	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	10	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	11.1	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
M	14.1	0.5D	1.5D	Vc m/min	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.025	0.039	0.045	0.064	0.074	0.085	0.093	0.107	0.095	0.103
				rpm obr/min	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	99	140	172	204	202	203	197	204	206	197
K	15-20	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT83

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING UNCOATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	35	40	40	40	40	40	40	40	40	40
				fz mm/tooth	0.018	0.028	0.05	0.059	0.056	0.063	0.061	0.067	0.072	0.08
				rpm obr/min	1857	1592	1273	1061	909	796	707	637	579	509
				feed posuw mm/min	100	134	255	250	204	201	173	171	208	204
	2	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	3-4	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	5	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	6	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	7	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	8-9	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	10	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	11.1	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
M	14.1	0.5D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.02	0.03	0.045	0.065	0.06	0.069	0.064	0.073	0.081	0.086
				rpm obr/min	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	64	72	115	138	109	110	91	93	117	109
K	15-20	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT74

3-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K					
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●

| ISO | N | | | | | | | | | |

PMT74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING TIALN COATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	55	60	60	60	60	60	60	60	60	60
				fz mm/tooth	0.027	0.04	0.055	0.065	0.074	0.086	0.099	0.111	0.096	0.105
				rpm obr/min	2918	2387	1910	1592	1364	1194	1061	955	868	764
				feed posuw mm/min	236	286	420	414	404	411	420	424	417	401
	2	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	3-4	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	5	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	6	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	7	0.5D	1.5D	Vc m/min	30	35	35	35	35	35	35	35	30	35
				fz mm/tooth	0.024	0.038	0.046	0.064	0.076	0.087	0.094	0.108	0.098	0.105
				rpm obr/min	1592	1393	1114	928	796	696	619	557	434	446
				feed posuw mm/min	115	159	205	238	242	242	233	241	213	234
	8-9	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
	10	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301
	11.1	0.5D	1.5D	Vc m/min	25	25	30	30	30	30	30	30	30	30
				fz mm/tooth	0.027	0.04	0.045	0.061	0.071	0.082	0.092	0.102	0.09	0.1
				rpm obr/min	1326	995	955	796	682	597	531	477	434	382
				feed posuw mm/min	107	119	172	194	194	196	195	195	195	191
M	14.1	0.5D	1.5D	Vc m/min	25	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.025	0.039	0.045	0.064	0.074	0.085	0.093	0.107	0.095	0.103
				rpm obr/min	1326	1194	955	796	682	597	531	477	434	382
				feed posuw mm/min	99	140	172	204	202	203	197	204	206	197
K	15-20	0.5D	1.5D	Vc m/min	40	50	45	45	45	50	50	50	45	45
				fz mm/tooth	0.027	0.04	0.053	0.069	0.079	0.087	0.093	0.109	0.102	0.105
				rpm obr/min	2122	1989	1432	1194	1023	995	884	796	651	573
				feed posuw mm/min	172	239	304	329	323	346	329	347	332	301

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT74

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING UNCOATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	22.0	25.0	18.0	20.0	22.0	25.0
P	1	0.5D	1.5D	Vc m/min	35	40	40	40	40	40	40	40	40	40
				fz mm/tooth	0.018	0.028	0.05	0.059	0.056	0.063	0.061	0.067	0.072	0.08
				rpm obr/min	1857	1592	1273	1061	909	796	707	637	579	509
				feed posuw mm/min	100	134	255	250	204	201	173	171	208	204
	2	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	3-4	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	5	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	6	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	7	0.5D	1.5D	Vc m/min	20	25	20	25	20	25	25	25	20	20
				fz mm/tooth	0.017	0.028	0.044	0.058	0.055	0.062	0.057	0.065	0.073	0.08
				rpm obr/min	1061	995	637	663	455	497	442	398	289	255
				feed posuw mm/min	54	84	112	154	100	123	101	103	106	102
	8-9	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
	10	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155
	11.1	0.5D	1.5D	Vc m/min	15	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.018	0.027	0.042	0.055	0.051	0.059	0.056	0.061	0.068	0.076
				rpm obr/min	796	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	43	64	107	117	93	94	79	78	98	97
M	14.1	0.5D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.02	0.03	0.045	0.065	0.06	0.069	0.064	0.073	0.081	0.086
				rpm obr/min	1061	796	637	531	455	398	354	318	289	255
				feed posuw mm/min	64	72	115	138	109	110	91	93	117	109
K	15-20	0.5D	1.5D	Vc m/min	30	35	30	30	30	30	35	30	30	30
				fz mm/tooth	0.018	0.027	0.049	0.063	0.058	0.064	0.056	0.067	0.078	0.081
				rpm obr/min	1592	1393	955	796	682	597	619	477	434	382
				feed posuw mm/min	86	113	187	201	158	153	139	128	169	155

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT77

4-5 Medium Rough

HSM Vmax A min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●						○	○	○													

UNCOATED	COATED	DC	DCON	APMX	LU	OAL	DN	#FLUTE	CHAMFER
PMT77100000B10022069	PMT78100000B10022069	10	10	22	69	110	8,5	4	0,34
PMT77120000B12026078	PMT78120000B12026078	12	12	26	78	125	10,5	4	0,5
PMT77160000B16032087	PMT78160000B16032087	16	16	32	87	138	14	4	0,55
PMT77200000B20038108	PMT78200000B20038108	20	20	38	108	160	18	5	0,55
PMT77250000B25045155	PMT78250000B25045155	25	25	45	155	216	23	5	0,55

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM						
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

PMT77

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING TIALN COATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	10.0	12.0	16.0	20.0	25.0
P	1	0.5D	1.5D	Vc m/min	60	60	60	60	60
				fz mm/tooth	0.047	0.055	0.074	0.094	0.09
				rpm obr/min	1910	1592	1194	955	764
				feed posuw mm/min	359	350	353	359	344
	2	0.5D	1.5D	Vc m/min	47	47	47	47	47
				fz mm/tooth	0.045	0.058	0.074	0.092	0.09
				rpm obr/min	1496	1247	935	748	598
				feed posuw mm/min	269	289	277	275	269
	3-4	0.5D	1.5D	Vc m/min	33	33	33	33	33
				fz mm/tooth	0.039	0.054	0.074	0.092	0.088
				rpm obr/min	1050	875	657	525	420
				feed posuw mm/min	164	189	194	193	185
	5	0.5D	1.5D	Vc m/min	28	28	28	28	28
				fz mm/tooth	0.038	0.052	0.07	0.088	0.086
				rpm obr/min	891	743	557	446	357
				feed posuw mm/min	135	154	156	157	153
	6	0.5D	1.5D	Vc m/min	47	47	47	47	47
				fz mm/tooth	0.045	0.058	0.074	0.092	0.09
				rpm obr/min	1496	1247	935	748	598
				feed posuw mm/min	269	289	277	275	269
	7	0.5D	1.5D	Vc m/min	33	33	33	33	33
				fz mm/tooth	0.039	0.054	0.074	0.092	0.088
				rpm obr/min	1050	875	657	525	420
				feed posuw mm/min	164	189	194	193	185
	8-9	0.5D	1.5D	Vc m/min	28	28	28	28	28
				fz mm/tooth	0.038	0.052	0.07	0.088	0.086
				rpm obr/min	891	743	557	446	357
				feed posuw mm/min	135	154	156	157	153
	10	0.5D	1.5D	Vc m/min	47	47	47	47	47
				fz mm/tooth	0.045	0.058	0.074	0.092	0.09
				rpm obr/min	1496	1247	935	748	598
				feed posuw mm/min	269	289	277	275	269
	11.1	0.5D	1.5D	Vc m/min	28	28	28	28	28
				fz mm/tooth	0.038	0.052	0.07	0.088	0.086
				rpm obr/min	891	743	557	446	357
				feed posuw mm/min	135	154	156	157	153
M	14.1	0.5D	1.5D	Vc m/min	30	30	30	30	30
				fz mm/tooth	0.038	0.055	0.073	0.091	0.087
				rpm obr/min	955	796	597	477	382
				feed posuw mm/min	145	175	174	174	166
K	15-20	0.5D	1.5D	Vc m/min	47	47	47	47	47
				fz mm/tooth	0.045	0.058	0.074	0.092	0.09
				rpm obr/min	1496	1247	935	748	598
				feed posuw mm/min	269	289	277	275	269

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

PMT77

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE CUTTING UNCOATED / FREZ O WIELU ZĘBACH FREZOWANIE BOKIEM BEZ POKRYCIA

ISO	VDI 3323	Ae mm	Ap mm	DC	10.0	12.0	16.0	20.0	25.0
P	1	0.5D	1.5D	Vc m/min	41	41	41	41	41
				fz mm/tooth	0.042	0.05	0.067	0.085	0.081
				rpm obr/min	1305	1088	816	653	522
				feed posuw mm/min	219	218	219	222	211
	2	0.5D	1.5D	Vc m/min	32	32	32	32	32
				fz mm/tooth	0.041	0.053	0.068	0.086	0.083
				rpm obr/min	1019	849	637	509	407
				feed posuw mm/min	167	180	173	175	169
	3-4	0.5D	1.5D	Vc m/min	23	23	23	23	23
				fz mm/tooth	0.037	0.05	0.067	0.083	0.082
				rpm obr/min	732	610	458	366	293
				feed posuw mm/min	108	122	123	122	120
	5	0.5D	1.5D	Vc m/min	19	19	19	19	19
				fz mm/tooth	0.035	0.048	0.064	0.079	0.079
				rpm obr/min	605	504	378	302	242
				feed posuw mm/min	85	97	97	96	96
	6	0.5D	1.5D	Vc m/min	32	32	32	32	32
				fz mm/tooth	0.041	0.053	0.068	0.086	0.083
				rpm obr/min	1019	849	637	509	407
				feed posuw mm/min	167	180	173	175	169
	7	0.5D	1.5D	Vc m/min	23	23	23	23	23
				fz mm/tooth	0.037	0.05	0.067	0.083	0.082
				rpm obr/min	732	610	458	366	293
				feed posuw mm/min	108	122	123	122	120
	8	0.5D	1.5D	Vc m/min	19	19	19	19	19
				fz mm/tooth	0.035	0.048	0.064	0.079	0.079
				rpm obr/min	605	504	378	302	242
				feed posuw mm/min	85	97	97	96	96
	9	0.5D	1.5D	Vc m/min	19	19	19	19	19
				fz mm/tooth	0.035	0.048	0.064	0.079	0.079
				rpm obr/min	605	504	378	302	242
				feed posuw mm/min	64	97	97	119	96
	10	0.5D	1.5D	Vc m/min	32	32	32	32	32
				fz mm/tooth	0.041	0.053	0.068	0.086	0.083
				rpm obr/min	1019	849	637	509	407
				feed posuw mm/min	167	180	173	175	169
	11.1	0.5D	1.5D	Vc m/min	19	19	19	19	19
				fz mm/tooth	0.035	0.048	0.064	0.079	0.079
				rpm obr/min	605	504	378	302	242
				feed posuw mm/min	85	97	97	96	96
M	14.1	0.5D	1.5D	Vc m/min	21	21	21	21	21
				fz mm/tooth	0.038	0.058	0.074	0.095	0.089
				rpm obr/min	668	557	418	334	267
				feed posuw mm/min	102	129	124	127	119
K	15-20	0.5D	1.5D	Vc m/min	32	32	32	32	32
				fz mm/tooth	0.041	0.053	0.068	0.086	0.083
				rpm obr/min	1019	849	637	509	407
				feed posuw mm/min	167	180	173	175	169

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

P M K N S H

General purpose HSSCo8 End Mills with TiAlN coating or non-coated

Frezy HSSCo8 do zastosowania ogólnego z pokryciem TiAlN lub bez pokrycia

HSSCo8 END MILLS

FREZY HSSCo8

Group					ISO	PAGE
HM035/ HMF35			2		P M K N S H	591
HM092/ HMF92			2		P M K N S H	594
HM61			1		P M K N S H	597
HM070/ HMF70			2		P M K N S H	598
HM071/ HMF71			2		P M K N S H	604
HM010/ HMF10			2		P M K N S H	614
HM064			2		P M K N S H	619
HM009			2		P M K N S H	621
HM072/ HMF72			3		P M K N S H	623
HM073/ HMF73			3		P M K N S H	632
HM016/ HMF16			3		P M K N S H	641
HM053/ HMF53			3		P M K N S H	650
HM054/ HMF54			3		P M K N S H	659
HM095/ HMF95			4		P M K N S H	668
HM097/ HMF97			4		P M K N S H	673
HM098/ HMF98			6		P M K N S H	678
HM0A3/ HMFA3			3-6		P M K N S H	683
HM0B2/ HMFB2			3-6		P M K N S H	688
HM0A5			3		P M K N S H	693

Group					ISO	PAGE
HM0A1/ HMFA1			3-6		P M K N S H	695
HM0A2/ HMFA2			3-6		P M K N S H	700

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

HM035/HMF35

2

B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM035020010B06004048	HMF35020010B06004048	R1,0	2	6	4	48
HM035025013B06005049	HMF35025013B06005049	R1,25	2,5	6	5	49
HM035030015B06005049	HMF35030015B06005049	R1,5	3	6	5	49
HM035035018B06006050	HMF35035018B06006050	R1,75	3,5	6	6	50
HM035040020B06007051	HMF35040020B06007051	R2,0	4	6	7	51
HM035045023B06007051	HMF35045023B06007051	R2,25	4,5	6	7	51
HM035050025B06008052	HMF35050025B06008052	R2,5	5	6	8	52
HM035055028B06008052	HMF35055028B06008052	R2,75	5,5	6	8	52
HM035060030B06008052	HMF35060030B06008052	R3,0	6	6	8	52
HM035070035B10010060	HMF35070035B10010060	R3,5	7	10	10	60
HM035080040B10011061	HMF35080040B10011061	R4,0	8	10	11	61
HM035090045B10011061	HMF35090045B10011061	R4,5	9	10	11	61
HM035100050B10013063	HMF35100050B10013063	R5,0	10	10	13	63
HM035110055B12013070	HMF35110055B12013070	R5,5	11	12	13	70
HM035120060B12016073	HMF35120060B12016073	R6,0	12	12	16	73
HM035130065B12016073	HMF35130065B12016073	R6,5	13	12	16	73
HM035140070B12016073	HMF35140070B12016073	R7,0	14	12	16	73
HM035150075B12016073	HMF35150075B12016073	R7,5	15	12	16	73
HM035160080B16019079	HMF35160080B16019079	R8,0	16	16	19	79
HM035170085B16019079	HMF35170085B16019079	R8,5	17	16	19	79
HM035180090B16019079	HMF35180090B16019079	R9,0	18	16	19	79
HM035190095B16019079	HMF35190095B16019079	R9,5	19	16	19	79
HM035200100B16022082	HMF35200100B16022082	R10,0	20	16	22	82
HM035200100B20022088	HMF35200100B20022088	R10,0	20	20	22	88
HM035220110B20022088	HMF35220110B20022088	R11,0	22	20	22	88
HM035220110B25022098	HMF35220110B25022098	R11,0	22	25	22	98
HM035240120B25026102	HMF35240120B25026102	R12,0	24	25	26	102
HM035250125B25026102	HMF35250125B25026102	R12,5	25	25	26	102
HM035260130B25026102	HMF35260130B25026102	R13,0	26	25	26	102
HM035280140B25026102	HMF35280140B25026102	R14,0	28	25	26	102
HM035300150B25026102	HMF35300150B25026102	R15,0	30	25	26	102
HM035320160B32032112	HMF35320160B32032112	R16,0	32	32	32	112

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h6

HM035/HMF35

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE UNCOATED / FREZ KULOWY O 2 ZĘBACH NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.7D	0.3D	Vc m/min	40	40	40	40	40	40	40	40	40
				fz mm/tooth	0.011	0.018	0.031	0.05	0.069	0.085	0.094	0.117	0.13
				rpm obr/min	4244	3183	2122	1592	1273	1061	796	637	509
				feed posuw mm/min	93	115	132	159	176	180	150	149	132
	2	0.7D	0.3D	Vc m/min	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088
				rpm obr/min	3183	2387	1592	1194	955	796	597	477	382
				feed posuw mm/min	64	81	83	105	115	105	99	81	67
	3-4	0.7D	0.3D	Vc m/min	20	20	20	20	20	15	20	20	15
				fz mm/tooth	0.008	0.013	0.023	0.036	0.054	0.061	0.079	0.083	0.091
				rpm obr/min	2122	1592	1061	796	637	398	398	318	191
				feed posuw mm/min	34	41	49	57	69	49	63	53	35
	5	0.7D	0.3D	Vc m/min	15	15	15	15	15	10	15	15	15
				fz mm/tooth	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094
				rpm obr/min	1592	1194	796	597	477	265	298	239	191
				feed posuw mm/min	22	31	29	36	42	29	42	42	36
	6	0.7D	0.3D	Vc m/min	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088
				rpm obr/min	3183	2387	1592	1194	955	796	597	477	382
				feed posuw mm/min	64	81	83	105	115	105	99	81	67
	7	0.7D	0.3D	Vc m/min	20	20	20	20	20	15	20	20	15
				fz mm/tooth	0.008	0.013	0.023	0.036	0.054	0.061	0.079	0.083	0.091
				rpm obr/min	2122	1592	1061	796	637	398	398	318	191
				feed posuw mm/min	34	41	49	57	69	49	63	53	35
	8-9	0.7D	0.3D	Vc m/min	15	15	15	15	15	10	15	15	15
				fz mm/tooth	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094
				rpm obr/min	1592	1194	796	597	477	265	298	239	191
				feed posuw mm/min	22	31	29	36	42	29	42	42	36
	10	0.7D	0.3D	Vc m/min	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088
				rpm obr/min	3183	2387	1592	1194	955	796	597	477	382
				feed posuw mm/min	64	81	83	105	115	105	99	81	67
	11.1	0.7D	0.3D	Vc m/min	15	15	15	15	15	10	15	15	15
				fz mm/tooth	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094
				rpm obr/min	1592	1194	796	597	477	265	298	239	191
				feed posuw mm/min	22	31	29	36	42	29	42	42	36
N	21-22	0.7D	0.3D	Vc m/min	105	100	105	100	100	95	100	100	100
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.088	0.096
				rpm obr/min	11141	7958	5570	3979	3183	2520	1989	1592	1273
				feed posuw mm/min	223	255	279	350	357	343	298	280	244
	23-24	0.7D	0.3D	Vc m/min	68	65	68	65	65	62	65	65	65
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.088	0.096
				rpm obr/min	7215	5173	3608	2586	2069	1645	1293	1035	828
				feed posuw mm/min	144	166	180	228	232	224	194	182	159

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM035/HMF35

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE TIALN COATED / FREZ KULOWY O 2 ZĘBACH POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.7D	0.3D	Vc m/min	60	55	60	55	55	55	55	55	55
				fz mm/tooth	0.011	0.018	0.031	0.05	0.069	0.086	0.095	0.115	0.129
				rpm obr/min	6366	4377	3183	2188	1751	1459	1094	875	700
				feed posuw mm/min	140	158	197	219	242	251	208	201	181
	2	0.7D	0.3D	Vc m/min	45	40	45	45	45	40	45	45	45
				fz mm/tooth	0.011	0.016	0.026	0.043	0.061	0.066	0.082	0.086	0.091
				rpm obr/min	4775	3183	2387	1790	1432	1061	895	716	573
				feed posuw mm/min	105	102	124	154	175	140	147	123	104
	3-4	0.7D	0.3D	Vc m/min	25	25	25	25	25	25	25	25	25
				fz mm/tooth	0.007	0.013	0.023	0.035	0.053	0.058	0.075	0.088	0.092
				rpm obr/min	2653	1989	1326	995	796	663	497	398	318
				feed posuw mm/min	37	52	61	70	84	77	75	70	59
	5	0.7D	0.3D	Vc m/min	20	20	20	20	15	15	20	20	15
				fz mm/tooth	0.008	0.013	0.018	0.029	0.045	0.056	0.071	0.083	0.1
				rpm obr/min	2122	1592	1061	796	477	398	398	318	191
				feed posuw mm/min	34	41	38	46	43	45	57	53	38
	6	0.7D	0.3D	Vc m/min	45	40	45	45	45	40	45	45	45
				fz mm/tooth	0.011	0.016	0.026	0.043	0.061	0.066	0.082	0.086	0.091
				rpm obr/min	4775	3183	2387	1790	1432	1061	895	716	573
				feed posuw mm/min	105	102	124	154	175	140	147	123	104
	7	0.7D	0.3D	Vc m/min	25	25	25	25	25	25	25	25	25
				fz mm/tooth	0.007	0.013	0.023	0.035	0.053	0.058	0.075	0.088	0.092
				rpm obr/min	2653	1989	1326	995	796	663	497	398	318
				feed posuw mm/min	37	52	61	70	84	77	75	70	59
	8-9	0.7D	0.3D	Vc m/min	20	20	20	20	15	15	20	20	15
				fz mm/tooth	0.008	0.013	0.018	0.029	0.045	0.056	0.071	0.083	0.1
				rpm obr/min	2122	1592	1061	796	477	398	398	318	191
				feed posuw mm/min	34	41	38	46	43	45	57	53	38
	10	0.7D	0.3D	Vc m/min	45	40	45	45	45	40	45	45	45
				fz mm/tooth	0.011	0.016	0.026	0.043	0.061	0.066	0.082	0.086	0.091
				rpm obr/min	4775	3183	2387	1790	1432	1061	895	716	573
				feed posuw mm/min	105	102	124	154	175	140	147	123	104
	11.1	0.7D	0.3D	Vc m/min	20	20	20	20	15	15	20	20	15
				fz mm/tooth	0.008	0.013	0.018	0.029	0.045	0.056	0.071	0.083	0.1
				rpm obr/min	2122	1592	1061	796	477	398	398	318	191
				feed posuw mm/min	34	41	38	46	43	45	57	53	38
N	21-22	0.7D	0.3D	Vc m/min	145	140	150	140	140	130	140	140	140
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.087	0.097
				rpm obr/min	15385	11141	7958	5570	4456	3448	2785	2228	1783
				feed posuw mm/min	308	357	398	490	499	469	418	388	346
	23-24	0.7D	0.3D	Vc m/min	94	91	98	91	91	85	91	91	91
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.087	0.097
				rpm obr/min	9974	7242	5199	3621	2897	2255	1810	1448	1159
				feed posuw mm/min	199	232	260	319	324	307	272	252	225

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM092/HMF92

2

B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	RADIUS OF BALL NOSE	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM092020010B06007054	HMF92020010B06007054	R1,0	2	6	7	54
HM092030015B06008056	HMF92030015B06008056	R1,5	3	6	8	56
HM092040020B06011063	HMF92040020B06011063	R2,0	4	6	11	63
HM092050025B06013068	HMF92050025B06013068	R2,5	5	6	13	68
HM092060030B06013068	HMF92060030B06013068	R3,0	6	6	13	68
HM092070035B10016080	HMF92070035B10016080	R3,5	7	10	16	80
HM092080040B10019088	HMF92080040B10019088	R4,0	8	10	19	88
HM092090045B10019088	HMF92090045B10019088	R4,5	9	10	19	88
HM092100050B10022095	HMF92100050B10022095	R5,0	10	10	22	95
HM092110055B12022102	HMF92110055B12022102	R5,5	11	12	22	102
HM092120060B12026110	HMF92120060B12026110	R6,0	12	12	26	110
HM092130065B12026110	HMF92130065B12026110	R6,5	13	12	26	110
HM092140070B12026110	HMF92140070B12026110	R7,0	14	12	26	110
HM092150075B12026110	HMF92150075B12026110	R7,5	15	12	26	110
HM092160080B16032123	HMF92160080B16032123	R8,0	16	16	32	123
HM092170085B16032123	HMF92170085B16032123	R8,5	17	16	32	123
HM092180090B16032123	HMF92180090B16032123	R9,0	18	16	32	123
HM092190095B16032123	HMF92190095B16032123	R9,5	19	16	32	123
HM092200100B20038141	HMF92200100B20038141	R10,0	20	20	38	141
HM092220110B20038141	HMF92220110B20038141	R11,0	22	20	38	141
HM092240120B25045166	HMF92240120B25045166	R12,0	24	25	45	166
HM092250125B25045166	HMF92250125B25045166	R12,5	25	25	45	166
HM092260130B25045166	HMF92260130B25045166	R13,0	26	25	45	166
HM092280140B25045166	HMF92280140B25045166	R14,0	28	25	45	166
HM092300150B25045166	HMF92300150B25045166	R15,0	30	25	45	166

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.03	h6

HM092/HMF92

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE UNCOATED / FREZ KULOWY O 2 ZĘBACH NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.7D	0.3D	Vc m/min	40	40	40	40	40	40	40	40	40
				fz mm/tooth	0.011	0.018	0.031	0.05	0.069	0.085	0.094	0.117	0.13
				rpm obr/min	4244	3183	2122	1592	1273	1061	796	637	509
				feed posuw mm/min	93	115	132	159	176	180	150	149	132
	2	0.7D	0.3D	Vc m/min	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088
				rpm obr/min	3183	2387	1592	1194	955	796	597	477	382
				feed posuw mm/min	64	81	83	105	115	105	99	81	67
	3-4	0.7D	0.3D	Vc m/min	20	20	20	20	20	15	20	20	15
				fz mm/tooth	0.008	0.013	0.023	0.036	0.054	0.061	0.079	0.083	0.091
				rpm obr/min	2122	1592	1061	796	637	398	398	318	191
				feed posuw mm/min	34	41	49	57	69	49	63	53	35
	5	0.7D	0.3D	Vc m/min	15	15	15	15	15	10	15	15	15
				fz mm/tooth	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094
				rpm obr/min	1592	1194	796	597	477	265	298	239	191
				feed posuw mm/min	22	31	29	36	42	29	42	42	36
	6	0.7D	0.3D	Vc m/min	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088
				rpm obr/min	3183	2387	1592	1194	955	796	597	477	382
				feed posuw mm/min	64	81	83	105	115	105	99	81	67
	7	0.7D	0.3D	Vc m/min	20	20	20	20	20	15	20	20	15
				fz mm/tooth	0.008	0.013	0.023	0.036	0.054	0.061	0.079	0.083	0.091
				rpm obr/min	2122	1592	1061	796	637	398	398	318	191
				feed posuw mm/min	34	41	49	57	69	49	63	53	35
	8-9	0.7D	0.3D	Vc m/min	15	15	15	15	15	10	15	15	15
				fz mm/tooth	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094
				rpm obr/min	1592	1194	796	597	477	265	298	239	191
				feed posuw mm/min	22	31	29	36	42	29	42	42	36
	10	0.7D	0.3D	Vc m/min	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088
				rpm obr/min	3183	2387	1592	1194	955	796	597	477	382
				feed posuw mm/min	64	81	83	105	115	105	99	81	67
	11.1	0.7D	0.3D	Vc m/min	15	15	15	15	15	10	15	15	15
				fz mm/tooth	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094
				rpm obr/min	1592	1194	796	597	477	265	298	239	191
				feed posuw mm/min	22	31	29	36	42	29	42	42	36
N	21-22	0.7D	0.3D	Vc m/min	105	100	105	100	100	95	100	100	100
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.088	0.096
				rpm obr/min	11141	7958	5570	3979	3183	2520	1989	1592	1273
				feed posuw mm/min	223	255	279	350	357	343	298	280	244
	23-24	0.7D	0.3D	Vc m/min	68	65	68	65	65	62	65	65	65
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.088	0.096
				rpm obr/min	7215	5173	3608	2586	2069	1645	1293	1035	828
				feed posuw mm/min	144	166	180	228	232	224	194	182	159

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM092/HMF92

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE TIALN COATED / FREZ KULOWY O 2 ZĘBACH POKRYCE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1	0.7D	0.3D	Vc m/min	60	55	60	55	55	55	55	55	55
				fz mm/tooth	0.011	0.018	0.031	0.05	0.069	0.086	0.095	0.115	0.129
				rpm obr/min	6366	4377	3183	2188	1751	1459	1094	875	700
				feed posuw mm/min	140	158	197	219	242	251	208	201	181
	2	0.7D	0.3D	Vc m/min	45	40	45	45	45	40	45	45	45
				fz mm/tooth	0.011	0.016	0.026	0.043	0.061	0.066	0.082	0.086	0.091
				rpm obr/min	4775	3183	2387	1790	1432	1061	895	716	573
				feed posuw mm/min	105	102	124	154	175	140	147	123	104
	3-4	0.7D	0.3D	Vc m/min	25	25	25	25	25	25	25	25	25
				fz mm/tooth	0.007	0.013	0.023	0.035	0.053	0.058	0.075	0.088	0.092
				rpm obr/min	2653	1989	1326	995	796	663	497	398	318
				feed posuw mm/min	37	52	61	70	84	77	75	70	59
	5	0.7D	0.3D	Vc m/min	20	20	20	20	15	15	20	20	15
				fz mm/tooth	0.008	0.013	0.018	0.029	0.045	0.056	0.071	0.083	0.1
				rpm obr/min	2122	1592	1061	796	477	398	398	318	191
				feed posuw mm/min	34	41	38	46	43	45	57	53	38
	6	0.7D	0.3D	Vc m/min	45	40	45	45	45	40	45	45	45
				fz mm/tooth	0.011	0.016	0.026	0.043	0.061	0.066	0.082	0.086	0.091
				rpm obr/min	4775	3183	2387	1790	1432	1061	895	716	573
				feed posuw mm/min	105	102	124	154	175	140	147	123	104
	7	0.7D	0.3D	Vc m/min	25	25	25	25	25	25	25	25	25
				fz mm/tooth	0.007	0.013	0.023	0.035	0.053	0.058	0.075	0.088	0.092
				rpm obr/min	2653	1989	1326	995	796	663	497	398	318
				feed posuw mm/min	37	52	61	70	84	77	75	70	59
	8-9	0.7D	0.3D	Vc m/min	20	20	20	20	15	15	20	20	15
				fz mm/tooth	0.008	0.013	0.018	0.029	0.045	0.056	0.071	0.083	0.1
				rpm obr/min	2122	1592	1061	796	477	398	398	318	191
				feed posuw mm/min	34	41	38	46	43	45	57	53	38
	10	0.7D	0.3D	Vc m/min	45	40	45	45	45	40	45	45	45
				fz mm/tooth	0.011	0.016	0.026	0.043	0.061	0.066	0.082	0.086	0.091
				rpm obr/min	4775	3183	2387	1790	1432	1061	895	716	573
				feed posuw mm/min	105	102	124	154	175	140	147	123	104
	11.1	0.7D	0.3D	Vc m/min	20	20	20	20	15	15	20	20	15
				fz mm/tooth	0.008	0.013	0.018	0.029	0.045	0.056	0.071	0.083	0.1
				rpm obr/min	2122	1592	1061	796	477	398	398	318	191
				feed posuw mm/min	34	41	38	46	43	45	57	53	38
N	21-22	0.7D	0.3D	Vc m/min	145	140	150	140	140	130	140	140	140
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.087	0.097
				rpm obr/min	15385	11141	7958	5570	4456	3448	2785	2228	1783
				feed posuw mm/min	308	357	398	490	499	469	418	388	346
	23-24	0.7D	0.3D	Vc m/min	94	91	98	91	91	85	91	91	91
				fz mm/tooth	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.087	0.097
				rpm obr/min	9974	7242	5199	3621	2897	2255	1810	1448	1159
				feed posuw mm/min	199	232	260	319	324	307	272	252	225

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM61

ISO																																										
	P										M			K					N									S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21									15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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UNCOATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM612030000A08012060	3	8	12	60
HM612040000A08012060	4	8	12	60
HM612050000A08014060	5	8	12	60
HM612060000A08014060	6	8	14	60
HM612070000A08014060	7	8	14	60
HM612080000A08014080	8	8	14	80
HM612090000A08014080	9	8	14	80
HM612100000A08014080	10	8	14	80

UNCOATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM612050000A08035080	5	8	18	80
HM612050000A08040100	5	8	40	100
HM612080000A08068120	8	8	14	120

CUTTING CONDITIONS PARAMETRY SKRAWANIA

1 FLUTE SLOTTING UNOATED / FREZ O 1 ZĘBIE ROWKOWANIE NIEPOKRYWANY

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	4.0	5.0	6.0	7.0	8.0	10.0
N	21-22	1.0D	0.5D (DIA 3:0.2D)	Vc m/min	188	226	220	207	220	214	220
				fz mm/tooth	0.055	0.053	0.054	0.055	0.055	0.053	0.054
				rpm obr/min	19947	17985	14006	10982	10004	8515	7003
				feed posuw mm/min	1097	953	756	604	550	451	378
	23-24	1.0D	0.5D (DIA 3:0.2D)	Vc m/min	122	147	143	135	143	139	143
				fz mm/tooth	0.055	0.053	0.054	0.055	0.055	0.053	0.054
				rpm obr/min	12945	11698	9104	7162	6503	5531	4552
				feed posuw mm/min	712	620	492	394	358	293	246

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±125	±150	±185	±215	±260	±310
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM070/HMF70

2

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM070010000B06003047	HMF70010000B06003047	1	6	2,5	47
HM070015000B06003047	HMF70015000B06003047	1,5	6	3	47
HM070020000B06004048	HMF70020000B06004048	2	6	4	48
HM070025000B06005049	HMF70025000B06005049	2,5	6	5	49
HM070028000B06005049	HMF70028000B06005049	2,8	6	5	49
HM070030000B06005049	HMF70030000B06005049	3	6	5	49
HM070035000B06006050	HMF70035000B06006050	3,5	6	6	50
HM070038000B06007051	HMF70038000B06007051	3,8	6	7	51
HM070040000B06007051	HMF70040000B06007051	4	6	7	51
HM070045000B06007051	HMF70045000B06007051	4,5	6	7	51
HM070048000B06008052	HMF70048000B06008052	4,8	6	8	52
HM070050000B06008052	HMF70050000B06008052	5	6	8	52
HM070055000B06008052	HMF70055000B06008052	5,5	6	8	52
HM070058000B06008052	HMF70058000B06008052	5,8	6	8	52
HM070060000B06008052	HMF70060000B06008052	6	6	8	52
HM070065000B10010060	HMF70065000B10010060	6,5	10	10	60
HM070068000B10010060	HMF70068000B10010060	6,8	10	10	60
HM070070000B10010060	HMF70070000B10010060	7	10	10	60
HM070075000B10010060	HMF70075000B10010060	7,5	10	10	60
HM070078000B10011061	HMF70078000B10011061	7,8	10	11	61
HM070080000B10011061	HMF70080000B10011061	8	10	11	61
HM070085000B10011061	HMF70085000B10011061	8,5	10	11	61
HM070087000B10011061	HMF70087000B10011061	8,7	10	11	61
HM070090000B10011061	HMF70090000B10011061	9	10	11	61
HM070095000B10011061	HMF70095000B10011061	9,5	10	11	61
HM070097000B10013063	HMF70097000B10013063	9,7	10	13	63
HM070100000B10013063	HMF70100000B10013063	10	10	13	63
HM070105000B12013070	HMF70105000B12013070	10,5	12	13	70
HM070107000B12013070	HMF70107000B12013070	10,7	12	13	70
HM070110000B12013070	HMF70110000B12013070	11	12	13	70
HM070115000B12013070	HMF70115000B12013070	11,5	12	13	70
HM070117000B12016073	HMF70117000B12016073	11,7	12	16	73
HM070120000B12016073	HMF70120000B12016073	12	12	16	73
HM070125000B12016073	HMF70125000B12016073	12,5	12	16	73
HM070127000B12016073	HMF70127000B12016073	12,7	12	16	73

TOLERANCE RANGE IN UM						
NOMINAL-DIAMETER IN UM						
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM070/HMF70

2

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM070130000B12016073	HMF70130000B12016073	13	12	16	73
HM070135000B12016073	HMF70135000B12016073	13,5	12	16	73
HM070137000B12016073	HMF70137000B12016073	13,7	12	16	73
HM070140000B12016073	HMF70140000B12016073	14	12	16	73
HM070147000B12016073	HMF70147000B12016073	14,7	12	16	73
HM070150000B12016073	HMF70150000B12016073	15	12	16	73
HM070157000B16019079	HMF70157000B16019079	15,7	16	19	79
HM070160000B16019079	HMF70160000B16019079	16	16	19	79
HM070167000B16019079	HMF70167000B16019079	16,7	16	19	79
HM070170000B16019079	HMF70170000B16019079	17	16	19	79
HM070177000B16019079	HMF70177000B16019079	17,7	16	19	79
HM070180000B16019079	HMF70180000B16019079	18	16	19	79
HM070190000B16019079	HMF70190000B16019079	19	16	19	79
HM070197000B20022088	HMF70197000B20022088	19,7	20	22	88
HM070200000B16022082	HMF70200000B16022082	20	16	22	82
HM070200000B20022088	HMF70200000B20022088	20	20	22	88
HM070210000B20022088	HMF70210000B20022088	21	20	22	88
HM070220000B20022088	HMF70220000B20022088	22	20	22	88
HM070220000B25022098	HMF70220000B25022098	22	25	22	98
HM070240000B25026102	HMF70240000B25026102	24	25	26	102
HM070250000B25026102	HMF70250000B25026102	25	25	26	102
HM070260000B25026102	HMF70260000B25026102	26	25	26	102
HM070270000B25026102	HMF70270000B25026102	27	25	26	102
HM070280000B25026102	HMF70280000B25026102	28	25	26	102
HM070290000B25026102	HMF70290000B25026102	29	25	26	102
HM070300000B25026102	HMF70300000B25026102	30	25	26	102
HM070320000B32032112	HMF70320000B32032112	32	32	32	112
HM070340000B32032112	HMF70340000B32032112	34	32	32	112
HM070350000B32032112	HMF70350000B32032112	35	32	32	112
HM070360000B32032112	HMF70360000B32032112	36	32	32	112
HM070380000B32038118	HMF70380000B32038118	38	32	38	118
HM070380000B40038130	HMF70380000B40038130	38	40	38	130
HM070400000B32038118	HMF70400000B32038118	40	32	38	118
HM070400000B40038130	HMF70400000B40038130	40	40	38	130

TOLERANCE RANGE IN UM						
NOMINAL-DIAMETER IN UM						
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM070/HMF70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	45	59	72	89	93	100	100	113
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	167	245	286	318	312	390	393	383
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	109	159	186	207	202	253	257	250

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM070/HMF70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	309	279
				feed posuw mm/min	110	110	98	99	101	89	80	74	70	60	60
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	100	100
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	884	796
				feed posuw mm/min	346	350	343	318	294	283	266	274	239	216	199
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	65	65
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	575	517
				feed posuw mm/min	226	228	223	207	192	185	173	177	155	140	129

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM070/HMF70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	50	45
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.062
				rpm obr/min	7958	4775	3979	3183	2387	1989	1592	1194
				feed posuw mm/min	64	76	103	127	119	143	143	148
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	150	140	135	130
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	16711	15385	11141	8913	7958	5570	4297	3448
				feed posuw mm/min	234	338	401	446	446	546	550	524
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	98	91	88	85
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	10823	9974	7242	5793	5199	3621	2801	2255
				feed posuw mm/min	152	219	261	290	291	355	359	343

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM070/HMF70

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50
				fz mm/tooth	0.07	0.078	0.078	0.088	0.1	0.096	0.1	0.1	0.1	0.094	0.106
				rpm obr/min	1137	995	884	796	723	637	568	477	497	442	398
				feed posuw mm/min	159	155	138	140	145	122	114	95	99	83	84
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	7	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	135	145	140	140	140
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	3069	2785	2476	2228	1953	1719	1535	1538	1393	1238	1114
				feed posuw mm/min	485	490	485	446	422	395	378	378	334	307	283
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	88	94	91	91	91
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	2001	1810	1609	1448	1273	1120	1000	997	905	805	724
				feed posuw mm/min	316	319	315	290	275	258	246	245	217	200	184

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

2

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM071015000B06007051	HMF71015000B06007051	1,5	6	7	51
HM071020000B06007051	HMF71020000B06007051	2	6	7	51
HM071025000B06008052	HMF71025000B06008052	2,5	6	8	52
HM071030000B06008052	HMF71030000B06008052	3	6	8	52
HM071035000B06010054	HMF71035000B06010054	3,5	6	10	54
HM071040000B06011055	HMF71040000B06011055	4	6	11	55
HM071045000B06011055	HMF71045000B06011055	4,5	6	11	55
HM071050000B06013057	HMF71050000B06013057	5	6	13	57
HM071055000B06013057	HMF71055000B06013057	5,5	6	13	57
HM071060000B06013057	HMF71060000B06013057	6	6	13	57
HM071065000B10016066	HMF71065000B10016066	6,5	10	16	66
HM071070000B10016066	HMF71070000B10016066	7	10	16	66
HM071075000B10016066	HMF71075000B10016066	7,5	10	16	66
HM071080000B10019069	HMF71080000B10019069	8	10	19	69
HM071085000B10019069	HMF71085000B10019069	8,5	10	19	69
HM071090000B10019069	HMF71090000B10019069	9	10	19	69
HM071095000B10019069	HMF71095000B10019069	9,5	10	19	69
HM071100000B10022072	HMF71100000B10022072	10	10	22	72
HM071110000B12022079	HMF71110000B12022079	11	12	22	79
HM071120000B12026083	HMF71120000B12026083	12	12	26	83
HM071130000B12026083	HMF71130000B12026083	13	12	26	83
HM071140000B12026083	HMF71140000B12026083	14	12	26	83
HM071150000B12026083	HMF71150000B12026083	15	12	26	83
HM071160000B16032092	HMF71160000B16032092	16	16	32	92

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	45	59	72	89	93	100	100	113
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	167	245	286	318	312	390	393	383
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	109	159	186	207	202	253	257	250

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	309	279
				feed posuw mm/min	110	110	98	99	101	89	80	74	70	60	60
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	100	100
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	884	796
				feed posuw mm/min	346	350	343	318	294	283	266	274	239	216	199
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	65	65
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	575	517
				feed posuw mm/min	226	228	223	207	192	185	173	177	155	140	129

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	50	45
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.062
				rpm obr/min	7958	4775	3979	3183	2387	1989	1592	1194
				feed posuw mm/min	64	76	103	127	119	143	143	148
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	150	140	135	130
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	16711	15385	11141	8913	7958	5570	4297	3448
				feed posuw mm/min	234	338	401	446	446	546	550	524
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	98	91	88	85
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	10823	9974	7242	5793	5199	3621	2801	2255
				feed posuw mm/min	152	219	261	290	291	355	359	343

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50
				fz mm/tooth	0.07	0.078	0.078	0.088	0.1	0.096	0.1	0.1	0.1	0.094	0.106
				rpm obr/min	1137	995	884	796	723	637	568	477	497	442	398
				feed posuw mm/min	159	155	138	140	145	122	114	95	99	83	84
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	7	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	135	145	140	140	140
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	3069	2785	2476	2228	1953	1719	1535	1538	1393	1238	1114
				feed posuw mm/min	485	490	485	446	422	395	378	378	334	307	283
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	88	94	91	91	91
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	2001	1810	1609	1448	1273	1120	1000	997	905	805	724
				feed posuw mm/min	316	319	315	290	275	258	246	245	217	200	184

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM071180000B16032092	HMF71180000B16032092	18	16	32	92
HM071200000B20038104	HMF71200000B20038104	20	20	38	104
HM071220000B20038104	HMF71220000B20038104	22	20	38	104
HM071240000B25045121	HMF71240000B25045121	24	25	45	121
HM071250000B25045121	HMF71250000B25045121	25	25	45	121
HM071260000B25045121	HMF71260000B25045121	26	25	45	121
HM071270000B25045121	HMF71270000B25045121	27	25	45	121
HM071280000B25045121	HMF71280000B25045121	28	25	45	121
HM071300000B25045121	HMF71300000B25045121	30	25	45	121
HM071320000B32053133	HMF71320000B32053133	32	32	53	133
HM071400000B40063155	HMF71400000B40063155	40	40	63	155

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	45	59	72	89	93	100	100	113
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	167	245	286	318	312	390	393	383
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	109	159	186	207	202	253	257	250

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	309	279
				feed posuw mm/min	110	110	98	99	101	89	80	74	70	60	60
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	100	100
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	884	796
				feed posuw mm/min	346	350	343	318	294	283	266	274	239	216	199
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	65	65
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	575	517
				feed posuw mm/min	226	228	223	207	192	185	173	177	155	140	129

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	50	45
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.062
				rpm obr/min	7958	4775	3979	3183	2387	1989	1592	1194
				feed posuw mm/min	64	76	103	127	119	143	143	148
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	150	140	135	130
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	16711	15385	11141	8913	7958	5570	4297	3448
				feed posuw mm/min	234	338	401	446	446	546	550	524
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	98	91	88	85
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	10823	9974	7242	5793	5199	3621	2801	2255
				feed posuw mm/min	152	219	261	290	291	355	359	343

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM071/HMF71

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50
				fz mm/tooth	0.07	0.078	0.078	0.088	0.1	0.096	0.1	0.1	0.1	0.094	0.106
				rpm obr/min	1137	995	884	796	723	637	568	477	497	442	398
				feed posuw mm/min	159	155	138	140	145	122	114	95	99	83	84
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	7	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	135	145	140	140	140
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	3069	2785	2476	2228	1953	1719	1535	1538	1393	1238	1114
				feed posuw mm/min	485	490	485	446	422	395	378	378	334	307	283
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	88	94	91	91	91
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	2001	1810	1609	1448	1273	1120	1000	997	905	805	724
				feed posuw mm/min	316	319	315	290	275	258	246	245	217	200	184

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM010/HMF10

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM010025000B06008056	HMF10025000B06008056	2,5	6	8	56
HM010030000B06008056	HMF10030000B06008056	3	6	8	56
HM010035000B06010059	HMF10035000B06010059	3,5	6	10	59
HM010040000B06011063	HMF10040000B06011063	4	6	11	63
HM010045000B06011063	HMF10045000B06011063	4,5	6	11	63
HM010050000B06013068	HMF10050000B06013068	5	6	13	68
HM010055000B06013068	HMF10055000B06013068	5,5	6	13	68
HM010060000B06013068	HMF10060000B06013068	6	6	13	68
HM010065000B10016080	HMF10065000B10016080	6,5	10	16	80
HM010070000B10016080	HMF10070000B10016080	7	10	16	80
HM010080000B10019088	HMF10080000B10019088	8	10	19	88
HM010085000B10019088	HMF10085000B10019088	8,5	10	19	88
HM010090000B10019088	HMF10090000B10019088	9	10	19	88
HM010100000B10022095	HMF10100000B10022095	10	10	22	95
HM010120000B12026110	HMF10120000B12026110	12	12	26	110
HM010140000B12026110	HMF10140000B12026110	14	12	26	110
HM010160000B16032123	HMF10160000B16032123	16	16	32	123
HM010180000B16032123	HMF10180000B16032123	18	16	32	123
HM010200000B20038141	HMF10200000B20038141	20	20	38	141
HM010220000B20038141	HMF10220000B20038141	22	20	38	141
HM010240000B25045166	HMF10240000B25045166	24	25	45	166
HM010250000B25045166	HMF10250000B25045166	25	25	45	166
HM010260000B25045166	HMF10260000B25045166	26	25	45	166
HM010280000B25045166	HMF10280000B25045166	28	25	45	166
HM010300000B25045166	HMF10300000B25045166	30	25	45	166
HM010320000B32053186	HMF10320000B32053186	32	32	53	186
HM010360000B32053186	HMF10360000B32053186	36	32	53	186
HM010400000B32063207	HMF10400000B32063207	40	32	63	207
HM010400000B40063217	HMF10400000B40063217	40	40	63	217

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM010/HMF10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	45	59	72	89	93	100	100	113
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	32	42	52	60	66	78	80	84
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	45	62	73	80	98	95	100
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	33	36	40	48	48	50
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	167	245	286	318	312	390	393	383
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	109	159	186	207	202	253	257	250

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM010/HMF10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE UNCOATED SLOTTING / FREZ O 2 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	309	279
				feed posuw mm/min	110	110	98	99	101	89	80	74	70	60	60
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.071	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102	0.1	0.111
				rpm obr/min	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	81	78	78	70	72	62	56	53	41	44	44
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.064	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	0.1	0.114
				rpm obr/min	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	87	95	95	95	87	76	68	62	58	53	54
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.071	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	0.104	0.114
				rpm obr/min	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	48	48	48	49	44	37	32	30	32	28	27
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	100	100
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	884	796
				feed posuw mm/min	346	350	343	318	294	283	266	274	239	216	199
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	65	65
				fz mm/tooth	0.08	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12	0.122	0.125
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	575	517
				feed posuw mm/min	226	228	223	207	192	185	173	177	155	140	129

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM010/HMF10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	50	45
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.062
				rpm obr/min	7958	4775	3979	3183	2387	1989	1592	1194
				feed posuw mm/min	64	76	103	127	119	143	143	148
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.004	0.008	0.013	0.019	0.025	0.04	0.05	0.061
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	45	59	62	85	80	95	111	113
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.007	0.012	0.02	0.024	0.04	0.05	0.064
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	59	76	102	102	127	127	136
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.003	0.007	0.013	0.02	0.025	0.041	0.05	0.064
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	30	41	51	53	65	64	68
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	150	140	135	130
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	16711	15385	11141	8913	7958	5570	4297	3448
				feed posuw mm/min	234	338	401	446	446	546	550	524
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	98	91	88	85
				fz mm/tooth	0.007	0.011	0.018	0.025	0.028	0.049	0.064	0.076
				rpm obr/min	10823	9974	7242	5793	5199	3621	2801	2255
				feed posuw mm/min	152	219	261	290	291	355	359	343

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM010/HMF10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE TIALN COATED SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE POKRYCIE TIALN

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50
				fz mm/tooth	0.07	0.078	0.078	0.088	0.1	0.096	0.1	0.1	0.1	0.094	0.106
				rpm obr/min	1137	995	884	796	723	637	568	477	497	442	398
				feed posuw mm/min	159	155	138	140	145	122	114	95	99	83	84
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	7	1.0D	0.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.069	0.077	0.091	0.091	0.1	0.094	0.094	0.1	0.108	0.092	0.11
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	110	107	97	101	101	84	75	74	64	57	53
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.063	0.078	0.089	0.096	0.096	0.1	0.1	0.094	0.094	0.1	0.117
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	129	124	126	122	125	115	102	80	75	71	74
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.07	0.081	0.093	0.108	0.108	0.1	0.1	0.1	0.1	0.117	0.117
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	64	64	66	69	63	51	45	42	40	31	37
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	135	145	140	140	140
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	3069	2785	2476	2228	1953	1719	1535	1538	1393	1238	1114
				feed posuw mm/min	485	490	485	446	422	395	378	378	334	307	283
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	88	94	91	91	91
				fz mm/tooth	0.079	0.088	0.098	0.1	0.108	0.115	0.123	0.123	0.12	0.124	0.127
				rpm obr/min	2001	1810	1609	1448	1273	1120	1000	997	905	805	724
				feed posuw mm/min	316	319	315	290	275	258	246	245	217	200	184

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM064

B min AIR

ISO																																									
	P										M			K					N									S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21									15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○				○				○											●	●	●	●	○																

UNCOATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM064010000B06003049	1	6	3	49
HM064015000B06005049	1,5	6	5	49
HM064020000B06007051	2	6	7	51
HM064025000B06008052	2,5	6	8	52
HM064030000B06008052	3	6	8	52
HM064035000B06010054	3,5	6	10	54
HM064040000B06011055	4	6	11	55
HM064045000B06011055	4,5	6	11	55
HM064050000B06013057	5	6	13	57
HM064055000B06013057	5,5	6	13	57
HM064060000B06013057	6	6	13	57
HM064065000B10016066	6,5	10	16	66
HM064070000B10016066	7	10	16	66
HM064075000B10016066	7,5	10	16	66
HM064080000B10019069	8	10	19	69
HM064085000B10019069	8,5	10	19	69
HM064090000B10019069	9	10	19	69
HM064100000B10022072	10	10	22	72
HM064110000B12022079	11	12	22	79
HM064120000B12026083	12	12	26	83
HM064130000B12026083	13	12	26	83
HM064140000B12026083	14	12	26	83
HM064150000B12026083	15	12	26	83
HM064160000B16032092	16	16	32	92
HM064200000B20038104	20	20	38	104
HM064210000B20038104	21	20	38	104
HM064220000B20038104	22	20	38	104
HM064230000B20038104	23	20	38	104
HM064240000B25045121	24	25	45	121
HM064250000B25045121	25	25	45	121
HM064260000B25045121	26	25	45	121
HM064280000B25045121	28	25	45	121
HM064300000B25045121	30	25	45	121
HM064320000B32053133	32	32	53	133

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM064

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	75	130	150	155	190	155	175	130	145
				fz mm/tooth	0.035	0.05	0.071	0.12	0.12	0.177	0.177	0.283	0.283
				rpm obr/min	7958	6897	5968	4934	5040	3524	3482	2299	2308
				feed posuw mm/min	557	690	848	1184	1210	1248	1232	1301	1306
	23-24	1.0D	0.5D	Vc m/min	49	85	98	101	124	101	114	85	94
				fz mm/tooth	0.035	0.05	0.071	0.12	0.12	0.177	0.177	0.283	0.283
				rpm obr/min	5199	4509	3899	3215	3289	2296	2268	1503	1496
				feed posuw mm/min	364	451	554	772	789	813	803	851	847

2 FLUTE SIDE CUTTING / FREZ O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	DIA 3-10: 0.25D DIA 12-20: 0.5D	1.0D	Vc m/min	75	130	150	155	190	155	175	130	145
				fz mm/tooth	0.046	0.064	0.092	0.15	0.15	0.229	0.229	0.37	0.37
				rpm obr/min	7958	6897	5968	4934	5040	3524	3482	2299	2308
				feed posuw mm/min	732	883	1098	1480	1512	1614	1595	1701	1708
	23-24	DIA 3-10: 0.25D DIA 12-20: 0.5D	1.0D	Vc m/min	49	85	98	101	124	101	114	85	94
				fz mm/tooth	0.046	0.064	0.092	0.15	0.15	0.229	0.229	0.37	0.37
				rpm obr/min	5199	4509	3899	3215	3289	2296	2268	1503	1496
				feed posuw mm/min	478	577	717	964	987	1052	1039	1112	1107

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM009

ISO																																										
	P										M			K					N									S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21									15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○				○				○											●	●	●	●	○																

UNCOATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM009020000B06010054	2	6	10	54
HM009030000B06012056	3	6	12	56
HM009040000B06019063	4	6	19	63
HM009050000B06024068	5	6	24	68
HM009060000B06024068	6	6	24	68
HM009070000B10030080	7	10	30	80
HM009080000B10038088	8	10	38	88
HM009090000B10038088	9	10	38	88
HM009100000B10045095	10	10	45	95
HM009110000B12045102	11	12	45	102
HM009120000B12053110	12	12	53	110
HM009130000B12053110	13	12	53	110
HM009140000B12053110	14	12	53	110
HM009150000B12053110	15	12	53	110
HM009160000B16063123	16	16	63	123
HM009180000B16063123	18	16	63	123
HM009200000B20075141	20	20	75	141

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM09

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE SLOTTING / FREZ O 2 ZĘBACH ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	1.0D	0.5D	Vc m/min	75	130	150	155	190	155	175	130	145
				fz mm/tooth	0.035	0.05	0.071	0.12	0.12	0.177	0.177	0.283	0.283
				rpm obr/min	7958	6897	5968	4934	5040	3524	3482	2299	2308
				feed posuw mm/min	557	690	848	1184	1210	1248	1232	1301	1306
	23-24	1.0D	0.5D	Vc m/min	49	85	98	101	124	101	114	85	94
				fz mm/tooth	0.035	0.05	0.071	0.12	0.12	0.177	0.177	0.283	0.283
				rpm obr/min	5199	4509	3899	3215	3289	2296	2268	1503	1496
				feed posuw mm/min	364	451	554	772	789	813	803	851	847

2 FLUTE SIDE CUTTING / FREZ O 2 ZĘBACH FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	3.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	21-22	DIA 3-10: 0.25D DIA 12-20: 0.5D	1.0D	Vc m/min	75	130	150	155	190	155	175	130	145
				fz mm/tooth	0.046	0.064	0.092	0.15	0.15	0.229	0.229	0.37	0.37
				rpm obr/min	7958	6897	5968	4934	5040	3524	3482	2299	2308
				feed posuw mm/min	732	883	1098	1480	1512	1614	1595	1701	1708
	23-24	DIA 3-10: 0.25D DIA 12-20: 0.5D	1.0D	Vc m/min	49	85	98	101	124	101	114	85	94
				fz mm/tooth	0.046	0.064	0.092	0.15	0.15	0.229	0.229	0.37	0.37
				rpm obr/min	5199	4509	3899	3215	3289	2296	2268	1503	1496
				feed posuw mm/min	478	577	717	964	987	1052	1039	1112	1107

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM072015000B06003047	HMF72015000B06003047	1,5	6	3	47
HM072020000B06004048	HMF72020000B06004048	2	6	4	48
HM072025000B06005049	HMF72025000B06005049	2,5	6	5	49
HM072030000B06005049	HMF72030000B06005049	3	6	5	49
HM072035000B06006050	HMF72035000B06006050	3,5	6	6	50
HM072040000B06007051	HMF72040000B06007051	4	6	7	51
HM072045000B06007051	HMF72045000B06007051	4,5	6	7	51
HM072050000B06008052	HMF72050000B06008052	5	6	8	52
HM072055000B06008052	HMF72055000B06008052	5,5	6	8	52
HM072060000B06008052	HMF72060000B06008052	6	6	8	52
HM072065000B10010060	HMF72065000B10010060	6,5	10	10	60
HM072070000B10010060	HMF72070000B10010060	7	10	10	60
HM072075000B10010060	HMF72075000B10010060	7,5	10	10	60
HM072080000B10011061	HMF72080000B10011061	8	10	11	61
HM072085000B10011061	HMF72085000B10011061	8,5	10	11	61
HM072100000B10013063	HMF72100000B10013063	10	10	13	63
HM072120000B12016073	HMF72120000B12016073	12	12	16	73
HM072140000B12016073	HMF72140000B12016073	14	12	16	73
HM072150000B12016073	HMF72150000B12016073	15	12	16	73
HM072160000B16019079	HMF72160000B16019079	16	16	19	79
HM072180000B16019079	HMF72180000B16019079	18	16	19	79
HM072200000B20022088	HMF72200000B20022088	20	20	22	88
HM072220000B20022088	HMF72220000B20022088	22	20	22	88
HM072240000B25026102	HMF72240000B25026102	24	25	26	102
HM072250000B25026102	HMF72250000B25026102	25	25	26	102
HM072260000B25026102	HMF72260000B25026102	26	25	26	102
HM072280000B25026102	HMF72280000B25026102	28	25	26	102
HM072300000B25026102	HMF72300000B25026102	30	25	26	102
HM072320000B32032112	HMF72320000B32032112	32	32	32	112

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.027	0.037
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	33	56	58	80	84	88	90	103
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	107	167	191	210	217	263	263	265
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	70	108	124	137	141	171	172	173

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.042	0.048	0.048	0.054	0.06	0.059	0.058	0.057	0.057	0.057	0.059	0.065
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	100	100	89	90	91	79	69	64	60	54	55	54
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	233	239	233	220	198	192	178	184	158	152	149	129
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	152	155	152	143	129	126	116	119	103	98	97	84

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	67	89	109	134	139	150	150	170
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	179	267	334	363	351	442	435	431
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	117	173	217	236	227	287	284	281

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.099	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	165	165	147	149	152	134	119	111	104	95	90	89
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
N	21-22	0.1D	1.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	395	400	393	358	334	323	295	304	269	261	247	220
	23-24	0.1D	1.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	258	260	255	233	218	211	192	197	175	169	160	143

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.028	0.036
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	48	72	84	115	107	125	120	143
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	150	231	267	294	277	351	374	352
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	97	150	174	191	180	228	244	230

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.042	0.048	0.047	0.053	0.06	0.058	0.06	0.058	0.058	0.059	0.058	0.064
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	143	143	125	127	130	111	102	83	87	80	77	76
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	3-4	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	7	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	341	334	334	314	281	273	248	250	226	218	208	184
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	222	217	217	204	183	178	162	162	147	141	135	119

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.004	0.007	0.012	0.02	0.025	0.035	0.047	0.059
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	95	100	143	191	179	209	202	235
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	251	369	468	508	485	618	632	590
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	162	239	304	330	314	402	412	386

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM072/HMF72

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.07	0.078	0.08	0.09	0.1	0.101	0.101	0.099	0.099	0.096	0.097	0.107
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	239	233	212	215	217	193	172	142	148	131	129	128
	2	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	3-4	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	6	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	7	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	10	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
N	21-22	0.1D	1.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	552	560	557	508	481	454	412	414	376	364	345	314
	23-24	0.1D	1.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	360	364	362	330	313	296	270	269	244	236	224	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM073010000B06003047	HMF73010000B06003047	1	6	3	47
HM073015000B06007051	HMF73015000B06007051	1,5	6	7	51
HM073020000B06007051	HMF73020000B06007051	2	6	7	51
HM073025000B06008052	HMF73025000B06008052	2,5	6	8	52
HM073030000B06008052	HMF73030000B06008052	3	6	8	52
HM073035000B06010054	HMF73035000B06010054	3,5	6	10	54
HM073040000B06011055	HMF73040000B06011055	4	6	11	55
HM073045000B06011055	HMF73045000B06011055	4,5	6	11	55
HM073050000B06013057	HMF73050000B06013057	5	6	13	57
HM073055000B06013057	HMF73055000B06013057	5,5	6	13	57
HM073060000B06013057	HMF73060000B06013057	6	6	13	57
HM073065000B10016066	HMF73065000B10016066	6,5	10	16	66
HM073070000B10016066	HMF73070000B10016066	7	10	16	66
HM073075000B10016066	HMF73075000B10016066	7,5	10	16	66
HM073080000B10019069	HMF73080000B10019069	8	10	19	69
HM073085000B10019069	HMF73085000B10019069	8,5	10	19	69
HM073090000B10019069	HMF73090000B10019069	9	10	19	69
HM073095000B10019069	HMF73095000B10019069	9,5	10	19	69
HM073100000B10022072	HMF73100000B10022072	10	10	22	72
HM073120000B12026083	HMF73120000B12026083	12	12	26	83
HM073140000B12026083	HMF73140000B12026083	14	12	26	83
HM073150000B12026083	HMF73150000B12026083	15	12	26	83
HM073160000B16032092	HMF73160000B16032092	16	16	32	92
HM073180000B16032092	HMF73180000B16032092	18	16	32	92
HM073200000B20038104	HMF73200000B20038104	20	20	38	104
HM073220000B20038104	HMF73220000B20038104	22	20	38	104
HM073240000B25045121	HMF73240000B25045121	24	25	45	121
HM073250000B25045121	HMF73250000B25045121	25	25	45	121
HM073260000B25045121	HMF73260000B25045121	26	25	45	121
HM073280000B25045121	HMF73280000B25045121	28	25	45	121
HM073300000B25045121	HMF73300000B25045121	30	25	45	121
HM073320000B32053133	HMF73320000B32053133	32	32	53	133
HM073400000B40063155	HMF73400000B40063155	40	40	63	155

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.027	0.037
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	33	56	58	80	84	88	90	103
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	107	167	191	210	217	263	263	265
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	70	108	124	137	141	171	172	173

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.042	0.048	0.048	0.054	0.06	0.059	0.058	0.057	0.057	0.057	0.059	0.065
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	100	100	89	90	91	79	69	64	60	54	55	54
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	233	239	233	220	198	192	178	184	158	152	149	129
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	152	155	152	143	129	126	116	119	103	98	97	84

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	67	89	109	134	139	150	150	170
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	179	267	334	363	351	442	435	431
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	117	173	217	236	227	287	284	281

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.099	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	165	165	147	149	152	134	119	111	104	95	90	89
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
N	21-22	0.1D	1.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	395	400	393	358	334	323	295	304	269	261	247	220
	23-24	0.1D	1.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	258	260	255	233	218	211	192	197	175	169	160	143

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.028	0.036
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	48	72	84	115	107	125	120	143
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	150	231	267	294	277	351	374	352
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	97	150	174	191	180	228	244	230

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.042	0.048	0.047	0.053	0.06	0.058	0.06	0.058	0.058	0.059	0.058	0.064
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	143	143	125	127	130	111	102	83	87	80	77	76
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	3-4	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	7	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	341	334	334	314	281	273	248	250	226	218	208	184
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	222	217	217	204	183	178	162	162	147	141	135	119

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.004	0.007	0.012	0.02	0.025	0.035	0.047	0.059
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	95	100	143	191	179	209	202	235
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	251	369	468	508	485	618	632	590
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	162	239	304	330	314	402	412	386

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM073/HMF73

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.07	0.078	0.08	0.09	0.1	0.101	0.101	0.099	0.099	0.096	0.097	0.107
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	239	233	212	215	217	193	172	142	148	131	129	128
	2	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	3-4	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	6	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	7	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	10	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
N	21-22	0.1D	1.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	552	560	557	508	481	454	412	414	376	364	345	314
	23-24	0.1D	1.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	360	364	362	330	313	296	270	269	244	236	224	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

3

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM016020000B06010054	HMF16020000B06010054	2	6	10	54
HM016025000B06012056	HMF16025000B06012056	2,5	6	12	56
HM016030000B06012056	HMF16030000B06012056	3	6	12	56
HM016035000B06015059	HMF16035000B06015059	3,5	6	15	59
HM016040000B06019063	HMF16040000B06019063	4	6	19	63
HM016045000B06019063	HMF16045000B06019063	4,5	6	19	63
HM016050000B06024068	HMF16050000B06024068	5	6	24	68
HM016055000B06024068	HMF16055000B06024068	5,5	6	24	68
HM016060000B06024068	HMF16060000B06024068	6	6	24	68
HM016070000B10030080	HMF16070000B10030080	7	10	30	80
HM016075000B10030080	HMF16075000B10030080	7,5	10	30	80
HM016080000B10038088	HMF16080000B10038088	8	10	38	88
HM016090000B10038088	HMF16090000B10038088	9	10	38	88
HM016100000B10045095	HMF16100000B10045095	10	10	45	95
HM016110000B12045102	HMF16110000B12045102	11	12	45	102
HM016120000B12053110	HMF16120000B12053110	12	12	53	110
HM016130000B12053110	HMF16130000B12053110	13	12	53	110
HM016140000B12053110	HMF16140000B12053110	14	12	53	110
HM016150000B12053110	HMF16150000B12053110	15	12	53	110
HM016160000B16063123	HMF16160000B16063123	16	16	63	123
HM016170000B16063123	HMF16170000B16063123	17	16	63	123
HM016180000B16063123	HMF16180000B16063123	18	16	63	123
HM016190000B16063123	HMF16190000B16063123	19	16	63	123
HM016200000B16075135	HMF16200000B16075135	20	16	75	135
HM016200000B20075141	HMF16200000B20075141	20	20	75	141
HM016220000B20075141	HMF16220000B20075141	22	20	75	141
HM016240000B25090166	HMF16240000B25090166	24	25	90	166
HM016250000B25090166	HMF16250000B25090166	25	25	90	166
HM016260000B25090166	HMF16260000B25090166	26	25	90	166
HM016280000B25090166	HMF16280000B25090166	28	25	90	166
HM016300000B25090166	HMF16300000B25090166	30	25	90	166
HM01632000B320106186	HMF1632000B320106186	32	32	106	186
HM01635000B320106186	HMF1635000B320106186	35	32	106	186
HM01636000B320106186	HMF1636000B320106186	36	32	106	186
HM01640000B400125217	HMF1640000B400125217	40	40	125	217

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.027	0.037
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	33	56	58	80	84	88	90	103
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	107	167	191	210	217	263	263	265
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	70	108	124	137	141	171	172	173

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.042	0.048	0.048	0.054	0.06	0.059	0.058	0.057	0.057	0.057	0.059	0.065
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	100	100	89	90	91	79	69	64	60	54	55	54
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	233	239	233	220	198	192	178	184	158	152	149	129
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	152	155	152	143	129	126	116	119	103	98	97	84

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	67	89	109	134	139	150	150	170
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	179	267	334	363	351	442	435	431
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	117	173	217	236	227	287	284	281

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.099	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	165	165	147	149	152	134	119	111	104	95	90	89
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
N	21-22	0.1D	1.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	395	400	393	358	334	323	295	304	269	261	247	220
	23-24	0.1D	1.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	258	260	255	233	218	211	192	197	175	169	160	143

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.028	0.036
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	48	72	84	115	107	125	120	143
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	150	231	267	294	277	351	374	352
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	97	150	174	191	180	228	244	230

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.042	0.048	0.047	0.053	0.06	0.058	0.06	0.058	0.058	0.059	0.058	0.064
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	143	143	125	127	130	111	102	83	87	80	77	76
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	3-4	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	7	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	341	334	334	314	281	273	248	250	226	218	208	184
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	222	217	217	204	183	178	162	162	147	141	135	119

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.004	0.007	0.012	0.02	0.025	0.035	0.047	0.059
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	95	100	143	191	179	209	202	235
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	251	369	468	508	485	618	632	590
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	162	239	304	330	314	402	412	386

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM016/HMF16

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.07	0.078	0.08	0.09	0.1	0.101	0.101	0.099	0.099	0.096	0.097	0.107
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	239	233	212	215	217	193	172	142	148	131	129	128
	2	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	3-4	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	6	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	7	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	10	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
N	21-22	0.1D	1.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	552	560	557	508	481	454	412	414	376	364	345	314
	23-24	0.1D	1.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	360	364	362	330	313	296	270	269	244	236	224	204

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM053010000B06002034	HMF53010000B06002034	1.0	6	2	34
HM053013000B06003034	HMF53013000B06003034	1.3	6	3	34
HM053015000B06003034	HMF53015000B06003034	1.5	6	3	34
HM053018000B06003034	HMF53018000B06003034	1.8	6	3	34
HM053020000B06004035	HMF53020000B06004035	2.0	6	4	35
HM053023000B06004035	HMF53023000B06004035	2.3	6	4	35
HM053025000B06005036	HMF53025000B06005036	2.5	6	5	36
HM053028000B06005036	HMF53028000B06005036	2.8	6	5	36
HM053030000B06005036	HMF53030000B06005036	3.0	6	5	36
HM053033000B06006037	HMF53033000B06006037	3.3	6	6	37
HM053035000B06006037	HMF53035000B06006037	3.5	6	6	37
HM053038000B06007038	HMF53038000B06007038	3.8	6	7	38
HM053040000B06007038	HMF53040000B06007038	4.0	6	7	38
HM053043000B06007038	HMF53043000B06007038	4.3	6	7	38
HM053045000B06007038	HMF53045000B06007038	4.5	6	7	38
HM053048000B06008039	HMF53048000B06008039	4.8	6	8	39
HM053050000B06008039	HMF53050000B06008039	5.0	6	8	39
HM053053000B06008039	HMF53053000B06008039	5.3	6	8	39
HM053055000B06008039	HMF53055000B06008039	5.5	6	8	39
HM053058000B06008039	HMF53058000B06008039	5.8	6	8	39
HM053060000B06008039	HMF53060000B06008039	6.0	6	8	39
HM053065000B08010042	HMF53065000B08010042	6.5	8	10	42
HM053070000B08010042	HMF53070000B08010042	7.0	8	10	42
HM053075000B08010042	HMF53075000B08010042	7.5	8	10	42
HM053080000B08011043	HMF53080000B08011043	8	8	11	43
HM053085000B10011048	HMF53085000B10011048	8,5	10	11	48
HM053090000B10011048	HMF53090000B10011048	9	10	11	48
HM053095000B10011048	HMF53095000B10011048	9,5	10	11	48
HM053100000B10013050	HMF53100000B10013050	10	10	13	50
HM053120000B12016058	HMF53120000B12016058	12	12	16	58
HM053160000B16019064	HMF53160000B16019064	16	16	19	64
HM053200000B20022078	HMF53200000B20022078	20	20	22	78

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.027	0.037
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	33	56	58	80	84	88	90	103
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	107	167	191	210	217	263	263	265
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	70	108	124	137	141	171	172	173

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.042	0.048	0.048	0.054	0.06	0.059	0.058	0.057	0.057	0.057	0.059	0.065
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	100	100	89	90	91	79	69	64	60	54	55	54
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	233	239	233	220	198	192	178	184	158	152	149	129
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	152	155	152	143	129	126	116	119	103	98	97	84

$Vc = \frac{\pi dn}{1000}\ (m/min)$

$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$

$f_z = \frac{f}{zn}\ (mm/tooth)$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	67	89	109	134	139	150	150	170
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	179	267	334	363	351	442	435	431
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	117	173	217	236	227	287	284	281

$Vc = \frac{\pi dn}{1000}\ (m/min)$

$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$

$f_z = \frac{f}{zn}\ (mm/tooth)$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.099	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	165	165	147	149	152	134	119	111	104	95	90	89
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
N	21-22	0.1D	1.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	395	400	393	358	334	323	295	304	269	261	247	220
	23-24	0.1D	1.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	258	260	255	233	218	211	192	197	175	169	160	143

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.028	0.036
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	48	72	84	115	107	125	120	143
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	150	231	267	294	277	351	374	352
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	97	150	174	191	180	228	244	230

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.042	0.048	0.047	0.053	0.06	0.058	0.06	0.058	0.058	0.059	0.058	0.064
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	143	143	125	127	130	111	102	83	87	80	77	76
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	3-4	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	7	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	341	334	334	314	281	273	248	250	226	218	208	184
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	222	217	217	204	183	178	162	162	147	141	135	119

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.004	0.007	0.012	0.02	0.025	0.035	0.047	0.059
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	95	100	143	191	179	209	202	235
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	251	369	468	508	485	618	632	590
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	162	239	304	330	314	402	412	386

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM053/HMF53

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.07	0.078	0.08	0.09	0.1	0.101	0.101	0.099	0.099	0.096	0.097	0.107
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	239	233	212	215	217	193	172	142	148	131	129	128
	2	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	3-4	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	6	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	7	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	10	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
N	21-22	0.1D	1.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	552	560	557	508	481	454	412	414	376	364	345	314
	23-24	0.1D	1.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	360	364	362	330	313	296	270	269	244	236	224	204

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

ISO																																								
	P										M			K					N									S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21									15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM054015000B06004035	HMF54015000B06004035	1,5	6	4	35
HM054020000B06007038	HMF54020000B06007038	2	6	7	38
HM054025000B06008039	HMF54025000B06008039	2,5	6	8	39
HM054030000B06008039	HMF54030000B06008039	3	6	8	39
HM054035000B06010041	HMF54035000B06010041	3,5	6	10	41
HM054040000B06011042	HMF54040000B06011042	4	6	11	42
HM054045000B060X2042	HMF54045000B060X2042	4,5	6	11	42
HM054050000B06013044	HMF54050000B06013044	5	6	13	44
HM054055000B06013044	HMF54055000B06013044	5,5	6	13	44
HM054060000B06013044	HMF54060000B06013044	6	6	13	44
HM054065000B08016048	HMF54065000B08016048	6,5	8	16	48
HM054070000B08016048	HMF54070000B08016048	7	8	16	48
HM054075000B08016048	HMF54075000B08016048	7,5	8	16	48
HM054080000B08019051	HMF54080000B08019051	8	8	19	51
HM054085000B10019056	HMF54085000B10019056	8,5	10	19	56
HM054090000B10019056	HMF54090000B10019056	9	10	19	56
HM054095000B10019056	HMF54095000B10019056	9,5	10	19	56
HM054100000B10022059	HMF54100000B10022059	10	10	22	59

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
e8	-14	-20	-25	-32	-40	-50
	-28	-38	-47	-59	-73	-89
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.027	0.037
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	33	56	58	80	84	88	90	103
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	24	24	36	38	44	57	55	58
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	29	38	50	57	67	75	74	79
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	14	21	20	24	32	32	35
N	21-22	1.0D	0.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	107	167	191	210	217	263	263	265
	23-24	1.0D	0.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	70	108	124	137	141	171	172	173

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SLOTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.042	0.048	0.048	0.054	0.06	0.059	0.058	0.057	0.057	0.057	0.059	0.065
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	100	100	89	90	91	79	69	64	60	54	55	54
	2	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	3-4	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	5	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	6	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	7	1.0D	0.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.045	0.04	0.042	0.046
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	56	55	56	50	52	41	36	32	27	27	28	27
	8-9	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
	10	1.0D	0.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054	0.051	0.053	0.061
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	68	75	75	74	68	62	53	52	48	42	42	44
	11.1	1.0D	0.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.033	0.036	0.04	0.045	0.045	0.037	0.042	0.042	0.048	0.038	0.042	0.045
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	34	32	32	32	29	21	21	20	21	16	17	16
N	21-22	1.0D	0.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	233	239	233	220	198	192	178	184	158	152	149	129
	23-24	1.0D	0.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.053	0.053	0.056	0.054
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	152	155	152	143	129	126	116	119	103	98	97	84

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.061
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114	928
				feed posuw mm/min	67	89	109	134	139	150	150	170
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.03	0.038	0.048
				rpm obr/min	3979	2653	1989	1592	1326	995	796	663
				feed posuw mm/min	36	48	54	67	72	90	91	95
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
				rpm obr/min	4775	3183	2387	1910	1592	1194	955	796
				feed posuw mm/min	43	57	79	103	110	129	126	134
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
				rpm obr/min	2387	1592	1194	955	796	597	477	398
				feed posuw mm/min	14	19	32	37	45	54	53	55
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95	95
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024	2520
				feed posuw mm/min	179	267	334	363	351	442	435	431
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62	62
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974	1645
				feed posuw mm/min	117	173	217	236	227	287	284	281

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.069	0.079	0.079	0.089	0.1	0.1	0.1	0.1	0.1	0.099	0.097	0.107
				rpm obr/min	796	696	619	557	506	446	398	371	348	318	309	279
				feed posuw mm/min	165	165	147	149	152	134	119	111	104	95	90	89
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.076	0.071	0.075	0.083
				rpm obr/min	568	497	442	398	362	318	284	265	199	227	221	199
				feed posuw mm/min	92	88	89	80	82	67	61	58	45	48	50	50
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.089	0.083	0.087	0.098
				rpm obr/min	682	597	531	477	434	382	341	318	298	273	265	239
				feed posuw mm/min	117	127	127	127	116	105	92	82	80	68	69	70
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.071	0.064	0.069	0.076
				rpm obr/min	341	298	265	239	217	191	171	159	149	136	133	119
				feed posuw mm/min	53	54	53	54	49	37	32	30	32	26	27	27
N	21-22	0.1D	1.5D	Vc m/min	95	100	100	100	95	95	95	105	100	105	100	100
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	2160	1989	1768	1592	1375	1210	1080	1114	995	955	884	796
				feed posuw mm/min	395	400	393	358	334	323	295	304	269	261	247	220
	23-24	0.1D	1.5D	Vc m/min	62	65	65	65	62	62	62	68	65	68	65	65
				fz mm/tooth	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.09	0.091	0.093	0.092
				rpm obr/min	1410	1293	1149	1035	897	789	705	722	647	618	575	517
				feed posuw mm/min	258	260	255	233	218	211	192	197	175	169	160	143

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	1.0D	0.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.002	0.005	0.007	0.012	0.015	0.021	0.028	0.036
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	48	72	84	115	107	125	120	143
	2	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	3-4	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	6	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	7	1.0D	0.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.002	0.003	0.005	0.008	0.011	0.018	0.023	0.028
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	33	33	36	53	53	75	77	78
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
	10	1.0D	0.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.002	0.004	0.006	0.01	0.014	0.022	0.028	0.033
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	38	51	57	76	89	105	107	105
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.003	0.007	0.008	0.011	0.017	0.021	0.03
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	19	33	31	35	41	40	48
N	21-22	1.0D	0.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	150	231	267	294	277	351	374	352
	23-24	1.0D	0.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.003	0.005	0.008	0.011	0.012	0.021	0.029	0.034
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	97	150	174	191	180	228	244	230

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE TIALN COATED SLOTTING / FREZ O 3 ZĘBACH POKRYWANY TIALN ROWKOWANIE

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	1.0D	0.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.042	0.048	0.047	0.053	0.06	0.058	0.06	0.058	0.058	0.059	0.058	0.064
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	143	143	125	127	130	111	102	83	87	80	77	76
	2	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	3-4	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	5	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	6	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	7	1.0D	0.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.032	0.037	0.042	0.042	0.048	0.043	0.043	0.038	0.043	0.04	0.042	0.047
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	76	66	67	70	73	57	51	42	38	33	33	34
	8-9	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
	10	1.0D	0.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.034	0.043	0.048	0.053	0.053	0.054	0.051	0.054	0.056	0.056	0.052	0.059
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	104	103	102	101	104	93	78	69	67	61	55	56
	11.1	1.0D	0.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.034	0.034	0.038	0.043	0.043	0.04	0.045	0.045	0.05	0.046	0.039	0.044
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	46	41	40	41	37	31	31	29	30	25	21	21
N	21-22	1.0D	0.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	341	334	334	314	281	273	248	250	226	218	208	184
	23-24	1.0D	0.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.037	0.04	0.045	0.047	0.048	0.053	0.056	0.056	0.054	0.055	0.056	0.055
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	222	217	217	204	183	178	162	162	147	141	135	119

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	45	50
				fz mm/tooth	0.004	0.007	0.012	0.02	0.025	0.035	0.047	0.059
				rpm obr/min	7958	4775	3979	3183	2387	1989	1432	1326
				feed posuw mm/min	95	100	143	191	179	209	202	235
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	35	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.028	0.038	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1393	1114	928
				feed posuw mm/min	50	67	64	94	86	117	127	131
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.038	0.044	0.058
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	57	76	105	130	146	181	168	185
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.005	0.009	0.013	0.018	0.03	0.037	0.045
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	19	32	43	50	57	72	71	72
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	145	140	135	130
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	16711	15385	11141	8913	7692	5570	4297	3448
				feed posuw mm/min	251	369	468	508	485	618	632	590
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	94	91	88	85
				fz mm/tooth	0.005	0.008	0.014	0.019	0.021	0.037	0.049	0.057
				rpm obr/min	10823	9974	7242	5793	4987	3621	2801	2255
				feed posuw mm/min	162	239	304	330	314	402	412	386

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM054/HMF54

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	35.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50	50
				fz mm/tooth	0.07	0.078	0.08	0.09	0.1	0.101	0.101	0.099	0.099	0.096	0.097	0.107
				rpm obr/min	1137	995	884	796	723	637	568	477	497	455	442	398
				feed posuw mm/min	239	233	212	215	217	193	172	142	148	131	129	128
	2	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	3-4	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	6	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	7	0.1D	1.5D	Vc m/min	35	30	30	35	35	35	35	35	30	30	30	30
				fz mm/tooth	0.053	0.058	0.065	0.065	0.075	0.07	0.073	0.071	0.075	0.075	0.077	0.087
				rpm obr/min	796	597	531	557	506	446	398	371	298	273	265	239
				feed posuw mm/min	127	104	103	109	114	94	87	79	67	61	61	62
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
	10	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.058	0.073	0.081	0.09	0.09	0.092	0.088	0.085	0.09	0.088	0.086	0.097
				rpm obr/min	1023	796	707	637	651	573	512	424	398	364	354	318
				feed posuw mm/min	178	174	172	172	176	158	135	108	107	96	91	93
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
				fz mm/tooth	0.051	0.06	0.067	0.075	0.075	0.067	0.061	0.061	0.067	0.065	0.069	0.078
				rpm obr/min	455	398	354	318	289	255	227	212	199	182	177	159
				feed posuw mm/min	70	72	71	72	65	51	42	39	40	35	37	37
N	21-22	0.1D	1.5D	Vc m/min	135	140	140	140	135	135	130	140	140	145	140	140
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	3069	2785	2476	2228	1953	1719	1478	1485	1393	1319	1238	1114
				feed posuw mm/min	552	560	557	508	481	454	412	414	376	364	345	314
	23-24	0.1D	1.5D	Vc m/min	88	91	91	91	88	88	85	91	91	94	91	91
				fz mm/tooth	0.06	0.067	0.075	0.076	0.082	0.088	0.093	0.093	0.09	0.092	0.093	0.094
				rpm obr/min	2001	1810	1609	1448	1273	1120	966	966	905	855	805	724
				feed posuw mm/min	360	364	362	330	313	296	270	269	244	236	224	204

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM095/HMF95

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM095020000B06007051	HMF95020000B06007051	2	6	7	51
HM095030000B06008052	HMF95030000B06008052	3	6	8	52
HM095040000B06011055	HMF95040000B06011055	4	6	11	55
HM095050000B06013057	HMF95050000B06013057	5	6	13	57
HM095060000B06013057	HMF95060000B06013057	6	6	13	57
HM095070000B10016066	HMF95070000B10016066	7	10	16	66
HM095080000B10019069	HMF95080000B10019069	8	10	19	69
HM095090000B10019069	HMF95090000B10019069	9	10	19	69
HM095100000B10022072	HMF95100000B10022072	10	10	22	72
HM095110000B12022079	HMF95110000B12022079	11	12	22	79
HM095120000B12026083	HMF95120000B12026083	12	12	26	83
HM095130000B12026083	HMF95130000B12026083	13	12	26	83
HM095140000B12026083	HMF95140000B12026083	14	12	26	83
HM095150000B12026083	HMF95150000B12026083	15	12	26	83
HM095160000B16032092	HMF95160000B16032092	16	16	32	92
HM095170000B16032092	HMF95170000B16032092	17	16	32	92
HM095180000B16032092	HMF95180000B16032092	18	16	32	92
HM095190000B16032092	HMF95190000B16032092	19	16	32	92
HM095200000B16038098	HMF95200000B16038098	20	16	38	98
HM095200000B20038104	HMF95200000B20038104	20	20	38	104
HM095220000B200X1104	HMF95220000B200X1104	22	20	38	104
HM095250000B250X1121	HMF95250000B250X1121	25	25	45	121

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~+0.04	h6

HM095/HMF95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE UNCOATED SIDE CUTTING / FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	89	119	145	178	186	201	201
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.019	0.029	0.038
				rpm obr/min	3979	2653	1989	1592	1326	995	796
				feed posuw mm/min	48	64	72	89	101	115	121
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.019	0.029	0.038
				rpm obr/min	3979	2653	1989	1592	1326	995	796
				feed posuw mm/min	48	64	72	89	101	115	121
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024
				feed posuw mm/min	239	401	446	484	468	573	581
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974
				feed posuw mm/min	156	260	290	314	303	372	379

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM095/HMF95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE UNCOATED SIDE CUTTING / FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	12.0	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.061	0.069	0.079	0.079	0.089	0.1	0.1	0.067	0.067	0.067	0.065	0.071
				rpm obr/min	928	796	696	619	557	506	446	398	371	348	309	279
				feed posuw mm/min	227	220	220	196	198	203	178	160	149	140	121	119
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.089	0.091	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	155	139	123	113	107	95	97
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.048	0.054	0.058	0.066	0.066	0.075	0.073	0.048	0.05	0.049	0.05	0.056
				rpm obr/min	663	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	127	123	115	117	105	109	93	82	80	58	66	67
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.074	0.069	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.089	0.091	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	155	139	123	113	107	95	97
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.048	0.054	0.058	0.066	0.066	0.075	0.073	0.048	0.05	0.049	0.05	0.056
				rpm obr/min	663	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	127	123	115	117	105	109	93	82	80	58	66	67
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.074	0.069	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.089	0.091	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	155	139	123	113	107	95	97
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.074	0.069	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
N	21-22	0.1D	1.5D	Vc m/min	95	95	100	100	100	95	95	95	105	100	100	100
				fz mm/tooth	0.057	0.06	0.066	0.074	0.075	0.08	0.088	0.061	0.061	0.06	0.061	0.06
				rpm obr/min	2520	2160	1989	1768	1592	1375	1210	1080	1114	995	884	796
				feed posuw mm/min	575	518	525	523	477	440	426	395	408	358	324	286
	23-24	0.1D	1.5D	Vc m/min	62	62	65	65	65	62	62	62	68	65	65	65
				fz mm/tooth	0.057	0.06	0.066	0.074	0.075	0.08	0.088	0.061	0.061	0.06	0.061	0.06
				rpm obr/min	1645	1410	1293	1149	1035	897	789	705	722	647	575	517
				feed posuw mm/min	375	338	341	340	310	287	278	258	264	233	210	186

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM095/HMF95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE TIALN COATED SIDE CUTTING / FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	50
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045
				rpm obr/min	7958	4775	3979	3183	2387	1989	1592
				feed posuw mm/min	127	153	207	255	239	286	286
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	76	102	140	183	195	229	229
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	30	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.029	0.039
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114
				feed posuw mm/min	67	89	86	125	115	138	174
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035
				rpm obr/min	3183	2122	1592	1273	1061	796	637
				feed posuw mm/min	25	34	64	71	81	89	89
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	76	102	140	183	195	229	229
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	30	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.029	0.039
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114
				feed posuw mm/min	67	89	86	125	115	138	174
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035
				rpm obr/min	3183	2122	1592	1273	1061	796	637
				feed posuw mm/min	25	34	64	71	81	89	89
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273
				feed posuw mm/min	76	102	140	183	195	229	229
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035
				rpm obr/min	3183	2122	1592	1273	1061	796	637
				feed posuw mm/min	25	34	64	71	81	89	89
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	150	140	135
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	16711	15385	11141	8913	7958	5570	4297
				feed posuw mm/min	334	554	624	677	668	802	825
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	98	91	88
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	10823	9974	7242	5793	5199	3621	2801
				feed posuw mm/min	216	359	406	440	437	521	538

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM095/HMF95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE TIALN COATED SIDE CUTTING / FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	12.0	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	45	50	50	50	50	50	50	50	45	50	50	50
				fz mm/tooth	0.062	0.07	0.078	0.078	0.088	0.1	0.096	0.068	0.065	0.065	0.063	0.071
				rpm obr/min	1194	1137	995	884	796	723	637	568	477	497	442	398
				feed posuw mm/min	296	318	310	276	280	289	244	232	186	194	167	170
	2	0.1D	1.5D	Vc m/min	40	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.057	0.056	0.07	0.08	0.087	0.087	0.093	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1061	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	242	229	223	226	222	227	213	178	145	138	127	132
	3-4	0.1D	1.5D	Vc m/min	35	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.047	0.053	0.056	0.066	0.066	0.073	0.069	0.046	0.05	0.05	0.047	0.057
				rpm obr/min	928	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	175	169	156	140	147	148	123	110	111	90	87	82
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.048	0.053	0.056	0.064	0.075	0.075	0.07	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	531	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	102	96	89	91	95	87	71	74	69	64	45	53
	6	0.1D	1.5D	Vc m/min	40	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.057	0.056	0.07	0.08	0.087	0.087	0.093	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1061	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	242	229	223	226	222	227	213	178	145	138	127	132
	7	0.1D	1.5D	Vc m/min	35	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.047	0.053	0.056	0.066	0.066	0.073	0.069	0.046	0.05	0.05	0.047	0.057
				rpm obr/min	928	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	175	169	156	140	147	148	123	110	111	90	87	82
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.048	0.053	0.056	0.064	0.075	0.075	0.07	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	531	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	102	96	89	91	95	87	71	74	69	64	45	53
	10	0.1D	1.5D	Vc m/min	40	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.057	0.056	0.07	0.08	0.087	0.087	0.093	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1061	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	242	229	223	226	222	227	213	178	145	138	127	132
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.048	0.053	0.056	0.064	0.075	0.075	0.07	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	531	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	102	96	89	91	95	87	71	74	69	64	45	53
N	21-22	0.1D	1.5D	Vc m/min	130	135	140	140	140	135	135	135	145	140	140	140
				fz mm/tooth	0.057	0.06	0.066	0.074	0.074	0.081	0.087	0.06	0.06	0.06	0.061	0.064
				rpm obr/min	3448	3069	2785	2476	2228	1953	1719	1535	1538	1393	1238	1114
				feed posuw mm/min	786	737	735	733	660	633	598	552	554	501	453	428
	23-24	0.1D	1.5D	Vc m/min	85	88	91	91	91	88	88	88	94	91	91	91
				fz mm/tooth	0.057	0.06	0.066	0.074	0.074	0.081	0.087	0.06	0.06	0.06	0.061	0.064
				rpm obr/min	2255	2001	1810	1609	1448	1273	1120	1000	997	905	805	724
				feed posuw mm/min	514	480	478	476	429	413	390	360	359	326	294	278

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM097/HMF97

4

B min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM097020000B06010054	HMF97020000B06010054	2	6	10	54
HM097025000B06012056	HMF97025000B06012056	2,5	6	12	56
HM097030000B06012056	HMF97030000B06012056	3	6	12	56
HM097035000B06015059	HMF97035000B06015059	3,5	6	15	59
HM097040000B06019063	HMF97040000B06019063	4	6	19	63
HM097045000B06019063	HMF97045000B06019063	4,5	6	19	63
HM097050000B06024068	HMF97050000B06024068	5	6	24	68
HM097055000B06024068	HMF97055000B06024068	5,5	6	24	68
HM097060000B06024068	HMF97060000B06024068	6	6	24	68
HM097070000B10030080	HMF97070000B10030080	7	10	30	80
HM097080000B10038088	HMF97080000B10038088	8	10	38	88
HM097090000B10038088	HMF97090000B10038088	9	10	38	88
HM097100000B10045095	HMF97100000B10045095	10	10	45	95
HM097110000B12045102	HMF97110000B12045102	11	12	45	102
HM097120000B12053110	HMF97120000B12053110	12	12	53	110
HM097130000B12053110	HMF97130000B12053110	13	12	53	110
HM097140000B12053110	HMF97140000B12053110	14	12	53	110
HM097150000B12053110	HMF97150000B12053110	15	12	53	110
HM097160000B16063123	HMF97160000B16063123	16	16	63	123
HM097170000B16063123	HMF97170000B16063123	17	16	63	123
HM097180000B16063123	HMF97180000B16063123	18	16	63	123
HM097190000B16063123	HMF97190000B16063123	19	16	63	123
HM097200000B20075141	HMF97200000B20075141	20	20	75	141

SIZE	MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
UP TO R6	0 –+0.04	h6
OVER TO R6	0 –+0.05	h6

HM097/HMF97

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE UNCOATED SIDE CUTTING / FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	89	119	145	178	186	201	201
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.019	0.029	0.038
				rpm obr/min	3979	2653	1989	1592	1326	995	796
				feed posuw mm/min	48	64	72	89	101	115	121
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.019	0.029	0.038
				rpm obr/min	3979	2653	1989	1592	1326	995	796
				feed posuw mm/min	48	64	72	89	101	115	121
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024
				feed posuw mm/min	239	401	446	484	468	573	581
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974
				feed posuw mm/min	156	260	290	314	303	372	379

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM097/HMF97

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE UNCOATED SIDE CUTTING / FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	12.0	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.061	0.069	0.079	0.079	0.089	0.067	0.067	0.067	0.067	0.067	0.065	0.071
				rpm obr/min	928	796	696	619	557	506	446	398	371	348	309	279
				feed posuw mm/min	227	220	220	196	198	204	179	160	149	140	121	119
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	154	138	123	113	107	95	97
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.048	0.054	0.058	0.066	0.066	0.05	0.048	0.048	0.05	0.049	0.05	0.056
				rpm obr/min	663	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	127	123	115	117	105	109	92	82	80	58	66	67
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	154	138	123	113	107	95	97
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.048	0.054	0.058	0.066	0.066	0.05	0.048	0.048	0.05	0.049	0.05	0.056
				rpm obr/min	663	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	127	123	115	117	105	109	92	82	80	58	66	67
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	154	138	123	113	107	95	97
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
N	21-22	0.1D	1.5D	Vc m/min	95	95	100	100	100	95	95	95	105	100	100	100
				fz mm/tooth	0.057	0.06	0.066	0.074	0.075	0.054	0.058	0.061	0.061	0.06	0.061	0.063
				rpm obr/min	2520	2160	1989	1768	1592	1375	1210	1080	1114	995	884	796
				feed posuw mm/min	575	518	525	523	477	445	421	395	408	358	324	301
	23-24	0.1D	1.5D	Vc m/min	62	62	65	65	65	62	62	62	68	65	65	65
				fz mm/tooth	0.057	0.06	0.066	0.074	0.075	0.054	0.058	0.061	0.061	0.06	0.061	0.063
				rpm obr/min	1645	1410	1293	1149	1035	897	789	705	722	647	575	517
				feed posuw mm/min	375	338	341	340	310	291	275	258	264	233	210	196

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM097/HMF97

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE TIALN COATED SIDE CUTTING / FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	50	45
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.062
				rpm obr/min	7958	4775	3979	3183	2387	1989	1592	1194
				feed posuw mm/min	127	153	207	255	239	286	286	296
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045	0.057
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	76	102	140	183	195	229	229	242
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.029	0.039	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	67	89	86	125	115	138	174	175
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035	0.048
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	25	34	64	71	81	89	89	102
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045	0.057
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	76	102	140	183	195	229	229	242
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.029	0.039	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	67	89	86	125	115	138	174	175
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035	0.048
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	25	34	64	71	81	89	89	102
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045	0.057
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	76	102	140	183	195	229	229	242
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035	0.048
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	25	34	64	71	81	89	89	102
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	150	140	135	130
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048	0.057
				rpm obr/min	16711	15385	11141	8913	7958	5570	4297	3448
				feed posuw mm/min	334	554	624	677	668	802	825	786
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	98	91	88	85
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048	0.057
				rpm obr/min	10823	9974	7242	5793	5199	3621	2801	2255
				feed posuw mm/min	216	359	406	440	437	521	538	514

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM097/HMF97

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE TIALN COATED SIDE CUTTING / FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50
				fz mm/tooth	0.07	0.078	0.078	0.088	0.067	0.064	0.068	0.065	0.065	0.063	0.071
				rpm obr/min	1137	995	884	796	723	637	568	477	497	442	398
				feed posuw mm/min	318	310	276	280	291	244	232	186	194	167	170
	2	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.056	0.07	0.08	0.087	0.058	0.062	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	229	223	226	222	227	213	178	145	138	127	132
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.053	0.056	0.066	0.066	0.048	0.046	0.046	0.05	0.05	0.047	0.057
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	169	156	140	147	146	123	110	111	90	87	82
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.053	0.056	0.064	0.075	0.05	0.047	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	96	89	91	95	87	72	74	69	64	45	53
	6	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.056	0.07	0.08	0.087	0.058	0.062	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	229	223	226	222	227	213	178	145	138	127	132
	7	0.1D	1.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.053	0.056	0.066	0.066	0.048	0.046	0.046	0.05	0.05	0.047	0.057
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	169	156	140	147	146	123	110	111	90	87	82
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.053	0.056	0.064	0.075	0.05	0.047	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	96	89	91	95	87	72	74	69	64	45	53
	10	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.056	0.07	0.08	0.087	0.058	0.062	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	229	223	226	222	227	213	178	145	138	127	132
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.053	0.056	0.064	0.075	0.05	0.047	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	96	89	91	95	87	72	74	69	64	45	53
N	21-22	0.1D	1.5D	Vc m/min	135	140	140	140	135	135	135	145	140	140	140
				fz mm/tooth	0.06	0.066	0.074	0.074	0.054	0.058	0.06	0.06	0.06	0.061	0.064
				rpm obr/min	3069	2785	2476	2228	1953	1719	1535	1538	1393	1238	1114
				feed posuw mm/min	737	735	733	660	633	598	552	554	501	453	428
	23-24	0.1D	1.5D	Vc m/min	88	91	91	91	88	88	88	94	91	91	91
				fz mm/tooth	0.06	0.066	0.074	0.074	0.054	0.058	0.06	0.06	0.06	0.061	0.064
				rpm obr/min	2001	1810	1609	1448	1273	1120	1000	997	905	805	724
				feed posuw mm/min	480	478	476	429	413	390	360	359	326	294	278

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM098/HMF98

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH
HM098220000B20075141	HMF98220000B20075141	22	20	75	141
HM098240000B25090166	HMF98240000B25090166	24	25	90	166
HM098250000B25090166	HMF98250000B25090166	25	25	90	166
HM098260000B25090166	HMF98260000B25090166	26	25	90	166
HM098280000B25090166	HMF98280000B25090166	28	25	90	166
HM098300000B25090166	HMF98300000B25090166	30	25	90	166
HM09832000B320106186	HMF9832000B320106186	32	32	106	186
HM09836000B320106186	HMF9836000B320106186	36	32	106	186
HM09840000B400125217	HMF9840000B400125217	40	40	125	217

MILL DIA TOLERANCE mm	SHANK DIA TOLERANCE
0 ~+0.05	h6

HM098/HMF98

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE UNCOATED SIDE CUTTING / FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045
				rpm obr/min	5570	3714	2785	2228	1857	1393	1114
				feed posuw mm/min	89	119	145	178	186	201	201
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.019	0.029	0.038
				rpm obr/min	3979	2653	1989	1592	1326	995	796
				feed posuw mm/min	48	64	72	89	101	115	121
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25
				fz mm/tooth	0.003	0.006	0.009	0.014	0.019	0.029	0.038
				rpm obr/min	3979	2653	1989	1592	1326	995	796
				feed posuw mm/min	48	64	72	89	101	115	121
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.003	0.006	0.011	0.017	0.023	0.036	0.044
				rpm obr/min	4775	3183	2387	1910	1592	1194	955
				feed posuw mm/min	57	76	105	130	146	172	168
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15
				fz mm/tooth	0.002	0.005	0.01	0.014	0.019	0.029	0.036
				rpm obr/min	2387	1592	1194	955	796	597	477
				feed posuw mm/min	19	32	48	53	60	69	69
N	21-22	0.1D	1.5D	Vc m/min	75	105	100	100	105	100	95
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	11937	11141	7958	6366	5570	3979	3024
				feed posuw mm/min	239	401	446	484	468	573	581
	23-24	0.1D	1.5D	Vc m/min	49	68	65	65	68	65	62
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048
				rpm obr/min	7799	7215	5173	4138	3608	2586	1974
				feed posuw mm/min	156	260	290	314	303	372	379

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM098/HMF98

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE UNCOATED SIDE CUTTING / FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	12.0	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.061	0.069	0.079	0.079	0.089	0.067	0.067	0.067	0.067	0.067	0.065	0.071
				rpm obr/min	928	796	696	619	557	506	446	398	371	348	309	279
				feed posuw mm/min	227	220	220	196	198	204	179	160	149	140	121	119
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	154	138	123	113	107	95	97
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.048	0.054	0.058	0.066	0.066	0.05	0.048	0.048	0.05	0.049	0.05	0.056
				rpm obr/min	663	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	127	123	115	117	105	109	92	82	80	58	66	67
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	154	138	123	113	107	95	97
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	20	25	25
				fz mm/tooth	0.048	0.054	0.058	0.066	0.066	0.05	0.048	0.048	0.05	0.049	0.05	0.056
				rpm obr/min	663	568	497	442	398	362	318	284	265	199	221	199
				feed posuw mm/min	127	123	115	117	105	109	92	82	80	58	66	67
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.056	0.057	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.06	0.06	0.068
				rpm obr/min	796	682	597	531	477	434	382	341	318	298	265	239
				feed posuw mm/min	178	156	170	170	170	154	138	123	113	107	95	97
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.047	0.054	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054	0.049	0.053
				rpm obr/min	398	341	298	265	239	217	191	171	159	149	133	119
				feed posuw mm/min	75	74	69	69	71	64	53	48	45	48	39	38
N	21-22	0.1D	1.5D	Vc m/min	95	95	100	100	100	95	95	95	105	100	100	100
				fz mm/tooth	0.057	0.06	0.066	0.074	0.075	0.054	0.058	0.061	0.061	0.06	0.061	0.063
				rpm obr/min	2520	2160	1989	1768	1592	1375	1210	1080	1114	995	884	796
				feed posuw mm/min	575	518	525	523	477	445	421	395	408	358	324	301
	23-24	0.1D	1.5D	Vc m/min	62	62	65	65	65	62	62	62	68	65	65	65
				fz mm/tooth	0.057	0.06	0.066	0.074	0.075	0.054	0.058	0.061	0.061	0.06	0.061	0.063
				rpm obr/min	1645	1410	1293	1149	1035	897	789	705	722	647	575	517
				feed posuw mm/min	375	338	341	340	310	291	275	258	264	233	210	196

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM098/HMF98

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE TIALN COATED SIDE CUTTING / FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1	0.1D	1.5D	Vc m/min	50	45	50	50	45	50	50	45
				fz mm/tooth	0.004	0.008	0.013	0.02	0.025	0.036	0.045	0.062
				rpm obr/min	7958	4775	3979	3183	2387	1989	1592	1194
				feed posuw mm/min	127	153	207	255	239	286	286	296
	2	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045	0.057
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	76	102	140	183	195	229	229	242
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.029	0.039	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	67	89	86	125	115	138	174	175
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035	0.048
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	25	34	64	71	81	89	89	102
	6	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045	0.057
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	76	102	140	183	195	229	229	242
	7	0.1D	1.5D	Vc m/min	35	35	30	35	30	30	35	35
				fz mm/tooth	0.003	0.006	0.009	0.014	0.018	0.029	0.039	0.047
				rpm obr/min	5570	3714	2387	2228	1592	1194	1114	928
				feed posuw mm/min	67	89	86	125	115	138	174	175
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035	0.048
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	25	34	64	71	81	89	89	102
	10	0.1D	1.5D	Vc m/min	40	40	40	40	40	40	40	40
				fz mm/tooth	0.003	0.006	0.011	0.018	0.023	0.036	0.045	0.057
				rpm obr/min	6366	4244	3183	2546	2122	1592	1273	1061
				feed posuw mm/min	76	102	140	183	195	229	229	242
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20
				fz mm/tooth	0.002	0.004	0.01	0.014	0.019	0.028	0.035	0.048
				rpm obr/min	3183	2122	1592	1273	1061	796	637	531
				feed posuw mm/min	25	34	64	71	81	89	89	102
N	21-22	0.1D	1.5D	Vc m/min	105	145	140	140	150	140	135	130
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048	0.057
				rpm obr/min	16711	15385	11141	8913	7958	5570	4297	3448
				feed posuw mm/min	334	554	624	677	668	802	825	786
	23-24	0.1D	1.5D	Vc m/min	68	94	91	91	98	91	88	85
				fz mm/tooth	0.005	0.009	0.014	0.019	0.021	0.036	0.048	0.057
				rpm obr/min	10823	9974	7242	5793	5199	3621	2801	2255
				feed posuw mm/min	216	359	406	440	437	521	538	514

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM098/HMF98

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE TIALN COATED SIDE CUTTING / FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	50	50	45	50	50	50
				fz mm/tooth	0.07	0.078	0.078	0.088	0.067	0.064	0.068	0.065	0.065	0.063	0.071
				rpm obr/min	1137	995	884	796	723	637	568	477	497	442	398
				feed posuw mm/min	318	310	276	280	291	244	232	186	194	167	170
	2	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.056	0.07	0.08	0.087	0.058	0.062	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	229	223	226	222	227	213	178	145	138	127	132
	3-4	0.1D	1.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.053	0.056	0.066	0.066	0.048	0.046	0.046	0.05	0.05	0.047	0.057
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	169	156	140	147	146	123	110	111	90	87	82
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.053	0.056	0.064	0.075	0.05	0.047	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	96	89	91	95	87	72	74	69	64	45	53
	6	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.056	0.07	0.08	0.087	0.058	0.062	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	229	223	226	222	227	213	178	145	138	127	132
	7	0.1D	1.5D	Vc m/min	35	35	30	35	35	35	35	35	30	35	30
				fz mm/tooth	0.053	0.056	0.066	0.066	0.048	0.046	0.046	0.05	0.05	0.047	0.057
				rpm obr/min	796	696	531	557	506	446	398	371	298	309	239
				feed posuw mm/min	169	156	140	147	146	123	110	111	90	87	82
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.053	0.056	0.064	0.075	0.05	0.047	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	96	89	91	95	87	72	74	69	64	45	53
	10	0.1D	1.5D	Vc m/min	45	40	40	40	45	45	45	40	40	40	40
				fz mm/tooth	0.056	0.07	0.08	0.087	0.058	0.062	0.058	0.057	0.058	0.06	0.069
				rpm obr/min	1023	796	707	637	651	573	512	424	398	354	318
				feed posuw mm/min	229	223	226	222	227	213	178	145	138	127	132
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.053	0.056	0.064	0.075	0.05	0.047	0.054	0.054	0.054	0.056	0.056
				rpm obr/min	455	398	354	318	289	255	227	212	199	133	159
				feed posuw mm/min	96	89	91	95	87	72	74	69	64	45	53
N	21-22	0.1D	1.5D	Vc m/min	135	140	140	140	135	135	135	145	140	140	140
				fz mm/tooth	0.06	0.066	0.074	0.074	0.054	0.058	0.06	0.06	0.06	0.061	0.064
				rpm obr/min	3069	2785	2476	2228	1953	1719	1535	1538	1393	1238	1114
				feed posuw mm/min	737	735	733	660	633	598	552	554	501	453	428
	23-24	0.1D	1.5D	Vc m/min	88	91	91	91	88	88	88	94	91	91	91
				fz mm/tooth	0.06	0.066	0.074	0.074	0.054	0.058	0.06	0.06	0.06	0.061	0.064
				rpm obr/min	2001	1810	1609	1448	1273	1120	1000	997	905	805	724
				feed posuw mm/min	480	478	476	429	413	390	360	359	326	294	278

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A3/HMFA3

3-6

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
HM0A3060000B06013057	HMFA3060000B06013057	6	6	13	57	3	0,18
HM0A3070000B10016066	HMFA3070000B10016066	7	10	16	66	3	0,18
HM0A3080000B10019069	HMFA3080000B10019069	8	10	19	69	3	0,18
HM0A3090000B10019069	HMFA3090000B10019069	9	10	19	69	3	0,18
HM0A3100000B10022072	HMFA3100000B10022072	10	10	22	72	4	0,18
HM0A3110000B12022079	HMFA3110000B12022079	11	12	22	79	4	0,18
HM0A3120000B12026083	HMFA3120000B12026083	12	12	26	83	4	0,18
HM0A3130000B12026083	HMFA3130000B12026083	13	12	26	83	4	0,18
HM0A3140000B12026083	HMFA3140000B12026083	14	12	26	83	4	0,25
HM0A3150000B12026083	HMFA3150000B12026083	15	12	26	83	4	0,25
HM0A3160000B16032092	HMFA3160000B16032092	16	16	32	92	4	0,25
HM0A3180000B16032092	HMFA3180000B16032092	18	16	32	92	4	0,25
HM0A3200000B20038104	HMFA3200000B20038104	20	20	38	104	4	0,25
HM0A3250000B25045121	HMFA3250000B25045121	25	25	45	121	5	0,36
HM0A3280000B25045121	HMFA3280000B25045121	28	25	45	121	6	0,36
HM0A3300000B25045121	HMFA3300000B25045121	30	25	45	121	6	0,36
HM0A3320000B32053133	HMFA3320000B32053133	32	32	53	133	6	0,51
HM0A3350000B32053133	HMFA3350000B32053133	35	32	53	133	6	0,51
HM0A3400000B32063155	HMFA3400000B32063155	40	32	63	155	6	0,56

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM0A3/HMFA3

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING
FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.5D	1.5D	Vc m/min	35	35	35	35	35	35
				fz mm/tooth	0.015	0.025	0.034	0.05	0.056	0.064
				rpm obr/min	1857	1393	1114	928	796	696
				feed posuw mm/min	84	104	152	186	178	178
	2	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	3-4	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	5	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	6	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	7	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	8-9	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	10	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	11.1	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
N	21-22	0.5D	1.5D	Vc m/min	85	80	80	75	80	80
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	4509	3183	2546	1989	1819	1592
				feed posuw mm/min	203	239	357	398	422	446
	23-24	0.5D	1.5D	Vc m/min	55	52	52	49	52	52
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	2918	2069	1655	1300	1182	1035
				feed posuw mm/min	131	155	232	260	274	290

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A3/HMFA3

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING
FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.071	0.08	0.088	0.098	0.088	0.1	0.1	0.113	0.119	0.152
				rpm obr/min	619	557	506	446	398	371	348	309	279	223
				feed posuw mm/min	176	178	223	218	210	223	209	210	199	203
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
N	21-22	0.1D	1.5D	Vc m/min	80	75	75	80	80	85	80	80	80	80
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	1415	1194	1085	1019	909	902	796	707	637	509
				feed posuw mm/min	475	497	461	458	513	530	497	475	455	376
	23-24	0.1D	1.5D	Vc m/min	52	49	49	52	52	55	52	52	52	52
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	920	780	709	662	591	584	517	460	414	331
				feed posuw mm/min	309	324	301	298	333	343	323	309	295	244

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A3/HMFA3

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING
FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.1D	1.5D	Vc m/min	45	50	50	45	50	50
				fz mm/tooth	0.015	0.025	0.034	0.05	0.057	0.063
				rpm obr/min	2387	1989	1592	1194	1137	995
				feed posuw mm/min	107	149	216	239	259	251
	2	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	3-4	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	6	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	7	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	10	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
N	21-22	0.1D	1.5D	Vc m/min	120	110	110	105	110	115
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	6366	4377	3501	2785	2501	2288
				feed posuw mm/min	286	328	490	557	590	641
	23-24	0.1D	1.5D	Vc m/min	78	72	72	68	72	75
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	4138	2865	2292	1804	1637	1492
				feed posuw mm/min	186	215	321	361	386	418

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A3/HMFA3

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING
FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	45	50	50	50	45
				fz mm/tooth	0.069	0.078	0.089	0.095	0.089	0.098	0.098	0.109	0.117	0.156
				rpm obr/min	884	796	723	637	568	477	497	442	398	286
				feed posuw mm/min	244	248	322	302	304	281	292	289	279	268
	2	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	3-4	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	6	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	7	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	10	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
N	21-22	0.1D	1.5D	Vc m/min	110	105	105	110	110	120	110	115	115	110
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1945	1671	1519	1401	1251	1273	1094	1017	915	700
				feed posuw mm/min	661	689	646	630	713	756	696	671	642	521
	23-24	0.1D	1.5D	Vc m/min	72	68	68	72	72	78	72	75	75	72
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1273	1082	984	917	819	828	716	663	597	458
				feed posuw mm/min	433	446	418	413	467	492	456	438	419	341

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0B2/HMFB2

3-6

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
HM0B2060000B06024068	HMFB2060000B06024068	6	6	24	68	3	0,18
HM0B2070000B10030080	HMFB2070000B10030080	7	10	30	80	3	0,18
HM0B2080000B10038088	HMFB2080000B10038088	8	10	38	88	3	0,18
HM0B2090000B10038088	HMFB2090000B10038088	9	10	38	88	3	0,18
HM0B2100000B10045095	HMFB2100000B10045095	10	10	45	95	4	0,18
HM0B2110000B12045102	HMFB2110000B12045102	11	12	45	102	4	0,18
HM0B2120000B12053110	HMFB2120000B12053110	12	12	53	110	4	0,18
HM0B2130000B12053110	HMFB2130000B12053110	13	12	53	110	4	0,18
HM0B2140000B12053110	HMFB2140000B12053110	14	12	53	110	4	0,25
HM0B2150000B12053110	HMFB2150000B12053110	15	12	53	110	4	0,25
HM0B2160000B16063123	HMFB2160000B16063123	16	16	63	123	4	0,25
HM0B2170000B16063123	HMFB2170000B16063123	17	16	63	123	4	0,25
HM0B2180000B16063123	HMFB2180000B16063123	18	16	63	123	4	0,25
HM0B2190000B16063123	HMFB2190000B16063123	19	16	63	123	4	0,25
HM0B2200000B20075141	HMFB2200000B20075141	20	20	75	141	4	0,25
HM0B2220000B20075141	HMFB2220000B20075141	22	20	75	141	5	0,36
HM0B2240000B25090166	HMFB2240000B25090166	24	25	90	166	5	0,36
HM0B2250000B25090166	HMFB2250000B25090166	25	25	90	166	5	0,36
HM0B2260000B25090166	HMFB2260000B25090166	26	25	90	166	6	0,36
HM0B2280000B25090166	HMFB2280000B25090166	28	25	90	166	6	0,36
HM0B2300000B25090166	HMFB2300000B25090166	30	25	90	166	6	0,36
HM0B232000B320106186	HMFB232000B320106186	32	32	106	186	6	0,51
HM0B235000B320106186	HMFB235000B320106186	35	32	106	186	6	0,51
HM0B236000B320106186	HMFB236000B320106186	36	32	106	186	6	0,56
HM0B238000B320125217	HMFB238000B320125217	38	32	125	217	6	0,56
HM0B240000B320125217	HMFB240000B320125217	40	32	125	217	6	0,56
HM0B240000B400125217	HMFB240000B400125217	40	40	125	217	6	0,56

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM						
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM0B2/HMFB2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING

FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.5D	1.5D	Vc m/min	35	35	35	35	35	35
				fz mm/tooth	0.015	0.025	0.034	0.05	0.056	0.064
				rpm obr/min	1857	1393	1114	928	796	696
				feed posuw mm/min	84	104	152	186	178	178
	2	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	3-4	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	5	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	6	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	7	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	8-9	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	10	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	11.1	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
N	21-22	0.5D	1.5D	Vc m/min	85	80	80	75	80	80
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	4509	3183	2546	1989	1819	1592
				feed posuw mm/min	203	239	357	398	422	446
	23-24	0.5D	1.5D	Vc m/min	55	52	52	49	52	52
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	2918	2069	1655	1300	1182	1035
				feed posuw mm/min	131	155	232	260	274	290

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0B2/HMFB2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING
FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.071	0.08	0.088	0.098	0.088	0.1	0.1	0.113	0.119	0.152
				rpm obr/min	619	557	506	446	398	371	348	309	279	223
				feed posuw mm/min	176	178	223	218	210	223	209	210	199	203
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
N	21-22	0.1D	1.5D	Vc m/min	80	75	75	80	80	85	80	80	80	80
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	1415	1194	1085	1019	909	902	796	707	637	509
				feed posuw mm/min	475	497	461	458	513	530	497	475	455	376
	23-24	0.1D	1.5D	Vc m/min	52	49	49	52	52	55	52	52	52	52
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	920	780	709	662	591	584	517	460	414	331
				feed posuw mm/min	309	324	301	298	333	343	323	309	295	244

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0B2/HMFB2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING
FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.1D	1.5D	Vc m/min	45	50	50	45	50	50
				fz mm/tooth	0.015	0.025	0.034	0.05	0.057	0.063
				rpm obr/min	2387	1989	1592	1194	1137	995
				feed posuw mm/min	107	149	216	239	259	251
	2	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	3-4	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	6	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	7	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	10	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
N	21-22	0.1D	1.5D	Vc m/min	120	110	110	105	110	115
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	6366	4377	3501	2785	2501	2288
				feed posuw mm/min	286	328	490	557	590	641
	23-24	0.1D	1.5D	Vc m/min	78	72	72	68	72	75
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	4138	2865	2292	1804	1637	1492
				feed posuw mm/min	186	215	321	361	386	418

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0B2/HMFB2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING

FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	45	50	50	50	45
				fz mm/tooth	0.069	0.078	0.089	0.095	0.089	0.098	0.098	0.109	0.117	0.156
				rpm obr/min	884	796	723	637	568	477	497	442	398	286
				feed posuw mm/min	244	248	322	302	304	281	292	289	279	268
	2	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	3-4	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	6	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	7	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	10	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
N	21-22	0.1D	1.5D	Vc m/min	110	105	105	110	110	120	110	115	115	110
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1945	1671	1519	1401	1251	1273	1094	1017	915	700
				feed posuw mm/min	661	689	646	630	713	756	696	671	642	521
	23-24	0.1D	1.5D	Vc m/min	72	68	68	72	72	78	72	75	75	72
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1273	1082	984	917	819	828	716	663	597	458
				feed posuw mm/min	433	446	418	413	467	492	456	438	419	341

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A5

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	○	○	○	●	○	○		●											●	●	●	●	○																

UNCOATED	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	CHAMFER
HM0A5060000B06013057	6	6	13	57	0,51
HM0A5080000B10019069	8	10	19	69	0,51
HM0A5100000B10022072	10	10	22	72	0,6
HM0A5120000B12026083	12	12	26	83	0,74
HM0A5140000B12026083	14	12	26	83	0,94
HM0A5160000B16032092	16	16	32	92	0,94
HM0A5180000B16032092	18	16	32	92	0,94
HM0A5200000B20038104	20	20	38	104	0,94
HM0A5220000B20038104	22	20	38	104	0,94
HM0A5250000B25045121	25	25	45	121	0,94
HM0A5300000B25045121	30	25	45	121	1,23

TOLERANCE RANGE IN UM

	NOMINAL-DIAMETER IN UM					
	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM0A5

CUTTING CONDITIONS PARAMETRY SKRAWANIA

3 FLUTE ROUGHING UNCOATED SIDE CUTTING / FREZ O 3 ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0	30.0
P	1	0.5D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.015	0.025	0.045	0.067	0.075	0.086	0.095	0.107	0.147	0.163	0.2
				rpm obr/min	1857	1393	1114	928	796	696	619	557	506	446	371
				feed posuw mm/min	84	104	150	187	179	180	176	179	223	218	223
	2	0.5D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.044	0.058	0.067	0.083	0.093	0.104	0.126	0.142	0.172
				rpm obr/min	1592	1194	955	796	682	597	531	477	434	382	318
				feed posuw mm/min	62	82	126	138	137	149	148	149	164	163	164
	3-4	0.5D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.046	0.058	0.065	0.081	0.092	0.092	0.133	0.151	0.173
				rpm obr/min	1326	995	796	663	568	497	442	398	362	318	265
				feed posuw mm/min	60	72	110	115	111	121	122	110	144	144	138
	5	0.5D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.044	0.058	0.067	0.083	0.093	0.106	0.129	0.157	0.177
				rpm obr/min	796	597	477	398	341	298	265	239	217	191	159
				feed posuw mm/min	31	38	63	69	69	74	74	76	84	90	85
	6	0.5D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.044	0.058	0.067	0.083	0.093	0.104	0.126	0.142	0.172
				rpm obr/min	1592	1194	955	796	682	597	531	477	434	382	318
				feed posuw mm/min	62	82	126	138	137	149	148	149	164	163	164
	7	0.5D	1.5D	Vc m/min	25	25	25	25	25	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.046	0.058	0.065	0.081	0.092	0.092	0.133	0.151	0.173
				rpm obr/min	1326	995	796	663	568	497	442	398	362	318	265
				feed posuw mm/min	60	72	110	115	111	121	122	110	144	144	138
	8-9	0.5D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.044	0.058	0.067	0.083	0.093	0.106	0.129	0.157	0.177
				rpm obr/min	796	597	477	398	341	298	265	239	217	191	159
				feed posuw mm/min	31	38	63	69	69	74	74	76	84	90	85
	10	0.5D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.044	0.058	0.067	0.083	0.093	0.104	0.126	0.142	0.172
				rpm obr/min	1592	1194	955	796	682	597	531	477	434	382	318
				feed posuw mm/min	62	82	126	138	137	149	148	149	164	163	164
	11.1	0.5D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.044	0.058	0.067	0.083	0.093	0.106	0.129	0.157	0.177
				rpm obr/min	796	597	477	398	341	298	265	239	217	191	159
				feed posuw mm/min	31	38	63	69	69	74	74	76	84	90	85
N	21-22	0.5D	1.5D	Vc m/min	85	80	80	75	80	80	80	75	75	80	85
				fz mm/tooth	0.015	0.025	0.047	0.067	0.078	0.094	0.112	0.139	0.142	0.15	0.196
				rpm obr/min	4509	3183	2546	1989	1819	1592	1415	1194	1085	1019	902
				feed posuw mm/min	203	239	359	400	426	449	475	498	462	458	530
	23-24	0.5D	1.5D	Vc m/min	55	52	52	49	52	52	52	49	49	52	55
				fz mm/tooth	0.015	0.025	0.047	0.067	0.078	0.094	0.112	0.139	0.142	0.15	0.196
				rpm obr/min	2918	2069	1655	1300	1182	1035	920	780	709	662	584
				feed posuw mm/min	131	155	233	261	277	292	309	325	302	298	343

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A1/HMFA1

3-6

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
HM0A1060030B06013057	HMFA1060000B06013057	6	6	13	57	3	0,25
HM0A1070030B10016066	HMFA1070030B10016066	7	10	16	66	3	0,25
HM0A1080030B10019069	HMFA1080000B10019069	8	10	19	69	3	0,25
HM0A1090030B10019069	HMFA1090030B10019069	9	10	19	69	3	0,34
HM0A1095030B10019069	HMFA1095030B10019069	9,5	10	19	69	3	0,34
HM0A1100040B10022072	HMFA1100040B10022072	10	10	22	72	4	0,34
HM0A1110040B12022079	HMFA1110040B12022079	11	12	22	79	4	0,5
HM0A1120040B12026083	HMFA1120040B12026083	12	12	26	83	4	0,5
HM0A1125040B12026083	HMFA1125040B12026083	12,5	12	26	83	4	0,5
HM0A1130040B12026083	HMFA1130040B12026083	13	12	26	83	4	0,5
HM0A1140040B12026083	HMFA1140040B12026083	14	12	26	83	4	0,55
HM0A1145040B12026083	HMFA1145040B12026083	14,5	12	26	83	4	0,55
HM0A1150040B12026083	HMFA1150040B12026083	15	12	26	83	4	0,55
HM0A1160040B16032092	HMFA1160040B16032092	16	16	32	92	4	0,55
HM0A1170040B16032092	HMFA1170040B16032092	17	16	32	92	4	0,55
HM0A1180040B16032092	HMFA1180040B16032092	18	16	32	92	4	0,55
HM0A1190040B16032092	HMFA1190040B16032092	19	16	32	92	4	0,55
HM0A1200040B20038104	HMFA1200040B20038104	20	20	38	104	4	0,55
HM0A1200040B16038098	HMFA1200040B16038098	20	16	38	98	4	0,55
HM0A1220050B20038104	HMFA1220050B20038104	22	20	38	104	5	0,55
HM0A1240050B25045121	HMFA1240050B25045121	24	25	45	121	5	0,55
HM0A1250050B25045121	HMFA1250050B25045121	25	25	45	121	5	0,55
HM0A1260060B25045121	HMFA1260060B25045121	26	25	45	121	6	0,55
HM0A1280060B25045121	HMFA1280060B25045121	28	25	45	121	6	0,7
HM0A1300060B25045121	HMFA1300060B25045121	30	25	45	121	6	0,7
HM0A1320060B32053133	HMFA1320060B32053133	32	32	53	133	6	0,7
HM0A1340060B32053133	HMFA1340060B32053133	34	32	53	133	6	0,7
HM0A1350060B32053133	HMFA1350060B32053133	35	32	53	133	6	0,7
HM0A1360060B32053133	HMFA1360060B32053133	36	32	53	133	6	0,7
HM0A1380060B32063155	HMFA1380060B32063155	38	32	63	155	6	0,7
HM0A1380060B40063155	HMFA1380060B40063155	38	40	63	155	6	0,7
HM0A1400060B32063155	HMFA1400060B32063155	40	32	63	155	6	0,88
HM0A1400060B40063155	HMFA1400060B40063155	40	40	63	155	6	0,88
HM0A1450060B32063143	HMFA1450060B32063143	45	32	63	143	6	0,88
HM0A1500060B50075177	HMFA1500060B50075177	50	50	75	177	6	0,88

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM

	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM0A1/HMFA1

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING
FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.5D	1.5D	Vc m/min	35	35	35	35	35	35
				fz mm/tooth	0.015	0.025	0.034	0.05	0.056	0.064
				rpm obr/min	1857	1393	1114	928	796	696
				feed posuw mm/min	84	104	152	186	178	178
	2	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	3-4	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	5	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	6	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	7	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	8-9	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	10	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	11.1	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
N	21-22	0.5D	1.5D	Vc m/min	85	80	80	75	80	80
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	4509	3183	2546	1989	1819	1592
				feed posuw mm/min	203	239	357	398	422	446
	23-24	0.5D	1.5D	Vc m/min	55	52	52	49	52	52
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	2918	2069	1655	1300	1182	1035
				feed posuw mm/min	131	155	232	260	274	290

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A1/HMFA1

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING
FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.071	0.08	0.088	0.098	0.088	0.1	0.1	0.113	0.119	0.152
				rpm obr/min	619	557	506	446	398	371	348	309	279	223
				feed posuw mm/min	176	178	223	218	210	223	209	210	199	203
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
N	21-22	0.1D	1.5D	Vc m/min	80	75	75	80	80	85	80	80	80	80
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	1415	1194	1085	1019	909	902	796	707	637	509
				feed posuw mm/min	475	497	461	458	513	530	497	475	455	376
	23-24	0.1D	1.5D	Vc m/min	52	49	49	52	52	55	52	52	52	52
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	920	780	709	662	591	584	517	460	414	331
				feed posuw mm/min	309	324	301	298	333	343	323	309	295	244

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A1/HMFA1

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING
FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.1D	1.5D	Vc m/min	45	50	50	45	50	50
				fz mm/tooth	0.015	0.025	0.034	0.05	0.057	0.063
				rpm obr/min	2387	1989	1592	1194	1137	995
				feed posuw mm/min	107	149	216	239	259	251
	2	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	3-4	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	6	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	7	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	10	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
N	21-22	0.1D	1.5D	Vc m/min	120	110	110	105	110	115
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	6366	4377	3501	2785	2501	2288
				feed posuw mm/min	286	328	490	557	590	641
	23-24	0.1D	1.5D	Vc m/min	78	72	72	68	72	75
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	4138	2865	2292	1804	1637	1492
				feed posuw mm/min	186	215	321	361	386	418

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A1/HMFA1

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING
FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	45	50	50	50	45
				fz mm/tooth	0.069	0.078	0.089	0.095	0.089	0.098	0.098	0.109	0.117	0.156
				rpm obr/min	884	796	723	637	568	477	497	442	398	286
				feed posuw mm/min	244	248	322	302	304	281	292	289	279	268
	2	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	3-4	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	6	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	7	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	10	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
N	21-22	0.1D	1.5D	Vc m/min	110	105	105	110	110	120	110	115	115	110
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1945	1671	1519	1401	1251	1273	1094	1017	915	700
				feed posuw mm/min	661	689	646	630	713	756	696	671	642	521
	23-24	0.1D	1.5D	Vc m/min	72	68	68	72	72	78	72	75	75	72
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1273	1082	984	917	819	828	716	663	597	458
				feed posuw mm/min	433	446	418	413	467	492	456	438	419	341

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A2/HMFA2

3-6

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

UNCOATED	TIAIN	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	#FLUTE	CHAMFER
HM0A2060030B06024068	HMFA2060000B06024068	6	6	24	68	3	0,25
HM0A2070030B10030080	HMFA2070030B10030080	7	10	30	80	3	0,25
HM0A2080030B10038088	HMFA2080000B10038088	8	10	38	88	3	0,25
HM0A2090030B10038088	HMFA2090030B10038088	9	10	38	88	3	0,34
HM0A2100040B10045095	HMFA2100040B10045095	10	10	45	95	4	0,34
HM0A2110040B12045102	HMFA2110040B12045102	11	12	45	102	4	0,5
HM0A2120040B12053110	HMFA2120040B12053110	12	12	53	110	4	0,5
HM0A2130040B12053110	HMFA2130040B12053110	13	12	53	110	4	0,5
HM0A2140040B12053110	HMFA2140040B12053110	14	12	53	110	4	0,55
HM0A2150040B12053110	HMFA2150040B12053110	15	12	53	110	4	0,55
HM0A2160040B16063123	HMFA2160040B16063123	16	16	63	123	4	0,55
HM0A2170040B16063123	HMFA2170040B16063123	17	16	63	123	4	0,55
HM0A2180040B16063123	HMFA2180040B16063123	18	16	63	123	4	0,55
HM0A2190040B16063123	HMFA2190040B16063123	19	16	63	123	4	0,55
HM0A2200040B20075141	HMFA2200040B20075141	20	20	75	141	4	0,55
HM0A2200040B16075135	HMFA2200040B16075135	20	16	75	135	4	0,55
HM0A2220050B20075141	HMFA2220050B20075141	22	20	75	141	5	0,55
HM0A2220050B25075151	HMFA2220050B25075151	22	25	75	151	5	0,55
HM0A2240050B25090166	HMFA2240050B25090166	24	25	90	166	5	0,55
HM0A2250050B25090166	HMFA2250050B25090166	25	25	90	166	5	0,55
HM0A2260060B25090166	HMFA2260060B25090166	26	25	90	166	6	0,55
HM0A2280060B25090166	HMFA2280060B25090166	28	25	90	166	6	0,7
HM0A2300060B25090166	HMFA2300060B25090166	30	25	90	166	6	0,7
HM0A232060B320106186	HMFA232060B320106186	32	32	106	186	6	0,7
HM0A235060B320106186	HMFA235060B320106186	35	32	106	186	6	0,7
HM0A236060B320106186	HMFA236060B320106186	36	32	106	186	6	0,7
HM0A238060B320125217	HMFA238060B320125217	38	32	125	217	6	0,7
HM0A238060B400125217	HMFA238060B400125217	38	40	125	217	6	0,7
HM0A240060B320125217	HMFA240060B320125217	40	32	125	217	6	0,88
HM0A240060B400125217	HMFA240060B400125217	40	40	125	217	6	0,88

TOLERANCE RANGE IN UM

NOMINAL-DIAMETER IN UM	1-3	3-6	6-10	10-18	18-30	30-50
js12	±50	±60	±75	±90	±105	±125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM0A2/HMFA2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING

FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.5D	1.5D	Vc m/min	35	35	35	35	35	35
				fz mm/tooth	0.015	0.025	0.034	0.05	0.056	0.064
				rpm obr/min	1857	1393	1114	928	796	696
				feed posuw mm/min	84	104	152	186	178	178
	2	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	3-4	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	5	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	6	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	7	0.5D	1.5D	Vc m/min	25	25	25	25	25	25
				fz mm/tooth	0.015	0.024	0.034	0.044	0.049	0.061
				rpm obr/min	1326	995	796	663	568	497
				feed posuw mm/min	60	72	108	117	111	121
	8-9	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
	10	0.5D	1.5D	Vc m/min	30	30	30	30	30	30
				fz mm/tooth	0.013	0.023	0.033	0.044	0.05	0.063
				rpm obr/min	1592	1194	955	796	682	597
				feed posuw mm/min	62	82	126	140	136	150
	11.1	0.5D	1.5D	Vc m/min	15	15	15	15	15	15
				fz mm/tooth	0.013	0.021	0.033	0.044	0.05	0.063
				rpm obr/min	796	597	477	398	341	298
				feed posuw mm/min	31	38	63	70	68	75
N	21-22	0.5D	1.5D	Vc m/min	85	80	80	75	80	80
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	4509	3183	2546	1989	1819	1592
				feed posuw mm/min	203	239	357	398	422	446
	23-24	0.5D	1.5D	Vc m/min	55	52	52	49	52	52
				fz mm/tooth	0.015	0.025	0.035	0.05	0.058	0.07
				rpm obr/min	2918	2069	1655	1300	1182	1035
				feed posuw mm/min	131	155	232	260	274	290

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A2/HMFA2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING UNCOATED SIDE CUTTING

FREZ O WIELU ZĘBACH NIEPOKRYWANY FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	35	35	35	35	35	35	35	35	35	35
				fz mm/tooth	0.071	0.08	0.088	0.098	0.088	0.1	0.1	0.113	0.119	0.152
				rpm obr/min	619	557	506	446	398	371	348	309	279	223
				feed posuw mm/min	176	178	223	218	210	223	209	210	199	203
	2	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	3-4	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	5	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	6	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	7	0.1D	1.5D	Vc m/min	25	25	25	25	25	25	20	25	25	25
				fz mm/tooth	0.069	0.069	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
				rpm obr/min	442	398	362	318	284	265	199	221	199	159
				feed posuw mm/min	122	110	145	143	131	138	117	143	132	139
	8-9	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
	10	0.1D	1.5D	Vc m/min	30	30	30	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
				rpm obr/min	531	477	434	382	341	318	298	265	239	191
				feed posuw mm/min	149	149	165	162	156	164	170	170	163	180
	11.1	0.1D	1.5D	Vc m/min	15	15	15	15	15	15	15	15	15	15
				fz mm/tooth	0.07	0.08	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
				rpm obr/min	265	239	217	191	171	159	149	133	119	95
				feed posuw mm/min	74	76	84	90	91	85	90	94	87	85
N	21-22	0.1D	1.5D	Vc m/min	80	75	75	80	80	85	80	80	80	80
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	1415	1194	1085	1019	909	902	796	707	637	509
				feed posuw mm/min	475	497	461	458	513	530	497	475	455	376
	23-24	0.1D	1.5D	Vc m/min	52	49	49	52	52	55	52	52	52	52
				fz mm/tooth	0.084	0.104	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
				rpm obr/min	920	780	709	662	591	584	517	460	414	331
				feed posuw mm/min	309	324	301	298	333	343	323	309	295	244

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A2/HMFA2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING

FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	6.0	8.0	10.0	12.0	14.0	16.0
P	1	0.1D	1.5D	Vc m/min	45	50	50	45	50	50
				fz mm/tooth	0.015	0.025	0.034	0.05	0.057	0.063
				rpm obr/min	2387	1989	1592	1194	1137	995
				feed posuw mm/min	107	149	216	239	259	251
	2	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	3-4	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	6	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	7	0.1D	1.5D	Vc m/min	30	30	35	35	35	35
				fz mm/tooth	0.015	0.024	0.035	0.043	0.048	0.06
				rpm obr/min	1592	1194	1114	928	796	696
				feed posuw mm/min	72	86	156	160	153	167
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
	10	0.1D	1.5D	Vc m/min	40	40	40	40	45	40
				fz mm/tooth	0.013	0.023	0.034	0.044	0.049	0.061
				rpm obr/min	2122	1592	1273	1061	1023	796
				feed posuw mm/min	83	110	173	187	201	194
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20
				fz mm/tooth	0.012	0.021	0.033	0.045	0.05	0.063
				rpm obr/min	1061	796	637	531	455	398
				feed posuw mm/min	38	50	84	95	91	100
N	21-22	0.1D	1.5D	Vc m/min	120	110	110	105	110	115
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	6366	4377	3501	2785	2501	2288
				feed posuw mm/min	286	328	490	557	590	641
	23-24	0.1D	1.5D	Vc m/min	78	72	72	68	72	75
				fz mm/tooth	0.015	0.025	0.035	0.05	0.059	0.07
				rpm obr/min	4138	2865	2292	1804	1637	1492
				feed posuw mm/min	186	215	321	361	386	418

$$Vc = \frac{\pi dn}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM0A2/HMFA2

CUTTING CONDITIONS PARAMETRY SKRAWANIA

P M K N S H

MULTI FLUTE ROUGHING TIALN COATED SIDE CUTTING

FREZ O WIELU ZĘBACH POKRYWANY TIALN FREZOWANIE ZGRUBNE BOKIEM

ISO	VDI 3323	Ae mm	Ap mm	DC	18.0	20.0	22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	1	0.1D	1.5D	Vc m/min	50	50	50	50	50	45	50	50	50	45
				fz mm/tooth	0.069	0.078	0.089	0.095	0.089	0.098	0.098	0.109	0.117	0.156
				rpm obr/min	884	796	723	637	568	477	497	442	398	286
				feed posuw mm/min	244	248	322	302	304	281	292	289	279	268
	2	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	3-4	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	5	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	6	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	0.16
				rpm obr/min	707	637	651	573	512	424	398	354	318	255
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	244
	7	0.1D	1.5D	Vc m/min	30	35	35	35	35	35	30	35	30	35
				fz mm/tooth	0.07	0.07	0.078	0.087	0.075	0.086	0.1	0.1	0.113	0.148
				rpm obr/min	531	557	506	446	398	371	298	309	239	223
				feed posuw mm/min	149	156	197	194	179	192	179	186	162	198
	8-9	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	20
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	0.153
				rpm obr/min	354	318	289	255	227	212	199	177	119	127
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
	10	0.1D	1.5D	Vc m/min	40	40	45	45	45	40	40	40	40	40
				fz mm/tooth	0.07	0.075	0.074	0.087	0.075	0.083	0.094	0.107	0.117	[illegible]
				rpm obr/min	707	637	651	573	512	424	398	354	318	[illegible]
				feed posuw mm/min	198	191	241	249	230	211	224	227	223	[illegible]
	11.1	0.1D	1.5D	Vc m/min	20	20	20	20	20	20	20	20	15	[illegible]
				fz mm/tooth	0.071	0.083	0.08	0.096	0.091	0.091	0.1	0.118	0.141	[illegible]
				rpm obr/min	354	318	289	255	227	212	199	177	119	[illegible]
				feed posuw mm/min	100	106	116	122	124	116	119	125	101	117
N	21-22	0.1D	1.5D	Vc m/min	110	105	105	110	110	120	110	115	115	110
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1945	1671	1519	1401	1251	1273	1094	1017	915	700
				feed posuw mm/min	661	689	646	630	713	756	696	671	642	521
	23-24	0.1D	1.5D	Vc m/min	72	68	68	72	72	78	72	75	75	72
				fz mm/tooth	0.085	0.103	0.085	0.09	0.095	0.099	0.106	0.11	0.117	0.124
				rpm obr/min	1273	1082	984	917	819	828	716	663	597	458
				feed posuw mm/min	433	446	418	413	467	492	456	438	419	341

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

General purpose. Available Dovetail, Woodruff Key-seat, T-slot, Side Milling Cutters and HSS (8% cobalt) Corner Rounding, Shell End Mills

Ogólnego zastosowania. Dostępny jaskółczy ogon, wpust klinowy Woodruff, rowek T, Frezy boczne i HSS (8% kobaltu) Zaokrąglanie naroży.

HSS MILLING CUTTERS

FREZY HSS

Group					ISO	PAGE
JO10			10		P M K N S H	708
SLO03			10		P M K N S H	710
SLO12			10		P M K N S H	712
SLO07			10		P M K N S H	715
MON10			18-24		P M K N S H	717
MON15			14-18		P M K N S H	719
MOE10			6-10		P M K N S H	725
MOE16			4-6		P M K N S H	727
MOE12			6-12		P M K N S H	728
MOE14			6-12		P M K N S H	730
MOE18			6-12		P M K N S H	732
HM20			4		P M K N S H	734

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

JO10

B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

PLAIN	FLAT	DC	A	α	DCON	OAL	#FLUTE
JO101645B12060	JO101645A12060	16	4	45°	12	60	6
JO102045B12063	JO102045A12063	20	5	45°	12	63	6
JO102245B12067	JO102245A12067	22	6	45°	12	67	6
JO102545B16067	JO102545A16067	25	6,3	45°	16	67	8
JO102845B16067	JO102845A16067	28	7,5	45°	16	67	8
JO103245B16071	JO103245A16071	32	8	45°	16	71	10
JO103845B16080	JO103845A16080	38	10	45°	16	80	12
JO101660B12060	JO101660A12060	16	6,3	60°	12	60	6
JO102060B12063	JO102060A12063	20	8	60°	12	63	6
JO102260B12067	JO102260A12067	22	9	60°	12	67	6
JO102560B16067	JO102560A16067	25	10	60°	16	67	8
JO102860B16067	JO102860A16067	28	11	60°	16	67	8
JO103260B16071	JO103260A16071	32	12,5	60°	16	71	10
JO103860B16080	JO103860A16080	38	16	60°	16	80	12
JO104060B25085	JO104060A25085	40	13	60°	25	85	12
JO105060B25100	JO105060A25100	50	16	60°	25	100	16

	NOMINAL-DIAMETER IN MM						
	3-6	6-10	10-18	18-30	30-50	50-80	80-120
TOLERANCE RANGE IN MM							
js16	±0,375	±0,45	±0,55	±0,65	±0,80	±0,95	±1,10
js14	±0,15	±0,18	±0,215	±0,26	±0,31	±0,37	±0,435
js18	±0,90	±1,10	±1,35	±1,65	±1,95	±2,30	±2,70
TOLERANCE RANGE IN UM							
h6	0	0	0	0	0	0	0
	-8	-9	-11	-13	-16	-19	-22

JO10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE DOVETAIL CUTTER

ISO	VDI 3323	DC	16.0	20.0	25.0	32.0	40.0	50.0	63.0
P	1	Vc m/min	30	30	30	30	30	30	30
		fz mm/tooth	0.03	0.037	0.026	0.042	0.043	0.03	0.031
		rpm obr/min	597	477	382	298	239	191	152
		feed posuw mm/min	107	106	79	125	123	92	75
	2	Vc m/min	15	15	15	15	15	15	15
		fz mm/tooth	0.031	0.036	0.031	0.041	0.043	0.026	0.031
		rpm obr/min	298	239	191	149	119	95	76
		feed posuw mm/min	56	52	47	61	62	40	38
	3-4	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.031	0.035	0.028	0.04	0.042	0.03	0.033
		rpm obr/min	199	159	127	99	80	64	51
		feed posuw mm/min	37	33	29	40	40	31	27
	5	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.021	0.02	0.02	0.02	0.022	0.02	0.023
		rpm obr/min	199	159	127	99	80	64	51
		feed posuw mm/min	25	19	20	20	21	20	19
	6	Vc m/min	15	15	15	15	15	15	15
		fz mm/tooth	0.031	0.036	0.031	0.041	0.043	0.026	0.031
		rpm obr/min	298	239	191	149	119	95	76
		feed posuw mm/min	56	52	47	61	62	40	38
	7	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.031	0.035	0.028	0.04	0.042	0.03	0.033
		rpm obr/min	199	159	127	99	80	64	51
		feed posuw mm/min	37	33	29	40	40	31	27
	8-9	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.021	0.02	0.02	0.02	0.022	0.02	0.023
		rpm obr/min	199	159	127	99	80	64	51
		feed posuw mm/min	25	19	20	20	21	20	19
	10	Vc m/min	15	15	15	15	15	15	15
		fz mm/tooth	0.031	0.036	0.031	0.041	0.043	0.026	0.031
		rpm obr/min	298	239	191	149	119	95	76
		feed posuw mm/min	56	52	47	61	62	40	38
	11.1	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.021	0.02	0.02	0.02	0.022	0.02	0.023
		rpm obr/min	199	159	127	99	80	64	51
		feed posuw mm/min	25	19	20	20	21	20	19
N	21-25	Vc m/min	95	85	90	90	95	85	90
		fz mm/tooth	0.03	0.04	0.029	0.041	0.042	0.03	0.033
		rpm obr/min	1890	1353	1146	895	756	541	455
		feed posuw mm/min	340	325	266	367	381	260	240

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

SLO03

10

B min AIR

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

PLAIN	FLAT	DC	A	α	DCON	OAL	#FLUTE
SLO0316040A12060	SLO0316040B12060	16	4	45	12	60	6
SLO0320050A12063	SLO0320050B12063	20	5	45 °	12	63	6
SLO0322060A12067	SLO0322060B12067	22	6	45 °	12	67	6
SLO0325063A16067	SLO0325063B16067	25	6,3	45 °	16	67	8
SLO0328075A16067	SLO0328075B16067	28	7,5	45	16	67	8
SLO0332080A16071	SLO0332080B16071	32	8	45	16	71	10
SLO0338100A16080	SLO0338100B16080	38	10	45	16	80	12
SLO0316063A12060	SLO0316063B12060	16	6,3	60 °	12	60	6
SLO0320080A12063	SLO0320080B12063	20	8	60 °	12	63	6
SLO0322090A12067	SLO0322090B12067	22	9	60	12	67	6
SLO0325100A16067	SLO0325100B16067	25	10	60	16	67	8
SLO0328110A16067	SLO0328110B16067	28	11	60	16	67	8
SLO0332125A16071	SLO0332125B16071	32	12,5	60 °	16	71	10
SLO0338160A16080	SLO0338160B16080	38	16	60	16	80	12

	NOMINAL-DIAMETER IN MM						
	3-6	6-10	10-18	18-30	30-50	50-80	80-120
	TOLERANCE RANGE IN MM						
js16	±0,375	±0,45	±0,55	±0,65	±0,80	±0,95	±1,10
js14	±0,15	±0,18	±0,215	±0,26	±0,31	±0,37	±0,435
js18	±0,90	±1,10	±1,35	±1,65	±1,95	±2,30	±2,70
	TOLERANCE RANGE IN UM						
h6	0	0	0	0	0	0	0
	-8	-9	-11	-13	-16	-19	-22

SLO03

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE DOVETAIL CUTTER

ISO	VDI 3323	DC	16.0	20.0	25.0	32.0
P	1	Vc m/min	30	30	30	30
		fz mm/tooth	0.03	0.037	0.026	0.042
		rpm obr/min	597	477	382	298
		feed posuw mm/min	107	106	79	125
	2	Vc m/min	15	15	15	15
		fz mm/tooth	0.031	0.036	0.031	0.041
		rpm obr/min	298	239	191	149
		feed posuw mm/min	56	52	47	61
	3-4	Vc m/min	10	10	10	10
		fz mm/tooth	0.031	0.035	0.028	0.04
		rpm obr/min	199	159	127	99
		feed posuw mm/min	37	33	29	40
	5	Vc m/min	10	10	10	10
		fz mm/tooth	0.021	0.02	0.02	0.02
		rpm obr/min	199	159	127	99
		feed posuw mm/min	25	19	20	20
	6	Vc m/min	15	15	15	15
		fz mm/tooth	0.031	0.036	0.031	0.041
		rpm obr/min	298	239	191	149
		feed posuw mm/min	56	52	47	61
	7	Vc m/min	10	10	10	10
		fz mm/tooth	0.031	0.035	0.028	0.04
		rpm obr/min	199	159	127	99
		feed posuw mm/min	37	33	29	40
	8-9	Vc m/min	10	10	10	10
		fz mm/tooth	0.021	0.02	0.02	0.02
		rpm obr/min	199	159	127	99
		feed posuw mm/min	25	19	20	20
	10	Vc m/min	15	15	15	15
		fz mm/tooth	0.031	0.036	0.031	0.041
		rpm obr/min	298	239	191	149
		feed posuw mm/min	56	52	47	61
	11.1	Vc m/min	10	10	10	10
		fz mm/tooth	0.021	0.02	0.02	0.02
		rpm obr/min	199	159	127	99
		feed posuw mm/min	25	19	20	20
N	21-25	Vc m/min	95	85	90	90
		fz mm/tooth	0.03	0.04	0.029	0.041
		rpm obr/min	1890	1353	1146	895
		feed posuw mm/min	340	325	266	367

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

SLO12

10

B min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

PLAIN	FLAT	DC	A	DCON	OAL	#FLUTE
SLO1211020A06050	SLO1211020B06050	10,5	2	6	50	8
SLO1211025A06050	SLO1211025B06050	10,5	2,5	6	50	8
SLO1211030A06050	SLO1211030B06050	10,5	3	6	50	8
SLO1214020A10056	SLO1214020B10056	13,5	2	10	56	8
SLO1214025A10056	SLO1214025B10056	13,5	2,5	10	56	8
SLO1214030A10056	SLO1214030B10056	13,5	3	10	56	8
SLO1214040A10056	SLO1214040B10056	13,5	4	10	56	8
SLO1217025A10056	SLO1217025B10056	16,5	2,5	10	56	8
SLO1217030A10056	SLO1217030B10056	16,5	3	10	56	8
SLO1217040A10056	SLO1217040B10056	16,5	4	10	56	8
SLO1217050A10056	SLO1217050B10056	16,5	5	10	56	8
SLO1220030A10056	SLO1220030B10056	19,5	3	10	56	8
SLO1220040A10063	SLO1220040B10063	19,5	4	10	63	8
SLO1220050A10063	SLO1220050B10063	19,5	5	10	63	8
SLO1220060A10063	SLO1220060B10063	19,5	6	10	63	8
SLO1223040A10063	SLO1223040B10063	22,5	4	10	63	10
SLO1223050A10063	SLO1223050B10063	22,5	5	10	63	10
SLO1223060A10063	SLO1223060B10063	22,5	6	10	63	10
SLO1223080A10063	SLO1223080B10063	22,5	8	10	63	10
SLO1226050A10063	SLO1226050B10063	25,5	5	10	63	10
SLO1226060A10063	SLO1226060B10063	25,5	6	10	63	10
SLO1226070A10063	SLO1226070B10063	25,5	7	10	63	10
SLO1226080A10063	SLO1226080B10063	25,5	8	10	63	10
SLO1229050A10063	SLO1229050B10063	28,5	5	10	63	10

	NOMINAL-DIAMETER IN MM						
	3-6	6-10	10-18	18-30	30-50	50-80	80-120
	TOLERANCE RANGE IN MM						
js18	±0,90	±1,10	±1,35	±1,65	±1,95	±2,30	±2,70
	TOLERANCE RANGE IN UM						
h11	0	0	0	0	0	0	0
	-60	-75	-90	-110	-130	-160	-190
e8	-14	-20	-25	-32	-40	-50	-60
	-28	-38	-47	-59	-73	-89	-106
h6	0	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16	-19

SLO12

10

B min AIR

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

PLAIN	FLAT	DC	A	DCON	OAL	#FLUTE
SLO1229060A10063	SLO1229060B10063	28,5	6	10	63	10
SLO1229070A10063	SLO1229070B10063	28,5	7	10	63	10
SLO1229080A10063	SLO1229080B10063	28,5	8	10	63	10
SLO1229100A12071	SLO1229100B12071	28,5	10	12	71	10
SLO1233050A12071	SLO1233050B12071	32,5	5	12	71	12
SLO1233060A12071	SLO1233060B12071	32,5	6	12	71	12
SLO1233070A12071	SLO1233070B12071	32,5	7	12	71	12
SLO1233080A12071	SLO1233080B12071	32,5	8	12	71	12
SLO1233100A12071	SLO1233100B12071	32,5	10	12	71	12
SLO1239070A12071	SLO1239070B12071	38,5	7	12	71	12
SLO1239080A12071	SLO1239080B12071	38,5	8	12	71	12
SLO1239090A12071	SLO1239090B12071	38,5	9	12	71	12
SLO1239100A12071	SLO1239100B12071	38,5	10	12	71	12
SLO1246100A12071	SLO1246100B12071	45,5	10	12	71	14

	NOMINAL-DIAMETER IN MM						
	3-6	6-10	10-18	18-30	30-50	50-80	80-120
	TOLERANCE RANGE IN MM						
js18	±0,90	±1,10	±1,35	±1,65	±1,95	±2,30	±2,70
	TOLERANCE RANGE IN UM						
h11	0	0	0	0	0	0	0
	-60	-75	-90	-110	-130	-160	-190
e8	-14	-20	-25	-32	-40	-50	-60
	-28	-38	-47	-59	-73	-89	-106
h6	0	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16	-19

SLO12

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTES WOODRUFF KEYSEAT CUTTERS

ISO	VDI 3323	DC	10.5	13.5	16.5	19.5	22.5	28.5	32.5	45.5
P	1	Vc m/min	30	30	30	30	30	30	30	30
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	909	707	579	490	424	335	294	210
		feed posuw mm/min	73	57	116	137	170	168	212	206
	2	Vc m/min	20	20	20	20	20	20	20	20
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	606	472	386	326	283	223	196	140
		feed posuw mm/min	49	38	77	91	113	112	141	137
	3-4	Vc m/min	15	15	15	15	15	15	15	15
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	455	354	289	245	212	168	147	105
		feed posuw mm/min	36	28	58	69	85	84	106	103
	5	Vc m/min	10	10	10	10	10	10	10	10
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	303	236	193	163	141	112	98	70
		feed posuw mm/min	24	19	39	46	57	56	71	69
	6	Vc m/min	20	20	20	20	20	20	20	20
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	606	472	386	326	283	223	196	140
		feed posuw mm/min	49	38	77	91	113	112	141	137
	7	Vc m/min	15	15	15	15	15	15	15	15
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	455	354	289	245	212	168	147	105
		feed posuw mm/min	36	28	58	69	85	84	106	103
	8-9	Vc m/min	10	10	10	10	10	10	10	10
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	303	236	193	163	141	112	98	70
		feed posuw mm/min	24	19	39	46	57	56	71	69
	10	Vc m/min	20	20	20	20	20	20	20	20
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	606	472	386	326	283	223	196	140
		feed posuw mm/min	49	38	77	91	113	112	141	137
	11.1	Vc m/min	10	10	10	10	10	10	10	10
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	303	236	193	163	141	112	98	70
		feed posuw mm/min	24	19	39	46	57	56	71	69
N	21-25	Vc m/min	100	100	100	100	100	100	90	100
		fz mm/tooth	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
		rpm obr/min	3032	2358	1929	1632	1415	1117	881	700
		feed posuw mm/min	243	189	386	457	566	558	635	686

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)

fz = feed per tooth – posuw na ostrze (mm/tooth)

f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)

d = diameter – średnica (mm)

z = number of teeth – liczba zębów

SLO07

10

ISO	P										M			K					N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●		●											○	○	○	○	○																

PLAIN	FLAT	DC	A	DCON	DN	OAL	#FLUTE
SLO0712506A10057	SLO0712506B10057	12,5	6	10	5	57	6
SLO0716008A10062	SLO0716008B10062	16	8	10	6,5	62	6
SLO0718008A12070	SLO0718008B12070	18	8	12	8	70	6
SLO0719009A12071	SLO0719009B12071	19	9	12	8	71	6
SLO0721009A12074	SLO0721009B12074	21	9	12	10	74	6
SLO0722010A12075	SLO0722010B12075	22	10	12	10	75	6
SLO0725011A16082	SLO0725011B16082	25	11	16	12	82	6
SLO0728012A16083	SLO0728012B16083	28	12	16	13	83	6
SLO0732014A16090	SLO0732014B16090	32	14	16	15	90	8
SLO0736016A25103	SLO0736016B25103	36	16	25	17	103	8
SLO0740018A25108	SLO0740018B25108	40	18	25	19	108	8

	NOMINAL-DIAMETER IN MM						
	3-6	6-10	10-18	18-30	30-50	50-80	80-120
	TOLERANCE RANGE IN MM						
h12	0	0	0	0	0	0	0
	-0.12	-0.15	-0.18	-0.21	-0.25	-0.30	-0.35
js18	±0,90	±1,10	±1,35	±1,65	±1,95	±2,30	±2,70
	TOLERANCE RANGE IN UM						
d11	-30	-40	-50	-65	-80	-100	-120
	-105	-130	-160	-195	-240	-290	-340
h6	0	0	0	0	0	0	0
	-8	-9	-11	-13	-16	-19	-22

SLO07

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE T-SLOT CUTTERS

ISO	VDI 3323	DC	12.5	16.0	18.0	19.0	21.0	22.0	25.0	28.0	32.0	50..0	63.0
P	1	Vc m/min	30	30	30	30	30	30	30	30	30	40	50
		fz mm/tooth	0.008	0.013	0.014	0.017	0.018	0.021	0.028	0.036	0.036	0.037	0.036
		rpm obr/min	764	597	531	503	455	434	382	341	298	255	253
		feed posuw mm/min	37	47	45	51	49	55	64	74	86	75	73
	2	Vc m/min	15	15	15	15	15	15	15	15	15	20	25
		fz mm/tooth	0.007	0.011	0.012	0.013	0.016	0.019	0.026	0.037	0.035	0.037	0.04
		rpm obr/min	382	298	265	251	227	217	191	171	149	127	126
		feed posuw mm/min	16	20	19	20	22	25	30	38	42	38	40
	3-4	Vc m/min	10	10	10	10	10	10	10	10	10	15	15
		fz mm/tooth	0.005	0.007	0.01	0.014	0.017	0.019	0.022	0.028	0.025	0.028	0.029
		rpm obr/min	255	199	177	168	152	145	127	114	99	95	76
		feed posuw mm/min	8	8	11	14	15	16	17	19	20	21	18
	6	Vc m/min	15	15	15	15	15	15	15	15	15	20	25
		fz mm/tooth	0.007	0.011	0.012	0.013	0.016	0.019	0.026	0.037	0.035	0.037	0.04
		rpm obr/min	382	298	265	251	227	217	191	171	149	127	126
		feed posuw mm/min	16	20	19	20	22	25	30	38	42	38	40
	7	Vc m/min	10	10	10	10	10	10	10	10	10	15	15
		fz mm/tooth	0.005	0.007	0.01	0.014	0.017	0.019	0.022	0.028	0.025	0.028	0.029
		rpm obr/min	255	199	177	168	152	145	127	114	99	95	76
		feed posuw mm/min	8	8	11	14	15	16	17	19	20	21	18
	10	Vc m/min	15	15	15	15	15	15	15	15	15	20	25
		fz mm/tooth	0.007	0.011	0.012	0.013	0.016	0.019	0.026	0.037	0.035	0.037	0.04
		rpm obr/min	382	298	265	251	227	217	191	171	149	127	126
		feed posuw mm/min	16	20	19	20	22	25	30	38	42	38	40
N	21-25	Vc m/min	90	90	95	90	95	90	90	90	90	125	145
		fz mm/tooth	0.008	0.013	0.015	0.017	0.019	0.021	0.026	0.034	0.034	0.036	0.036
		rpm obr/min	2292	1790	1680	1508	1440	1302	1146	1023	895	796	733
		feed posuw mm/min	110	140	151	154	164	164	179	209	244	229	211

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

MON10

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MON1005000401618	50	4	16	18
MON1005000501618	50	5	16	18
MON1005000601618	50	6	16	18
MON1005000801616	50	8	16	16
MON1005001001616	50	10	16	16
MON1006300502222	63	5	22	22
MON1006300602222	63	6	22	22
MON1006300802220	63	8	22	20
MON1006301002220	63	10	22	20
MON1006301202220	63	12	22	20
MON1008000602224	80	6	22	24
MON1008000802224	80	8	22	24
MON1008001002224	80	10	22	24
MON1008001202220	80	12	22	20
MON1008000602724	80	6	27	24
MON1008000802724	80	8	27	24
MON1008001002724	80	10	27	24
MON1008001202720	80	12	27	20
MON1010000602726	100	6	27	26
MON1010000802726	100	8	27	26
MON1010001002722	100	10	27	22
MON1010000603226	100	6	32	26
MON1010000803226	100	8	32	26
MON1010001003222	100	10	32	22
MON1010001203222	100	12	32	22
MON1012500803230	125	8	32	30
MON1012501003230	125	10	32	30
MON1012501203224	125	12	32	24

	NOMINAL-DIAMETER IN MM							
	3-6	6-10	10-18	18-30	30-50	50-80	80-120	120-180
	TOLERANCE RANGE IN MM							
js18	±0,15	±0.18	±0.215	±0.26	±0.31	±0.37	±0.435	±0.50
	TOLERANCE RANGE IN UM							
d11	+75	+90	+110	+130	+160	+190	+220	+250
	0	0	0	0	0	0	0	0
h6	+12	+15	+18	+21	+25	+30	+35	+40
	0	0	0	0	0	0	0	0

MON10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTES SIDE AND FACE MILLING CUTTERS WITH STRAIGHT TEETH

ISO	VDI 3323	DC	50.0	63.0	80.0	100.0	125.0
P	1	Vc m/min	25	25	25	25	25
		fz mm/tooth	0.045	0.058	0.06	0.063	0.066
		rpm obr/min	159	126	99	80	64
		feed posuw mm/min	129	161	143	130	126
	2	Vc m/min	20	20	20	20	20
		fz mm/tooth	0.04	0.036	0.041	0.038	0.05
		rpm obr/min	127	101	80	64	51
		feed posuw mm/min	92	80	78	63	76
	3-4	Vc m/min	15	15	15	15	15
		fz mm/tooth	0.034	0.031	0.033	0.034	0.042
		rpm obr/min	95	76	60	48	38
		feed posuw mm/min	58	52	47	42	48
	5	Vc m/min	10	10	10	10	10
		fz mm/tooth	0.031	0.029	0.03	0.03	0.036
		rpm obr/min	64	51	40	32	25
		feed posuw mm/min	36	32	29	25	28
	6	Vc m/min	20	20	20	20	20
		fz mm/tooth	0.04	0.036	0.041	0.038	0.05
		rpm obr/min	127	101	80	64	51
		feed posuw mm/min	92	80	78	63	76
	7	Vc m/min	15	15	15	15	15
		fz mm/tooth	0.034	0.031	0.033	0.034	0.042
		rpm obr/min	95	76	60	48	38
		feed posuw mm/min	58	52	47	42	48
	8-9	Vc m/min	10	10	10	10	10
		fz mm/tooth	0.031	0.029	0.03	0.03	0.036
		rpm obr/min	64	51	40	32	25
		feed posuw mm/min	36	32	29	25	28
	10	Vc m/min	20	20	20	20	20
		fz mm/tooth	0.04	0.036	0.041	0.038	0.05
		rpm obr/min	127	101	80	64	51
		feed posuw mm/min	92	80	78	63	76
	11.1	Vc m/min	10	10	10	10	10
		fz mm/tooth	0.031	0.029	0.03	0.03	0.036
		rpm obr/min	64	51	40	32	25
		feed posuw mm/min	36	32	29	25	28
N	21-25	Vc m/min	100	100	100	100	100
		fz mm/tooth	0.018	0.023	0.026	0.024	0.033
		rpm obr/min	637	505	398	318	255
		feed posuw mm/min	206	256	248	199	252

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

MON15

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MON1505000301614	50.0	3	16	14
MON1505000401614	50.0	4	16	14
MON1505000501614	50.0	5	16	14
MON1505000601614	50.0	6	16	14
MON1505000701614	50.0	7	16	14
MON1505000801614	50.0	8	16	14
MON1505000901614	50.0	9	16	14
MON1505001001614	50.0	10	16	14
MON1506300302216	63.0	3	22	16
MON1506300402216	63.0	4	22	16
MON1506300502216	63.0	5	22	16
MON1506300602216	63.0	6	22	16
MON1506300702216	63.0	7	22	16
MON1506300802216	63.0	8	22	16
MON1506300902216	63.0	9	22	16
MON1506301002216	63.0	10	22	16
MON1506301202216	63.0	12	22	16
MON1506301402216	63.0	14	22	16
MON1506301602216	63.0	16	22	16
MON1506301802216	63.0	18	22	16
MON1508000302218	80.0	3	22	18
MON1508000402218	80.0	4	22	18
MON1508000502218	80.0	5	22	18
MON1508000602218	80.0	6	22	18
MON1508000702218	80.0	7	22	18

	NOMINAL-DIAMETER IN MM								
	3-6	6-10	10-18	18-30	30-50	50-80	80-120	120-180	180-250
	TOLERANCE RANGE IN MM								
js18	±0,15	±0.18	±0.215	±0.26	±0.31	±0.37	±0.435	±0.50	±0.575
	TOLERANCE RANGE IN UM								
d11	+75	+90	+110	+130	+160	+190	+220	+250	+290
	0	0	0	0	0	0	0	0	0
h6	+12	+15	+18	+21	+25	+30	+35	+40	+46
	0	0	0	0	0	0	0	0	0

MON15

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MON1508000802218	80.0	8	22	18
MON1508000902218	80.0	9	22	18
MON1508001002218	80.0	10	22	18
MON1508001202218	80.0	12	22	18
MON1508001402218	80.0	14	22	18
MON1508001602218	80.0	16	22	18
MON1508001802218	80.0	18	22	18
MON1508002002218	80.0	20	22	18
MON1508000402718	80.0	4	27	18
MON1508000502718	80.0	5	27	18
MON1508000602718	80.0	6	27	18
MON1508000702718	80.0	7	27	18
MON1508000802718	80.0	8	27	18
MON1508000902718	80.0	9	27	18
MON1508001002718	80.0	10	27	18
MON1508001202718	80	12	27	18
MON1508001402718	80	14	27	18
MON1508001602718	80	16	27	18
MON1508001802718	80	18	27	18
MON1508002002718	80	20	27	18
MON1510000302720	100	3	27	20
MON1510000402720	100	4	27	20
MON1510000502720	100	5	27	20
MON1510000602720	100	6	27	20
MON1510000702720	100	7	27	20

	NOMINAL-DIAMETER IN MM								
	3-6	6-10	10-18	18-30	30-50	50-80	80-120	120-180	180-250
	TOLERANCE RANGE IN MM								
js18	±0,15	±0.18	±0.215	±0.26	±0.31	±0.37	±0.435	±0.50	±0.575
	TOLERANCE RANGE IN UM								
d11	+75	+90	+110	+130	+160	+190	+220	+250	+290
	0	0	0	0	0	0	0	0	0
h6	+12	+15	+18	+21	+25	+30	+35	+40	+46
	0	0	0	0	0	0	0	0	0

MON15

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MON1510000802720	100	8	27	20
MON1510000902720	100	9	27	20
MON1510001002720	100	10	27	20
MON1510001202720	100	12	27	20
MON1510001402720	100	14	27	20
MON1510001502720	100	15	27	20
MON1510001602720	100	16	27	20
MON1510001802720	100	18	27	20
MON1510002002720	100	20	27	20
MON1510000403220	100	4	32	20
MON1510000503220	100	5	32	20
MON1510000603220	100	6	32	20
MON1510000703220	100	7	32	20
MON1510000803220	100	8	32	20
MON1510000903220	100	9	32	20
MON1510001003220	100	10	32	20
MON1510001203220	100	12	32	20
MON1510001403220	100	14	32	20
MON1510001503220	100	15	32	20
MON1510001603220	100	16	32	20
MON1510001803220	100	18	32	20
MON1510002003220	100	20	32	20
MON1512500503222	125	5	32	22
MON1512500603222	125	6	32	22
MON1512500803222	125	8	32	22

	NOMINAL-DIAMETER IN MM								
	3-6	6-10	10-18	18-30	30-50	50-80	80-120	120-180	180-250
	TOLERANCE RANGE IN MM								
js18	±0,15	±0.18	±0.215	±0.26	±0.31	±0.37	±0.435	±0.50	±0.575
	TOLERANCE RANGE IN UM								
d11	+75	+90	+110	+130	+160	+190	+220	+250	+290
	0	0	0	0	0	0	0	0	0
h6	+12	+15	+18	+21	+25	+30	+35	+40	+46
	0	0	0	0	0	0	0	0	0

MON15

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MON1512501003222	125	10	32	22
MON1512501203222	125	12	32	22
MON1512501403222	125	14	32	22
MON1512501603222	125	16	32	22
MON1512501803222	125	18	32	22
MON1512502003222	125	20	32	22
MON1516000603226	160	6	32	26
MON1516000803226	160	8	32	26
MON1516001003226	160	10	32	26
MON1516001203226	160	12	32	26
MON1516001403226	160	14	32	26
MON1516001603226	160	16	32	26
MON1516001803226	160	18	32	26
MON1516002003226	160	20	32	26
MON1516000604026	160	6	40	26
MON1516000804026	160	8	40	26
MON1516001004026	160	10	40	26
MON1516001204026	160	12	40	26
MON1516001404026	160	14	40	26
MON1516001604026	160	16	40	26
MON1516001804026	160	18	40	26
MON1516002004026	160	20	40	26
MON1520001004030	200	10	40	30
MON1520001204030	200	12	40	30
MON1520001404030	200	14	40	30

	NOMINAL-DIAMETER IN MM								
	3-6	6-10	10-18	18-30	30-50	50-80	80-120	120-180	180-250
	TOLERANCE RANGE IN MM								
js18	±0,15	±0.18	±0.215	±0.26	±0.31	±0.37	±0.435	±0.50	±0.575
	TOLERANCE RANGE IN UM								
d11	+75	+90	+110	+130	+160	+190	+220	+250	+290
	0	0	0	0	0	0	0	0	0
h6	+12	+15	+18	+21	+25	+30	+35	+40	+46
	0	0	0	0	0	0	0	0	0

MON15

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MON1520001604030	200	16	40	30
MON1520001804030	200	18	40	30
MON1520002004030	200	20	40	30
MON1520002204030	200	22	40	30
MON1520002504030	200	25	40	30

	NOMINAL-DIAMETER IN MM								
	3-6	6-10	10-18	18-30	30-50	50-80	80-120	120-180	180-250
	TOLERANCE RANGE IN MM								
js18	±0,15	±0.18	±0.215	±0.26	±0.31	±0.37	±0.435	±0.50	±0.575
	TOLERANCE RANGE IN UM								
d11	+75	+90	+110	+130	+160	+190	+220	+250	+290
	0	0	0	0	0	0	0	0	0
h6	+12	+15	+18	+21	+25	+30	+35	+40	+46
	0	0	0	0	0	0	0	0	0

MON15

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SIDE AND FACE MILLING CUTTERS WITH STAGGERED TEETH

ISO	VDI 3323	DC	50.0	63.0	80.0	100.0	125.0	160.0	200.0
P	1	Vc m/min	25	25	25	25	25	25	25
		fz mm/tooth	0.058	0.08	0.081	0.081	0.072	0.081	0.079
		rpm obr/min	159	126	99	80	64	50	40
		feed posuw mm/min	129	162	145	129	101	105	94
	2	Vc m/min	20	20	20	20	20	20	20
		fz mm/tooth	0.053	0.052	0.055	0.05	0.055	0.05	0.048
		rpm obr/min	127	101	80	64	51	40	32
		feed posuw mm/min	94	84	79	64	62	52	46
	3-4	Vc m/min	15	15	15	15	15	15	15
		fz mm/tooth	0.044	0.043	0.044	0.044	0.045	0.044	0.041
		rpm obr/min	95	76	60	48	38	30	24
		feed posuw mm/min	59	52	47	42	38	34	29
	5	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.039	0.04	0.04	0.039	0.039	0.04	0.039
		rpm obr/min	64	51	40	32	25	20	16
		feed posuw mm/min	35	32	29	25	22	21	19
	6	Vc m/min	20	20	20	20	20	20	20
		fz mm/tooth	0.053	0.052	0.055	0.05	0.055	0.05	0.048
		rpm obr/min	127	101	80	64	51	40	32
		feed posuw mm/min	94	84	79	64	62	52	46
	7	Vc m/min	15	15	15	15	15	15	15
		fz mm/tooth	0.044	0.043	0.044	0.044	0.045	0.044	0.041
		rpm obr/min	95	76	60	48	38	30	24
		feed posuw mm/min	59	52	47	42	38	34	29
	8-9	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.039	0.04	0.04	0.039	0.039	0.04	0.039
		rpm obr/min	64	51	40	32	25	20	16
		feed posuw mm/min	35	32	29	25	22	21	19
	10	Vc m/min	20	20	20	20	20	20	20
		fz mm/tooth	0.053	0.052	0.055	0.05	0.055	0.05	0.048
		rpm obr/min	127	101	80	64	51	40	32
		feed posuw mm/min	94	84	79	64	62	52	46
	11.1	Vc m/min	10	10	10	10	10	10	10
		fz mm/tooth	0.039	0.04	0.04	0.039	0.039	0.04	0.039
		rpm obr/min	64	51	40	32	25	20	16
		feed posuw mm/min	35	32	29	25	22	21	19
N	21-25	Vc m/min	100	100	100	100	100	100	100
		fz mm/tooth	0.023	0.031	0.035	0.031	0.036	0.029	0.031
		rpm obr/min	637	505	398	318	255	199	159
		feed posuw mm/min	205	251	251	197	202	150	148

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

MOE10

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	●	●	●	●	○	●	○																													○	

CODE	DC	A	DCON	#FLUTE
MOE1003003001306	30	30	13	6
MOE1003503501606	35	35	16	6
MOE1004002001608	40	20	16	8
MOE1004004001608	40	40	16	8
MOE1005002502208	50	25	22	8
MOE1005005002208	50	50	22	8
MOE1006003002708	60	30	27	8
MOE1006006002708	60	60	27	8
MOE1007503502710	75	35	27	10
MOE1007507502710	75	75	27	10
MOE1009003502710	90	35	27	10
MOE1011003503210	110	35	32	10

MOE10

CODE	DC	A	DCON	#FLUTE
MOE1004003201608	40.0	32	16	8
MOE1005003602208	50.0	36	22	8
MOE1006304002708	63.0	40	27	8
MOE1008004502710	80.0	45	27	10
MOE1010005003210	100.0	50	32	10
MOE1012505604012	125.0	56	40	12
MOE1016006305014	160.0	63	50	14

MILL DIA TOLERANCE mm	WIDTH OF FACE TOLERANCE mm	INTERNAL DIA TOLERANCE mm
+0.25	+0.5	+0.05
-0.15	-0	-0

MOE10

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SHELL END MILL

ISO	VDI 3323	Ae mm	Ap mm	DC	40.0	50.0	63.0	80.0	100.0	125.0	160.0
P	1-2	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.092	0.1	0.115	0.12	0.131
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	134	119	112	119	110	110	109
	3-4	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.075	0.077	0.091	0.1	0.119	0.113	0.119
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	119	98	92	99	95	86	99
	5	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.116
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	90	79	73	75	74	66	65
	6	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.092	0.1	0.115	0.12	0.131
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	134	119	112	119	110	110	109
	7	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.075	0.077	0.091	0.1	0.119	0.113	0.119
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	119	98	92	99	95	86	99
	8	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.116
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	90	79	73	75	74	66	65
	9	0.75D	0.25	Vc m/min	10	10	10	10	10	10	10
				fz mm/tooth	0.078	0.08	0.1	0.1	0.117	0.146	0.125
				rpm obr/min	80	64	51	40	32	25	20
				feed posuw mm/min	50	41	40	40	37	45	35
	10	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.07	0.078	0.092	0.1	0.115	0.12	0.131
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	134	119	112	119	110	110	109
	11.1	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.116
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	90	79	73	75	74	66	65

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

MOE16

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	○	○	○	○		○	○			○											●	●	●	●	●																

CODE	DC	A	DCON	#FLUTE
MOE1603003001304	30	30	13	4
MOE1604002001604	40	20	16	4
MOE1604004001604	40	40	16	4
MOE1605002502206	50	25	22	6
MOE1605005002206	50	50	22	6
MOE1606003002706	60	30	27	6
MOE1606006002706	60	60	27	6
MOE1607507502706	75	75	27	6

MOE16

CODE	DC	A	DCON	#FLUTE
MOE1604003201604	40	32	16	4
MOE1605003602206	50	36	22	6
MOE1606304002706	63	40	27	6
MOE1608004502706	80	45	27	6
MOE1610005003206	100	50	32	6

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE SHELL END MILL FOR ALUMINIUM

ISO	VDI 3323	Ae mm	Ap mm	DC	30.0	40.0	50.0	60.0	63.0	75.0	80.0	100.0
N	21-25	0.75D	0.25	Vc m/min	100	105	95	95	95	105	100	100
				fz mm/tooth	0.05	0.06	0.069	0.1	0.115	0.13	0.128	0.151
				rpm obr/min	1061	836	605	504	480	446	398	318
				feed posuw mm/min	212	201	250	302	331	348	306	288

MILL DIA TOLERANCE mm	WIDTH OF FACE TOLERANCE mm	INTERNAL DIA TOLERANCE mm
+0.25	+0.5	+0.05
-0.15	-0	-0

MOE12

ISO	P										M			K						N										S						H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MOE1204004001606	40	40	16	6
MOE1205005002208	50	50	22	8
MOE1206003002708	60	30	27	8
MOE1206006002708	60	60	27	8
MOE1207503502710	75	35	27	10
MOE1207507502710	75	75	27	10
MOE1209003502710	90	35	27	10
MOE1211003503212	110	35	32	12

MOE12

CODE	DC	A	DCON	#FLUTE
MOE1204003201606	40	32	16	6
MOE1205003602208	50	36	22	8
MOE1206304002708	63	40	27	8
MOE1208004502710	80	45	27	10
MOE1210005003210	100	50	32	10
MOE1212505604012	125	56	40	12
MOE1216006305012	160	63	50	12

MILL DIA TOLERANCE mm	WIDTH OF FACE TOLERANCE mm	INTERNAL DIA TOLERANCE mm
+0.25	+0.5	+0.05
-0.15	-0	-0

MOE12

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SHELL END MILL

ISO	VDI 3323	Ae mm	Ap mm	DC	40.0	50.0	63.0	80.0	100.0	125.0	160.0
P	1-2	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	3-4	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.071	0.077	0.091	0.1	0.119	0.113	0.139
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	85	98	92	99	95	86	100
	5	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64
	6	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	7	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.071	0.077	0.091	0.1	0.119	0.113	0.139
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	85	98	92	99	95	86	100
	8	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64
	9	0.75D	0.25	Vc m/min	10	10	10	10	10	10	10
				fz mm/tooth	0.073	0.08	0.1	0.1	0.117	0.146	0.146
				rpm obr/min	80	64	51	40	32	25	20
				feed posuw mm/min	35	41	40	40	37	45	35
	10	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	11.1	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64

$$Vc = \frac{\pi d n}{1000}\ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d}\ (rpm)$$

$$f_z = \frac{f}{zn}\ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

MOE14

ISO	P										M			K						N										S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21										15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MOE1404004001606	40	40	16	6
MOE1405005002208	50	50	22	8
MOE1406003002708	60	30	27	8
MOE1406006002708	60	60	27	8
MOE1407503502710	75	35	27	10
MOE1407507502710	75	75	27	10
MOE1409003502710	90	35	27	10
MOE1411003503212	110	35	32	12

MOE14

CODE	DC	A	DCON	#FLUTE
MOE1404003201606	40	32	16	6
MOE1405003602208	50	36	22	8
MOE1406304002708	63	40	27	8
MOE1408004502710	80	45	27	10
MOE1410005003210	100	50	32	10
MOE1412505604012	125	56	40	12
MOE1416006305012	160	63	50	12

MILL DIA TOLERANCE mm	WIDTH OF FACE TOLERANCE mm	INTERNAL DIA TOLERANCE mm
+0.25	+0.5	+0.05
-0.15	-0	-0

MOE14

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SHELL END MILL

ISO	VDI 3323	Ae mm	Ap mm	DC	40.0	50.0	63.0	80.0	100.0	125.0	160.0
P	1-2	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	3-4	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.071	0.077	0.091	0.1	0.119	0.113	0.139
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	85	98	92	99	95	86	100
	5	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64
	6	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	7	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.071	0.077	0.091	0.1	0.119	0.113	0.139
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	85	98	92	99	95	86	100
	8	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64
	9	0.75D	0.25	Vc m/min	10	10	10	10	10	10	10
				fz mm/tooth	0.073	0.08	0.1	0.1	0.117	0.146	0.146
				rpm obr/min	80	64	51	40	32	25	20
				feed posuw mm/min	35	41	40	40	37	45	35
	10	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	11.1	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

MOE18

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

CODE	DC	A	DCON	#FLUTE
MOE1804004001606	40	40	16	6
MOE1805005002208	50	50	22	8
MOE1806003002708	60	30	27	8
MOE1806006002708	60	60	27	8
MOE1807503502710	75	35	27	10
MOE1807507502710	75	75	27	10
MOE1809003502710	90	35	27	10
MOE1811003503212	110	35	32	12

MOE18

CODE	DC	A	DCON	#FLUTE
MOE1804003201606	40	32	16	6
MOE1805003602208	50	36	22	8
MOE1806304002708	63	40	27	8
MOE1808004502710	80	45	27	10
MOE1810005003210	100	50	32	10
MOE1812505604012	125	56	40	12
MOE1816006305012	160	63	50	12

MILL DIA TOLERANCE mm	WIDTH OF FACE TOLERANCE mm	INTERNAL DIA TOLERANCE mm
+0.25	+0.5	+0.05
-0.15	-0	-0

MOE18

CUTTING CONDITIONS PARAMETRY SKRAWANIA

MULTI FLUTE ROUGHING SHELL END MILL

ISO	VDI 3323	Ae mm	Ap mm	DC	40.0	50.0	63.0	80.0	100.0	125.0	160.0
P	1-2	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	3-4	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.071	0.077	0.091	0.1	0.119	0.113	0.139
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	85	98	92	99	95	86	100
	5	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64
	6	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	7	0.75D	0.25	Vc m/min	25	25	25	25	25	25	30
				fz mm/tooth	0.071	0.077	0.091	0.1	0.119	0.113	0.139
				rpm obr/min	199	159	126	99	80	64	60
				feed posuw mm/min	85	98	92	99	95	86	100
	8	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64
	9	0.75D	0.25	Vc m/min	10	10	10	10	10	10	10
				fz mm/tooth	0.073	0.08	0.1	0.1	0.117	0.146	0.146
				rpm obr/min	80	64	51	40	32	25	20
				feed posuw mm/min	35	41	40	40	37	45	35
	10	0.75D	0.25	Vc m/min	30	30	30	30	30	30	30
				fz mm/tooth	0.069	0.078	0.092	0.1	0.115	0.12	0.153
				rpm obr/min	239	191	152	119	95	76	60
				feed posuw mm/min	99	119	112	119	110	110	110
	11.1	0.75D	0.25	Vc m/min	20	20	20	20	20	20	20
				fz mm/tooth	0.071	0.078	0.09	0.094	0.117	0.108	0.135
				rpm obr/min	159	127	101	80	64	51	40
				feed posuw mm/min	68	79	73	75	74	66	64

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

HM20

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	●	●	●	●	○	●	●	○	○	●	○										○	○	○	○	○																

CODE	RE	DC	DCON	OAL
HM20080010B10000060	R1,0	8	10	60
HM20090015B10000060	R1,5	9	10	60
HM20100020B10000060	R2,0	10	10	60
HM20110025B10000060	R2,5	11	10	60
HM20120030B12000060	R3,0	12	12	60
HM20130035B12000060	R3,5	13	12	60
HM20140040B12000060	R4,0	14	12	60
HM20150045B12000060	R4,5	15	12	60
HM20160050B12000060	R5,0	16	12	60
HM20190055B16000067	R5,5	19	16	67
HM20200060B16000067	R6,0	20	16	67
HM20210065B16000071	R6,5	21	16	71
HM20220070B16000071	R7,0	22	16	71
HM20230075B16000071	R7,5	23	16	71
HM20240080B16000071	R8,0	24	16	71
HM20250085B25000085	R8,5	25	25	85
HM20260090B25000085	R9,0	26	25	85
HM20270095B25000085	R9,5	27	25	85
HM20280100B25000085	R10.0	28.0	25	85
HM20310105B25000090	R10.5	31.0	25	90
HM20320110B25000090	R11.0	32.0	25	90
HM20340120B25000090	R12.0	34.0	25	90
HM20410125B25000100	R12.5	41.0	25	100
HM20420130B25000100	R13.0	42.0	25	100
HM20440140B25000100	R14.0	44.0	25	100
HM20460150B25000100	R15.0	46.0	25	100
HM20480160B25000100	R16.0	48.0	25	100
HM20520180B32000112	R18.0	52.0	32	112
HM20560200B32000112	R20.0	56.0	32	112

	NOMINAL-DIAMETER IN MM					
	1-3	3-6	6-10	10-18	18-30	30-50
	TOLERANCE RANGE IN UM					
H11	+60	+75	+90	+110	+130	+160
	0	0	0	0	0	0
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16

HM20

CUTTING CONDITIONS PARAMETRY SKRAWANIA

4 FLUTE CORNER ROUNDING CUTTERS / FREZ O 4 ZĘBACH DO ZAOKRĄGLEŃ

ISO	VDI 3323	DC	8.0	9.0	10.0	11.0	12.0	14.0	16.0	20.0	24.0	28.0	34.0	48.0
P	1	Vc m/min	20	20	20	20	20	20	20	20	20	20	20	20
		fz mm/tooth	0.017	0.022	0.02	0.021	0.021	0.025	0.029	0.032	0.038	0.042	0.049	0.058
		rpm obr/min	796	707	637	579	531	455	398	318	265	227	187	133
		feed posuw mm/min	54	62	51	49	45	45	46	41	40	38	37	31
	2	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
		fz mm/tooth	0.015	0.016	0.016	0.019	0.019	0.023	0.029	0.033	0.039	0.04	0.048	0.053
		rpm obr/min	597	531	477	434	398	341	298	239	199	171	140	99
		feed posuw mm/min	36	34	31	33	30	31	35	32	31	27	27	21
	3-4	Vc m/min	10	10	10	10	10	10	10	10	10	10	10	10
		fz mm/tooth	0.018	0.023	0.02	0.024	0.024	0.023	0.03	0.034	0.04	0.05	0.048	0.05
		rpm obr/min	398	354	318	289	265	227	199	159	133	114	94	66
		feed posuw mm/min	29	33	25	28	25	21	24	22	21	23	18	13
	6	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
		fz mm/tooth	0.015	0.016	0.016	0.019	0.019	0.023	0.029	0.033	0.039	0.04	0.048	0.053
		rpm obr/min	597	531	477	434	398	341	298	239	199	171	140	99
		feed posuw mm/min	36	34	31	33	30	31	35	32	31	27	27	21
	7-8	Vc m/min	10	10	10	10	10	10	10	10	10	10	10	10
		fz mm/tooth	0.018	0.023	0.02	0.024	0.024	0.023	0.03	0.034	0.04	0.05	0.048	0.05
		rpm obr/min	398	354	318	289	265	227	199	159	133	114	94	66
		feed posuw mm/min	29	33	25	28	25	21	24	22	21	23	18	13
	10	Vc m/min	15	15	15	15	15	15	15	15	15	15	15	15
		fz mm/tooth	0.015	0.016	0.016	0.019	0.019	0.023	0.029	0.033	0.039	0.04	0.048	0.053
		rpm obr/min	597	531	477	434	398	341	298	239	199	171	140	99
		feed posuw mm/min	36	34	31	33	30	31	35	32	31	27	27	21
	11.1	Vc m/min	10	10	10	10	10	10	10	10	10	10	10	10
		fz mm/tooth	0.018	0.023	0.02	0.024	0.024	0.023	0.03	0.034	0.04	0.05	0.048	0.05
		rpm obr/min	398	354	318	289	265	227	199	159	133	114	94	66
		feed posuw mm/min	29	33	25	28	25	21	24	22	21	23	18	13
N	21-25	Vc m/min	90	80	90	85	90	90	80	90	90	85	85	90
		fz mm/tooth	0.018	0.021	0.02	0.023	0.022	0.025	0.031	0.034	0.038	0.045	0.05	0.058
		rpm obr/min	3581	2829	2865	2460	2387	2046	1592	1432	1194	966	796	597
		feed posuw mm/min	258	238	229	226	210	205	197	195	181	174	159	138

$$Vc = \frac{\pi d n}{1000} \ (m/min)$$

$$n = \frac{1000 \times Vc}{\pi d} \ (rpm)$$

$$f_z = \frac{f}{zn} \ (mm/tooth)$$

Vc = cutting speed – prędkość skrawania (m/min)
fz = feed per tooth – posuw na ostrze (mm/tooth)
f = minute feed – posuw minutowy (mm/min)

n = tool rotation – obroty narzędzia (rpm)
d = diameter – średnica (mm)
z = number of teeth – liczba zębów

P M K N S H

CUBIC BORON NITRIDE CBN machining high hardened steels up to 70 HRC

FREZY Z AZTOKIEM BORU CBN przeznaczone są do wysokowydajnej obróbki materiałów >70 HRC

CUBIC BORON NITRIDE
FREZY Z AZOTKIEM BORU

Group					ISO	PAGE
CBN01			2		P M K N S **H**	739
CBN02			2		P M K N S **H**	740

MATERIAL GROUPS / GRUPY MATERIAŁÓW

ISO	P										
Description Opis	Non-alloy steel Stal niestopowa					Low alloy steel Stal niskostopowa				High alloyed steel, tool steel Stal wysokostopowa, stal narzędziowa	
VDI3323	1	2	3	4	5	6	7	8	9	10	11
HRC		13	25	28	32	10	29	32	38	15	35
HB	125	190	250	270	300	180	275	300	350	200	325
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	~0.15% C	~0.45% C	~0.45% C	~0.75% C	~0.75% C						
	Annealed Wyżarzony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Quenched Tempered Hartowany odpuszczony	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony

ISO	M			K					
Description Opis	Stainess steel Stal nierdzewna			Grey cast iron Żeliwo szare		Nodular cast iron Żeliwo sferoidalne		Malleable cast iron Żeliwo ciągliwe	
VDI3323	12	13	14	15	16	17	18	19	20
HRC	15	23	10	10	26	3	25		21
HB	200	240	180	180	260	160	250	130	230
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Ferritic / Martensitic Ferrytyczne/ Martenzyty-czne	Martensitic Martenzyty-czne	Austenitic Austenityczna	Pearlitic / ferritic Perlityczny / ferrytyczny	Pearlitic (Mar-tensitic) Perlityczny (martenzyty-czny)	Ferritic Ferrytyczne	Pearlitic Perlityczny	Ferritic Ferrytyczne	Pearlitic Perlityczny
	Annealed Wyżarzony	Quenched Tempered Hartowany odpuszczony							

ISO	N									
Description Opis	Aluminum wrought alloy Aluminium kute		Aluminum-cast, alloyed Odlew aluminiowy			Copper and Copper Alloys (Bronze / Brass) Stopy miedzi i stopy miedzi (Brąz / Mosiądz)			Non Metallic Materials Niemetaliczne Materiały	
VDI3323	21	22	23	24	25	26	27	28	29	30
HRC										
HB	60	100	75	90	130	110	90	100		
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Not Curable Nieutwardzal-ny	Curable Utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	≤ 12% Si, Curable ≤ 12% Si, utwardzalny	≤ 12% Si, Not Curable ≤ 12% Si, nieutwardzal-ny	Cutting Alloys, PB>1% Stopy tnące, PB>1%	CuZn, CuSnZn (Brass) CuZn, CuSnZn (mosiądz)	CuSn, lead-free copper and electrolyt-ic copper CuSn, miedź bezołowiowa i miedź elektro-lityczna	Duroplastic, Fiber Rein-forced Plastic Duroplast, wzmocniony włóknem plastik	Rubber, Wood, etc. Guma, drew-no itp.
		Hardened Utwardzony		Hardened Utwardzony						

ISO	S							H			
Description Opis	Heat Resistant Super Alloys Superstopy żaroodporne					Titanium Alloys Stopy tytanu		Hardened steel Stal hartowana		Chilled Cast Iron Chłodzone żeliwo	Hardened Cast Iron Żeliwo ut-wardzone
VDI3323	31	32	33	34	35	36	37	38	39	40	41
HRC	15	30	25	38	34			55	60	42	55
HB	200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Composition Structure Heat Treatment Kompozycja Struktura Obróbka cieplna	Fe Based	Fe Based	Ni or Co Based	Ni or Co Based	Ni or Co Based	Pure Titanium	Alpha + Beta Alloys				
	Annealed Wyżarzony	Cured Utwardzona	Annealed Wyżarzony	Cured Utwardzona	Cast Odlew		Hardened Utwardzony	Hardened Utwardzony	Hardened Utwardzony	Cast Odlew	Hardened Utwardzony

CBN01

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																																						●	●		●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
CBN01004002A04000001	0,2	0,4	4	0,3	1,2	50	0,37
CBN01005003A04000002	0,25	0,5	4	0,4	1,5	50	0,46
CBN01006003A04001002	0,3	0,6	4	0,5	1,5	50	0,56
CBN01008004A04001002	0,4	0,8	4	0,6	2	50	0,76
CBN01010005A04001003	0,5	1	4	0,6	2,5	50	0,95
CBN01010005A04001004	0,5	1	4	0,6	4	50	0,95
CBN01010005A04001006	0,5	1	4	0,6	6	50	0,95
CBN01012006A04001003	0,6	1,2	4	0,8	3	50	1,15
CBN01015008A04001003	0,75	1,5	4	0,95	3	50	1,45
CBN01015008A04001004	0,75	1,5	4	0,95	4	50	1,45
CBN01015008A04001006	0,75	1,5	4	0,95	6	50	1,45
CBN01020010A04001005	1	2	4	1,2	5	50	1,95
CBN01020010A04001006	1	2	4	1,2	6	50	1,95
CBN01030015A04002006	1,5	3	4	1,8	6	50	2,85

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE BALL NOSE / FREZ KULOWY O 2 ZĘBACH

ISO	VDI 3323	Ae mm	Ap mm	DC	0.4	0.5	0.6	0.8	1.0	1.2	1.5	2.0	3.0
H	38	0.5D	0.2R	Vc m/min	65	80	95	125	155	190	235	250	250
				fz mm/tooth	0.012	0.015	0.02	0.02	0.03	0.03	0.03	0.04	0.04
				rpm obr/min	51725	50930	50399	49736	49338	50399	49869	39789	26526
				feed posuw mm/min	1241	1528	2016	1989	2960	3024	2992	3183	2122
	39.1	0.5D	0.2R	Vc m/min	65	80	95	125	155	190	235	250	250
				fz mm/tooth	0.012	0.015	0.02	0.02	0.03	0.03	0.03	0.04	0.04
				rpm obr/min	51725	50930	50399	49736	49338	50399	49869	39789	26526
				feed posuw mm/min	1241	1528	2016	1989	2960	3024	2992	3183	2122
	39.2	0.5D	0.2R	Vc m/min	65	80	95	125	155	190	235	200	205
				fz mm/tooth	0.012	0.015	0.02	0.02	0.03	0.03	0.03	0.039	0.04
				rpm obr/min	51725	50930	50399	49736	49338	50399	49869	31831	21751
				feed posuw mm/min	1241	1528	2016	1989	2960	3024	2992	2483	1740
	39.3	R0.2~R0.4 = 0.005mm R0.5~R1.5 = 0.01mm	R0.2~R0.4 = 0.005mm R0.5~R1.5 = 0.01mm	Vc m/min	65	80	95	125	155	190	235	200	205
				fz mm/tooth	0.012	0.015	0.02	0.02	0.03	0.03	0.03	0.039	0.04
				rpm obr/min	51725	50930	50399	49736	49338	50399	49869	31831	21751
				feed posuw mm/min	1241	1528	2016	1989	2960	3024	2992	2483	1740
	41	0.5D	0.2R	Vc m/min	65	80	95	125	155	190	235	250	250
				fz mm/tooth	0.012	0.015	0.02	0.02	0.03	0.03	0.03	0.04	0.04
				rpm obr/min	51725	50930	50399	49736	49338	50399	49869	39789	26526
				feed posuw mm/min	1241	1528	2016	1989	2960	3024	2992	3183	2122

RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.005	h5

CBN02

ISO	P										M			K						N											S							H			
HRc		13	25	28	31	10	29	32	38	15	35	15	23	10	10	26	3	25		21											15	30	25	38	34	400	1050	55	60	42	55
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	60	100	75	90	130	110	90	100			200	280	250	350	320	Rm	Rm	550	630	400	550
VDI3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
																																						●	●		●

CODE	RE	DC	DCON	APMX	LU	OAL	DN
CBN02005001A04000002	0,05	0,5	4	0,3	2	50	0,46
CBN02005001A04000003	0,05	0,5	4	0,3	3	50	0,46
CBN02010001AX4001003	0,05	1	4	0,7	3	50	0,95
CBN02010001AX4001005	0,05	1	4	0,7	5	50	0,95
CBN02010001A04001003	0,1	1	4	0,7	3	50	0,95
CBN02010001A04001005	0,1	1	4	0,7	5	50	0,95
CBN02015001A04001005	0,1	1,5	4	1	5	50	1,45
CBN02015001A04001008	0,1	1,5	4	1	8	50	1,45
CBN02015002A04001005	0,2	1,5	4	1	5	50	1,45
CBN02015002A04001008	0,2	1,5	4	1	8	50	1,45
CBN02020001A04001006	0,1	2	4	1,2	6	50	1,95
CBN02020001A04001010	0,1	2	4	1,2	10	50	1,95
CBN02020002A04001006	0,2	2	4	1,2	6	50	1,95
CBN02020002A04001010	0,2	2	4	1,2	10	50	1,95

CUTTING CONDITIONS PARAMETRY SKRAWANIA

2 FLUTE CORNER RADIUS / FREZ PROMIENIOWY O 2 ZĘBACH

ISO	VDI 3323	DC	0.5	1.0	1.5	2.0
H	38 - 39.1	Vc m/min	80	135	140	140
		fz mm/tooth	0.007	0.012	0.017	0.02
		rpm obr/min	50930	42972	29709	22282
		feed posuw mm/min	713	1031	1010	891
		Ae mm	0.1	0.2	0.4	0.6
		Ap mm	0.01	0.01	0.02	0.03
	39.2 - 39.3	Vc m/min	80	95	90	90
		fz mm/tooth	0.006	0.012	0.018	0.029
		rpm obr/min	50930	30239	19099	14324
		feed posuw mm/min	611	726	688	831
		Ae mm	0.06	0.1	0.2	0.3
		Ap mm	0.005	0.01	0.02	0.03
	41	Vc m/min	80	135	140	140
		fz mm/tooth	0.007	0.012	0.017	0.02
		rpm obr/min	50930	42972	29709	22282
		feed posuw mm/min	713	1031	1010	891
		Ae mm	0.1	0.2	0.4	0.6
		Ap mm	0.01	0.01	0.02	0.03

RADIUS TOLERANCE mm	SHANK DIA TOLERANCE
0 ~-0.005	h5

Reference table: Steel hardness conversion table - all values are approximate.
Tabela referencyjna: Tabela przeliczeniowa twardości stali – wszystkie wartości są przybliżone.

Twardość Brinella	Rockwella	Rockwella	Vickers	N/mm²
HB	HRC	HRB	HV	
800 HB	72 HRC	–	–	–
780 HB	71 HRC	–	–	–
760 HB	70 HRC	–	–	–
752 HB	69 HRC	–	–	–
745 HB	68 HRC	–	–	–
746 HB	67 HRC	–	–	–
735 HB	66 HRC	–	–	–
711 HB	65 HRC	–	–	–
695 HB	64 HRC	–	–	–
681 HB	63 HRC	–	–	–
658 HB	62 HRC	–	–	–
642 HB	61 HRC	–	–	–
627 HB	60 HRC	–	–	–
613 HB	59 HRC	–	–	–
601 HB	58 HRC	–	746 HV	–
592 HB	57 HRC	–	727 HV	–
572 HB	56 HRC	–	694 HV	–
552 HB	55 HRC	–	649 HV	–
534 HB	54 HRC	120 HRB	589 HV	–
513 HB	53 HRC	119 HRB	567 HV	–
504 HB	52 HRC	118 HRB	549 HV	–
486 HB	51 HRC	118 HRB	531 HV	–
469 HB	50 HRC	117 HRB	505 HV	–
468 HB	49 HRC	117 HRB	497 HV	–
456 HB	48 HRC	116 HRB	490 HV	1569 N/mm²
445 HB	47 HRC	115 HRB	474 HV	1520 N/mm²
430 HB	46 HRC	115 HRB	458 HV	1471 N/mm²
419 HB	45 HRC	114 HRB	448 HV	1447 N/mm²
415 HB	44 HRC	114 HRB	438 HV	1422 N/mm²
402 HB	43 HRC	114 HRB	424 HV	1390 N/mm²
388 HB	42 HRC	113 HRB	406 HV	1363 N/mm²
375 HB	41 HRC	112 HRB	393 HV	1314 N/mm²
373 HB	40 HRC	111 HRB	388 HV	1265 N/mm²
360 HB	39 HRC	111 HRB	376 HV	1236 N/mm²
348 HB	38 HRC	110 HRB	361 HV	1187 N/mm²
341 HB	37 HRC	109 HRB	351 HV	1157 N/mm²
331 HB	36 HRC	109 HRB	342 HV	1118 N/mm²
322 HB	35 HRC	108 HRB	332 HV	1089 N/mm²
314 HB	34 HRC	108 HRB	320 HV	1049 N/mm²
308 HB	33 HRC	107 HRB	311 HV	1035 N/mm²
300 HB	32 HRC	107 HRB	303 HV	1020 N/mm²
290 HB	31 HRC	106 HRB	292 HV	990 N/mm²
277 HB	30 HRC	105 HRB	285 HV	971 N/mm²
271 HB	29 HRC	104 HRB	277 HV	941 N/mm²
264 HB	28 HRC	103 HRB	271 HV	892 N/mm²
262 HB	27 HRC	103 HRB	262 HV	880 N/mm²
255 HB	26 HRC	102 HRB	258 HV	870 N/mm²
250 HB	25 HRC	101 HRB	255 HV	853 N/mm²
245 HB	24 HRC	100 HRB	252 HV	838 N/mm²
240 HB	23 HRC	100 HRB	247 HV	824 N/mm²
233 HB	22 HRC	99 HRB	241 HV	794 N/mm²
229 HB	21 HRC	98 HRB	235 HV	775 N/mm²
223 HB	20 HRC	97 HRB	227 HV	755 N/mm²
216 HB	19 HRC	96 HRB	222 HV	716 N/mm²
212 HB	18 HRC	95 HRB	218 HV	706 N/mm²
208 HB	17 HRC	95 HRB	210 HV	696 N/mm²
203 HB	16 HRC	94 HRB	201 HV	680 N/mm²

Twardość Brinella	Rockwella	Rockwella	Vickers	N/mm²
HB	HRC	HRB	HV	
199 HB	15 HRC	93 HRB	199 HV	667 N/mm²
191 HB	14 HRC	92 HRB	197 HV	657 N/mm²
190 HB	13 HRC	92 HRB	186 HV	648 N/mm²
186 HB	12 HRC	91 HRB	184 HV	637 N/mm²
183 HB	11 HRC	90 HRB	183 HV	617 N/mm²
180 HB	10 HRC	89 HRB	180 HV	608 N/mm²
175 HB	9 HRC	88 HRB	178 HV	685 N/mm²
170 HB	7 HRC	87 HRB	175 HV	559 N/mm²
167 HB	6 HRC	86 HRB	172 HV	555 N/mm²
166 HB	5 HRC	86 HRB	168 HV	549 N/mm²
163 HB	4 HRC	85 HRB	162 HV	539 N/mm²
160 HB	3 HRC	84 HRB	160 HV	535 N/mm²
156 HB	2 HRC	83 HRB	158 HV	530 N/mm²
154 HB	1 HRC	82 HRB	152 HV	515 N/mm²
149 HB	–	81 HRB	149 HV	500 N/mm²
147 HB	–	80 HRB	147 HV	490 N/mm²
143 HB	–	79 HRB	146 HV	482 N/mm²
141 HB	–	78 HRB	144 HV	481 N/mm²
139 HB	–	77 HRB	142 HV	480 N/mm²
137 HB	–	76 HRB	140 HV	475 N/mm²
135 HB	–	75 HRB	137 HV	467 N/mm²
131 HB	–	74 HRB	134 HV	461 N/mm²
127 HB	–	72 HRB	129 HV	451 N/mm²
121 HB	–	70 HRB	127 HV	431 N/mm²
116 HB	–	68 HRB	124 HV	422 N/mm²
114 HB	–	67 HRB	121 HV	412 N/mm²
111 HB	–	66 HRB	118 HV	402 N/mm²
107 HB	–	64 HRB	115 HV	382 N/mm²
105 HB	–	62 HRB	112 HV	378 N/mm²
103 HB	–	61 HRB	108 HV	373 N/mm²
95 HB	–	56 HRB	104 HV	–
90 HB	–	52 HRB	95 HV	–
81 HB	–	41 HRB	85 HV	–
76 HB	–	37 HRB	80 HV	–

Twardość Brinella	Rockwella	Rockwella	Vickers	N/mm²
HB	HRC	HRB	HV	
3000kg	150kg	100kg	Diamentowa Piramida	Wytrzymałość na rozciąganie (w przybliżeniu)
Kula 10mm	Brale	Kula 1/16"	120kg	
Reference table: Steel hardness conversion table				

Tabela referencyjna: Tabela konwersji twardości stali

Reference table: Material equivalence table

Tabela referencyjna: Tabela odpowiedników materiałów

ISO	Country and standard											
	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia	China
	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST	GB
	Alloy steel											
P	1015	1.0401	C15	080M15	–	1350	CC12	C15C16	F.111	–		15
	1020	1.0402	C22	050A20	2C	1450	CC20	C20C21	F.112	–	20	20
	1035	1.0501	C35	060A35	–	1550	CC35	C35	F.113	–	35	35
	1045	1.0503	C45	080M40	–	1650	CC45	C45	F.114	–	45	45
	1055	1.0535	C55	070M55	–	1655	–	C55	–	–	55	55
	1060	1.0601	C60	080A62	43D	–	CC55	C60	–	–	60	60
	1213	1.7015	9SMn28	230M07	–	1912	S250	CF9SMn28	11SMn28	SUM22	15Ch	Y15
	12L13	1.0718	9SMnPb28	–	–	1914	S250Pb	CF9MnPb28	11SMnPb28	SUM22L	–	–
	–	1.0722	10SPb20	–	–	–	10PbF2	CF10Pb20	10SPb20	–	–	–
	1140	1.0726	35S20	212M36	8M	1957	35MF4	–	F210G	–	–	–
	1215	1.0736	9SMn36	240M07	1B	–	S300	CF9SMn36	12SMn35	–	–	Y13
	12L14	1.0737	9SMnPb36	–	–	1926	S300Pb	CF9SMnPb36	12SMnP35	–	–	–
	9255	1.0904	55Si9	250A53	45	2085	55S7	55Si8	56Si7	–	–	55Si2Mn
	9262	1.0961	60SiCr7	–	–	–	60SC7	60SiCr8	60SiCr8	–	–	–
	1015	1.1141	Ck15	080M15	32C	1370	XC12	C16	C15K	S15C	15	15
	1039	1.1157	40Mn4	150M36	15	–	35M5	–	–	–	40G	40Mn
	1025	1.1158	Ck25	–	–	–	–	–	–	S25C	25	25
	1335	1.1167	36Mn5	–	–	2120	40Mn5	–	36Mn5	SMn438(H)	35G2,35GL	35Mn2
	1330	1.1170	28Mn6	150M28	14A	–	20M5	C28Mn	–	SCMn1	30G	30Mn
	1035	1.1183	Cf35	060A35	–	1572	XS38TS	C36	–	S35C	–	35Mn
	1045	1.1191	45	080M46	–	1672	XC42	C45	C45K	S45C	–	Ck45
	1055	1.1203	Ck55	070M55	–	–	XC45	C50	C55K	S55C	55	55
	1050	1.1213	Cf53	060A52	–	1674	XC48TS	C53	–	S50C	–	50
	1060	1.1221	Ck60	080A62	43D	1678	XC60	C60	–	S58C	60,60G	60Mn
	1095	1.1274	Ck101	060A96	–	1870	–	–	–	SUP4	–	–
	–	1.3401	X120Mn12	Z120M12	–	–	X120M12	XG120Mn12	X120Mn12	SCMnH/1	110G13L	–
	52100	1.3505	100Cr6	534A99	31	2258	100C6	100Cr6	F.131	SUJ2	SchCh 15	Gr15;45Gr
	A204Gr.A	1.5415	15Mo3	1501-240	–	2912	15D3	16Mo3KW	16Mo3	–	–	–
	4520	1.5426	16Mo5	1503-245- 420	–	–	–	16Mo5	16Mo5	–	–	–
	A350LF5	1.5622	14Ni6	–	–	–	16N6	14Ni6	15Ni6	–	–	–
	ASTM A353	1.5662	X8Ni9	1501-509;510	–	–	–	X10Ni9	XBNi09	–	–	–
	2515	1.5680	12Ni19	–	–	–	Z18N5	–	–	–	–	–
	3135	1.5710	36NiCr6	640A35	111A	–	35NC6	–	–	SNC236	–	–
	3415	1.5732	14NiCr10	–	–	–	14NC11	16NiCr11	15NiCr11	SNC415(H)	–	–
	3415 3310	1.5752	14NiCr14	655M13 655A12	36A	–	12NC15	–	–	SNC815(H)	–	–
	9840	1.6511	36CrNiMo4	816M40	110	–	40NCD3	38CrNiMo4(KB)	35CrNiMo4	–	40 ChN2MA	–
	8620	1.6523	21NiCrMo2	850M20	362	2503	20NCD2	20NiCrMo2	20NiCrMo2	SNCCM220(H)	–	–
	8740	1.6546	40NiCrMo2	311-Type7	–	–	–	40NiCrMo2(KB)	40NiCrMo2	SNC240	38ChGNM	–
	4340	1.6582	34CrNiMo6	817M40	24	2541	35NCD6	35CrNiMo6(KB)	–	–	38Ch2N2MA	40CrNiMoA
	–	1.6587	17CrNiMo6	820A16	–	–	18NCD6	–	14CrNiMo13	–	–	–
	5015	1.7015	15Cr3	523M15	–	–	12C3	–	–	SCr415(H)	15Ch	15Cr
	5132	1.7033	34Cr4	530A32	18B	–	32C4	34Cr4(KB)	35Cr4	SCr430(H)	35Ch	35Cr
	5140	1.7035	41Cr4	530M40	18	–	42C4	41Cr4	42Cr4	SCr440(H)	40Ch	40Cr
	5140	1.7045	42Cr4	–	–	2245	–	–	42Cr4	SCr440	40Ch	40Cr
	5115	1.7131	16MnCr15	(527M20)	–	2511	16MC5	16MnCr15	16MnCr15	–	18ChG	18CrMn
	5155	1.7176	55Cr3	527A60	48	–	55C3	–	–	SUP9(A)	50ChGA	20CrMn
	4130	1.7218	25CrMo4	1717CDS110	–	2225	25CD4	25CrMo4(KB)	55Cr3	SCM420; SCM430	30ChM	30CrMn
	4137;4135	1.7220	34CrMo4	708A37	19B	2234	35CD4	35CrMo4	34CrMo4	SCM432; SCRRM3	AS38ChGM	35CrMo
	4140;4142	1.7223	41CrMo4	708M40	19A	2244	42CD4TS	41CrMo4	41CrMo4	SCM440	40 ChFA	40CrMoA
	4140	1.7225	42CrMo4	708M40	19A	2244	42CD4	42CrMo4	42CrMo4	SCM440(H)	–	42CrMo 42CrMnMo
	–	1.7262	15CrMo5	–	–	2216	12CD4	–	12CrMo4	SCM415(H)	–	–
	ASTM A182 F11;F12	1.7335	13CrMo44	1501-620Gr.27	–	–	15CD3.5; 15CD4.5	14CrMo44	14CrMo45	–	12ChM , 15ChM	–
	–	1.7361	32CrMo12	722M24	40B	2240	30CD12	32CrMo12	F.124.A	–	–	–
	ASTM A182 F.22	1.7380	10CrMo910	1501-622Gr.31;45	–	2218	12CD9;10	12CrMo9,10	TU.H	–	–	–
	–	1.7715	14MoV63	1503-660-440	–	–	–	–	13MoCrV6	–	–	–
	6150	1.8159	50CrV4	735A50	47	2230	50CV4	50CrV4	51CrV4	SUP10	50ChGFA	50CrVA

ISO	Country and standard											
	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia	China
	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST	GB
P	–	1.8509	41CrAlMo7	905M39	41B	2940	40CAD6,12	41CrAlMo7	41CrAlMo7	–	38ChMJuA	–
	–	1.8523	39CrMoV139	897M39	40C	–	–	36CrMoV12	–	–	–	–
	W.110	1.1545	C105W1	–	–	1880	Y1105	C98KU C100KU	F.515 F.516	–	U10A	T10
	W.112	1.1663	C125W	–	–	–	Y2120	C120KU	(C120)	SK2	U13	T12A
	L3	1.2067	100Cr6	BL3	–	–	Y100C6	–	100Cr6	–	–	CrV;9SiCr
	D3	1.2080	X210Cr12	BD3	–	–	Z200Cr12	X210Cr13KU X250Cr12KU	X210Cr12	SKD1	Ch12	Cr12
	H13	1.2344	X40CrMoV5 1	BH13	–	2242	Z40CDV5	X35CrMoV05KU X40CrMoV51KU	X40CrMoV5	SKD61	4Ch5MF1S	4Cr5MoVSi
	A2	1.2363	X100CrMoV5 1	BA2	–	2260	Z100CDV5	X100CrMoV51KU	X100CrMoV5	SKD12	–	Cr6WV
	–	1.2419	105WCr6	–	–	2140	105WC13	10WCr6 107WCr5KU	105WCr5	SKS31 SKS2 SKS3	ChWG	CrWMo
	–	1.2436	X210CrW12	–	–	2312	–	X215CrW12 1KU	X210CrW12	SKD2	–	Cr12W
	S1	1.2542	45WCrV7	BS1	–	2710	–	45WCrV8KU	45WCrSi8	–	–	5CrNiMo
	H21	1.2581	X30WCrV9 3 X30WCrV93KU	BH21	–	–	Z30WCV9	X28W09KU X30WCrV9 3KU	X30WCrV9	SKD5	3Ch2W8F	3Cr2W8V
	–	1.2601	X165CrMoV 12	–	–	2310	–	X165CrMoW12KU	X160CrMoV12	SKD11	–	Cr12MoV
	L6	1.2713	55NiCrMoV6	–	–	–	55NCDV7	–	F.250.S	SKT4	5ChNM	5CrNiMo
	W210	1.2833	100V1	BW2	–	–	Y1105V	–	–	SKS43	–	V
	–	1.3243	S6-5-2-5	–	–	2723	Z85WDKCV	HS6-5-2-5	HS6-5-2-5	SKH55	R6M5K5	W6Mo5Cr4V2Co5
	T4	1.3255	S18-1-2-5	BT4	–	–	Z80WKCV 10-05-04-01	X78WCo1805KU	HS18-1-1-5	SKH3	–	W18Cr4VCo5
	M2	1.3343	S6-5-2	BM2	–	2722	Z85WDCV 06-05-04-02	X82WMo0605KU	HS6-5-2	SKH9	R6M5	W6Mo5Cr4V2
	M7	1.3348	S2-9-2	–	-Z-	2782	Z100WCWV 09-02-04-02	HS2-9-2	HS2-9-2	–	–	–
	T1	1.3355	S18-0-1	BT1	–	–	Z80WCV 18-04-01	X75W18KU	HS18-0-1	SKH2	–	W18Cr4V
	M3	–	S6-5-3	–	–	–	–	–	–	SKH52	–	W6Mo5Cr4V3
	M42	–	–	BM42	–	–	–	–	–	SKH59	–	–

ISO	Country and standard											
	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia	China
	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST	GB
M	Stainless steel											
	403	1.4000	X6Cr13	403S17	–	2301	Z6C13	X6Cr13	F.3110	SUS403	08Ch13	0Cr13; 1Cr12
	–	1.4001	X7Cr14	–	–	–	–	–	F.8401	–	–	–
	410	1.4006	X10Cr13	410S21	56A	2302	Z10C14	X12Cr13	F.3401	SUS410	12Ch13	1Cr13
	430	1.4016	X6Cr17	430S15	60	220	Z8C17	X8Cr17	F.3113	SUS430	12Ch17	1Cr17
	410	1.4021	X20Cr13	S62	56B; 56C	–	Z20C13	X20C13	F.3401	SUS410	20Ch13	2Cr13
	–	1.4027	G-X20Cr14	420C29	56B	–	Z20C13M	–	–	SCS2	20Ch13L	–
	–	1.4034	X46Cr13	420S45	56D	2304	Z40CM Z38C13M	X40Cr14	F.3405	SUS420J2	40Ch13	4Cr13
	431	1.4057	X20CrNi172	431S29	57	2321	Z15CNi6.02	X16CNi16	F.3427	SUS431	20Ch17N2	1Cr17Ni2
	430F	1.4104	X12CrMoS17	–	–	2383	Z10CF17	X10CrS17	F.3117	SUS430F	–	Y1Cr17
	434	1.4113	X6CrMo171	434S17	–	2325	Z8CD 17.01	X8CrMo17	–	SUS434	–	1Cr17Mo
	–	1.4313	X5CrNi134	425C11	–	–	Z4CND13.4M	–	–	SCS5	–	–
	–	1.4408	G-X6CrNiMo1810	316C16	–	–	–	–	F.8414	SCS14	07Ch 18N10G2S2M2L	–
	HW3	1.4718	X45CrSi93	401S45	52	–	Z45CS9	X45CrSi8	F.322	SUH1	40Ch9S2	4Cr9Si2
	405	1.4724	X10CrAl13	403S17	–	–	Z10C13	X10CrAl12	F.311	SUS405	10Ch13SJu	0Cr13Al
	430	1.4742	X10CrAl18	430S15	60	–	Z10CAS18	X8Cr17	F.3113	SUS430	15Ch18SJu	Cr17
	HNV6	1.4757	X80CrNiSi20	443S65	59	–	Z80CSN20.02	X80CrSiNi20	F.320V	SUH4	–	8Cr20Si2Ni
	446	1.4762	X10CrAl24	–	–	2322	Z10CAS24	X16Cr26	–	SUH446	–	2Cr25N
	Austenitic stainless steel											
	304	1.4301	X5CrNi1810	304S15	58E	2332	Z6CN18.09	X5CrNi1810	F.3551; F.3541; F.3504	SUS304	08Ch18N10	0Cr18Ni9
	303	1.4305	X10CrNiS189	303S21	58M	2346	Z10CNF18.09	X10CrNiS18.09	F.3508	SUS303	–	1Cr18Ni9MoZr
	304L	1.4306	X2CrNi1911	304S12	–	2352	Z2CN18.10	X2CrNi18.11	F.3503	SCS19	03Ch18N11	0Cr19Ni10
	–	1.4308	G-X6CrNi189	304C15	–	–	Z6CN18.10M	–	–	SCS13	07Ch18N9L	–
	301	1.4310	X12CrNi177	–	–	2331	Z12CN17.07	X12CrNi1707	F.3517	SUS301	–	Cr17Ni7
	304LN	1.4311	X2CrNiN1810	304S62	–	2371	Z2CN18.10	–	–	SUS304LN	–	-
	304	1.4350	X5CrNi189	304S31	58E	–	Z6CN 18.09	X5CrNi1810	–	SUS304	–	0Cr19Ni9
	316	1.4401	X5CrNiMo1712	316S16	Z6CND17.11	2347	sty.01	X5CrNiMo1712	F.3543	SUS316	–	0Cr17Ni11Mo2
	316LN	1.4429	X2CrNiMoN 17133	–	–	2375	Z2CND17.13	–	–	SUS316LN	–	00Cr17Ni 13Mo2
	316L	1.4435	X2CrNiMo18143	316S12	–	2353	Z2CDN17.13	X2CrNiMo1713	–	SCS16,	03Ch17N14M2	0Cr27Ni12Mo3
	317L	1.4438	X2CrNiMo17133	317S12	–	2367	Z2CND19.15	X2CrNiMo18.16	–	SUS317L	–	00Cr19Ni13Mo3
	329L	1.4460	X8CrNiMo275	–	–	2324	–	–	–	SUS329L; SCH11; SCS11	–	–

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	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST	GB
M	321	1.4541	X6CrNiTi1810	2337	321S12	58B	Z6CNT18.10	X6CrNiTi1811	F.3553	SUS321	12Ch18N10T	1Cr18Ni9Ti
	347	1.4550	X6CrNiNb1810	347S17	58F	2338	Z6CNNb18.1	X6CrNiTi1811	F.3552	SUS347	08Ch18N12B	1 Cr18Ni11 Nb
	316Ti	1.4571	X6CrNiMoTi17122	320S17	58J	2350	Z6NDT17.12	X6CrNiMoTi17	F.3535	–	10Ch17N13M2T	Cr18Ni12Mo2Ti
	–	1.4581	G-X5CrNiMoNb1810	318C7	–	–	Z4CNDNb1812M	XG8CrNiMo18	–	SCS22	–	–
	318	1.4583	X10CrNiMoNb1812	–	–	–	Z6CNDNb1713B	X6CrNiMoTiNb17	–	–	–	Cr17Ni12Mo3Nb
	309	1.4828	X15CrNiSi2012	309S24	–	–	Z15CNS20.1	–	–	SUH309	20Ch20N14S2	1Cr23Ni13
	310S	1.4845	X12CrNi2521	310S24	–	2361	Z12CN2520	X6CrNi2520	F.331	SUH310	20Ch23N18	0Cr25Ni20
	330	1.4864	X12NiCrSi3616	–	–	–	Z12CNS35.1	–	–	SUH330	–	Cr15Ni36W3Ti
	–	1.4865	G-X40NiCrSi3818	330C11	–	–	–	XG50NiCr3919	–	SCH15	–	–
	EV8	1.4871	X53CrMnNiN219	349S54; 321S12	– 58B	–	Z52CMN21.0	X53CrMnNiN219	–	SUH35	55Ch20G9AN4	5Cr2Mn9Ni4N
	321	1.4878	X12CrNiTi189	321S320	58C	–	Z6CNT18.12	X6CrNiTi1811	F.3523	SU321	09Ch18N10T	1Cr18Ni9Ti

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K	Nodular cast iron									
	60-40-18	GGG40	400/17	0717-02	FGS370-17	GS370-17	FGE38-17	FCD400	VC 42-12	QT400-18
	65-45-12	—	420/12	—	FGS400-12	GS400-12	FGE42-12	FCD450	–	QT450-10
	70-50-05	GGG50	500/7	0727-02	FGS500-7	GS500-7	FGE50-7	FCD500	VC 50-2	QT500-7
	80-60-03	GGG60	600/7	0732-03	FGS600-2	GS600-2	FGE60-2	FCD600	VC 60-2	QT600-3
	100-70-03	GGG70	700/2	0737-01	FGS700-2	GS700-2	FGE70-2	FCD700	VC 70-2	QT700-2
	120-90-02	GGG80	800/2	0864-03	FGS800-2	GS800-2	FGE80-2	FCD800	VC 80-2	QT800-2
	—	—	900/2	—	—	—	—	—	–	QT900-2
	NO.60	GG40	—	140	FGL400	—	—		Sc 40	—
	NO.50	GG35	350	135	FGL350	G35	FG35	FC350	Sc 35	HT350
	NO.45	GG30	300	130	FGL300	G30	FG30	FC300	Sc 30	HT300
	NO.35	GG25	250	125	FGL250	G25	FG25	FC250	Sc 25	HT250
	NO.30	GG20	200	120	FGL200	G20	FG20	FC200	Sc 20	HT200
	NO.20	GG15	150	115	FGL150	G15	FG15	FC150	Sc 15	HT150
	—	—	100	110	—	G10	—	FC100	–	HT100

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	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST	GB
H	Hardened materials											
	440A	1.4108	X100CrMo03	–	–	2258 08	–	–	–	C4BS	–	–
	610	1.4111	X100CrMoV15	–	–	2534 05	–	–		AC4A	–	–
	0-2	–	X65CrMo14	–	–	2541 06	–	–		AC4A	–	–

ISO	Country and standard											
	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia	China
	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST	GB
N	Aluminium-based alloys											
	SC64D	3.2373	G-AlSI9MGWA	—	—	4251	A-S7G	—	—	C4BS	—	–
	DG-AlSI12	—	G-ALMG5	LM5	—	4252	A-SU12	—	—	AC4A	—	–
	356.1	—	—	LM25	—	4244	—	—	—	A5052	—	–
	A413.0	—	GD-AlSi12	—	—	4247	—	—	—	A6061	—	–
	A380.1	—	GD-AlSi8Cu3	LM24	—	4250	—	—	—	A7075	—	–
	A413.1	—	G-AlSi12(Cu)	LM20	—	4260	—	—	—	ADC12	—	–
	A413.2	—	G-AlSi12	LM6	—	4261	—	—	—	—	—	–
	A360.2	—	G-AlSi10Mg(Cu)	LM9	—	4253	—	—	—	—	—	–

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	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST	GB
S	Nickel based alloys											
	5391	LW2 4670	S-NiCr13A16MoNb	mar-46	–	–	NC12AD	–	–	–	–	–
	AMS 5397	LW2 4674	NiCo15Cr10MoAlTi	–	–	–	–	–	–	–	–	–
	5660	LW2.4662	NiFe35Cr14MoTi	–	–	–	ZSNCDT42	–	–	–	–	–
	5383	LW2.4668	NiCr19Fe19NbMo	HR8	–	–	NC19eNB	–	–	–	–	–
	–	2.4631	NiCr20TiAk	Hr401.601	–	–	NC20TA	–	–	–	–	–
	AMS 5399	2.4973	NiCr19Co11MoTi	–	–	–	NC19KDT	–	–	–	–	–
	AMS 5544	LW2.4668	NiCr19Fe19NbMo	–	–	–	NC20K14	–	–	–	–	–
	5390A	2.4603	–	–	–	–	NC22FeD	–	–	–	–	–
	5666	2.4856	NiCr22Mo9Nb	–	–	–	NC22FeDNB	–	–	–	–	–
	–	2.4630	NiCr20Ti	HR5.2034	–	–	NC20T	–	–	–	–	–
	4676	2.4375	NiCu30AL3Ti	3072-76	–	–	–	–	–	–	–	–
	Cobalt based alloys											
	5537C AMS	–	CoCr20W15Ni	–	–	–	KC20WN	–	–	–	–	–
	5772	LW2.4964	CoCr20W14Ni	–	–	–	KC22WN	–	–	–	–	–
	Titanium alloys											
	UNS R54520	3.7115.1	TiAl5Sn2.5	TA14/17	–	–	T-A5E	–	–	–	–	–
	–	–	–	–	–	–	UNS R56400	–	–	–	–	–
	–	3.7165.1	TiAl6V4	TA10-13/ TA28	–	–	UNS R56401	T-A6V	–	–	–	–
	–	–	TiAl5V5Mo5Cr3	–	–	–	–	–	–	–	–	–
	–	3.7185	TiAl4Mo4Sn4Si0.5	–	–	–	–	–	–	–	–	–

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