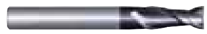
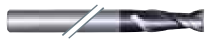
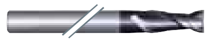
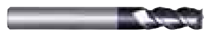
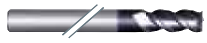
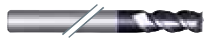
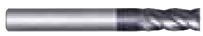
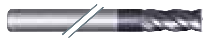
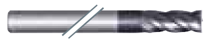
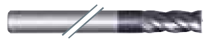
	ITEM No.	PAGE	
G2 general purpose, square	GB205	318	
	G2CS2	320	
	G2WS2	322	
	G2210	324	
	G2211	324	
	G2212	324	
	GB305	327	
	G2CSH3	329	
	G2WSH3	331	
	G2310	333	
	G2311	333	
	G2312	333	
	GB405	335	
	G2CS4	337	
	G2WS4	339	
	G2410	341	
	G2411	341	
	G2412	341	
	G2413	341	
	G2CSHM	343	
G2 general purpose, roughing	G2CSFR	345	
	G2WSFR	347	
G2 general purpose, corner radius	G2CS2R	349	
	G2CS4R	351	
	G2CL4R	353	
G2 general purpose, ball nose	GB255	355	
	G2CSB2	357	

OSAWA

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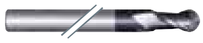
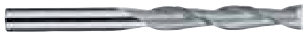
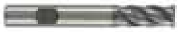
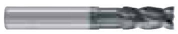
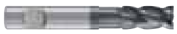
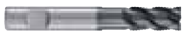
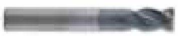
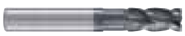
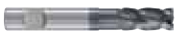
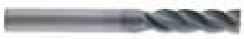
RANGE	NORM	TYPE	MATERIAL / COATING	HRC	HELIX ANGLE	GEOMETRY	Z	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H
1-12	OSAWA	N	MG BR	<45	30°	SQUARE	2	★	☆	★	☆		
1-20	OSAWA	N	MG PV200	<45	30°	SQUARE	2	★	☆	★	☆		
3-20	OSAWA	N	MG PV200	<45	30°	SQUARE	2	★	☆	★	☆		
2-6	OSAWA	N	MG PV200	<45	30°	SQUARE	2	★	☆	★	☆		
5-12	OSAWA	N	MG PV200	<45	30°	SQUARE	2	★	☆	★	☆		
8-16	OSAWA	N	MG PV200	<45	30°	SQUARE	2	★	☆	★	☆		
1-12	OSAWA	N	MG BR	<45	45°	SQUARE	3	★	☆	★	☆		
1-20	OSAWA	N	MG PV200	<45	45°	SQUARE	3	★	☆	★	☆		
3-20	OSAWA	N	MG PV200	<45	45°	SQUARE	3	★	☆	★	☆		
2-6	OSAWA	N	MG PV200	<45	45°	SQUARE	3	★	☆	★	☆		
4-12	OSAWA	N	MG PV200	<45	45°	SQUARE	3	★	☆	★	☆		
8-20	OSAWA	N	MG PV200	<45	45°	SQUARE	3	★	☆	★	☆		
1-12	OSAWA	N	MG BR	<45	30°	SQUARE	4	★	☆	★	☆		
1-25	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
3-20	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
2-6	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
3-12	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
8-20	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
16-20	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
6-20	OSAWA	N	MG PV200	<45	45°	SQUARE	6	★	☆	★	☆		
4-20	OSAWA	N - HR	MG PV200	<45	30°	SQUARE	3-4	★	☆	★	☆		
6-20	OSAWA	N - HR	MG PV200	<45	30°	SQUARE	3-4	★	☆	★	☆		
1-12	OSAWA	N	MG PV200	<45	30°	CORNER RADIUS	2	★	☆	★	☆		
1-12	OSAWA	N	MG PV200	<45	30°	CORNER RADIUS	4	★	☆	★	☆		
2-12	OSAWA	N	MG PV200	<45	30°	CORNER RADIUS	4	★	☆	★	☆		
1-12	OSAWA	N	MG BR	<45	30°	BALL NOSE	2	★	☆	★	☆		
1-20	OSAWA	N	MG PV200	<45	30°	BALL NOSE	2	★	☆	★	☆		

★ 1st choice ☆ suitable

	ITEM No.	PAGE	
G2 general purpose, ball nose	**G2250**	359	
	G2251	359	
	G2CSB4	361	
MDTA general purpose, square	**MDTACS2**	364	
	MDTA210	366	
	MDCL2	368	
	MDTACS3	370	
	MDTAWSH3	372	
	MDTACS4	374	
	MDTA410	376	
	MDCL4	378	
MDTA general purpose, roughing	**MDTAUPR**	380	
MDTA general purpose, ball nose	**MDTACSB2**	382	
	MDTA250	384	
HF UNI < 40 HRC, 45° chamfer	**HF840**	390	
	HF440	394	
	HF441	399	
HF UNI < 40 HRC, roughing	**HF844**	405	
	HF444	409	
	HF445	413	
HF UNI < 40 HRC, corner radius	**HF342**	418	
	HF842	421	
	HF442	425	
	HF443	430	
	HF542	435	
	HF942	438	
	HF943	442	

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RANGE	NORM	TYPE	MATERIAL / COATING	HRC	HELIX ANGLE	GEOMETRY	Z	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H
1-12	OSAWA	N	MG PV200	<45	30°	BALL NOSE	2	★	☆	★	☆		
6-20	OSAWA	N	MG PV200	<45	30°	BALL NOSE	2	★	☆	★	☆		
1-20	OSAWA	N	MG PV200	<45	30°	BALL NOSE	4	★	☆	★	☆		
1-20	OSAWA	N	MG PV200	<45	30°	SQUARE	2	★	☆	★	☆		
3-12	OSAWA	N	MG PV200	<45	30°	SQUARE	2	★	☆	★	☆		
3-12	OSAWA	N	MG BR	<45	30°	SQUARE	2	★	☆	★	☆		
1-20	OSAWA	N	MG PV200	<45	30°	SQUARE	3	★	☆	★	☆		
3-20	OSAWA	N	MG PV200	<45	45°	SQUARE	3	★	☆	★	☆		
1-20	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
3-16	OSAWA	N	MG PV200	<45	30°	SQUARE	4	★	☆	★	☆		
3-20	OSAWA	N	MG BR	<45	30°	SQUARE	4	★	☆	★	☆		
6-20	OSAWA	N - UP - NR	MG PV200	<45	40°	C45°	3-4	★	☆	★			
1-12	OSAWA	N	MG PV200	<45	30°	BALL NOSE	2	★	☆	★	☆		
3-12	OSAWA	N	MG PV200	<45	30°	BALL NOSE	2	★	☆	★	☆		
3-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CHAMFER 45°	4	★	★	★		★	
3-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CHAMFER 45°	4	★	★	★		★	
3-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CHAMFER 45°	4	★	★	★		★	
6-20	OSAWA	VH/UP - HR	MG PV300	<40	36°/39°	CHAMFER 45°	4	★	★	★		★	
6-20	OSAWA	VH/UP - HR	MG PV300	<40	36°/39°	CHAMFER 45°	4	★	★	★		★	
6-20	OSAWA	VH/UP - HR	MG PV300	<40	36°/39°	CHAMFER 45°	4	★	★	★		★	
3-12	OSAWA	VH/UP	MG PV300	<40	36°/39°	CORNER RADIUS	4	★	★	★		★	
4-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CORNER RADIUS	4	★	★	★		★	
3-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CORNER RADIUS	4	★	★	★		★	
3-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CORNER RADIUS	4	★	★	★		★	
6-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CORNER RADIUS	4	★	★	★		★	
4-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CORNER RADIUS	4	★	★	★		★	
4-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CORNER RADIUS	4	★	★	★		★	

★ 1st choice ☆ suitable

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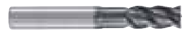
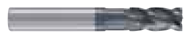
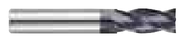
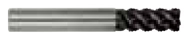
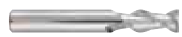
	ITEM No.	PAGE	
HF UNI < 40 HRC, corner radius	HF642	446	
	HF643	449	
	HF742	452	
	HF743	455	
HF UNI SC < 40 HRC, 45° chamfer + corner radius	HF861	458	
HF HARD 30÷55 HRC, 45° chamfer	HF850	463	
	HF450	467	
	HF451	471	
HF HARD 30÷55 HRC, corner radius	HF852	475	
	HF452	479	
MEF stainless steel and super alloys, square	MEFCS2	484	
	MEFCSH3	486	
	MEFCS4	488	
	MEF600	490	
MEF stainless steel and super alloys, roughing	MEF901	492	
	MEF902	494	
ALU unequal pitch, square	HFAL4	498	
ALU unequal pitch, corner radius	HFAL3	501	
	HFA53	504	
ALU square	MDCSA1	507	
	MDCSA2	509	
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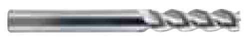
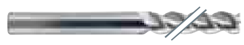
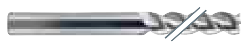
	MDA310	514	
	MDA311	514	
	MDA312	514	
	MDCSAM	517	
ALU corner radius	MCA212R	519	

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RANGE	NORM	TYPE	MATERIAL / COATING	HRC	HELIX ANGLE	GEOMETRY	Z	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H
4-20	OSAWA	VH	MG PV300	<40	36°/37°/38°	CORNER RADIUS	5	★	★	★		★	
4-20	OSAWA	VH	MG PV300	<40	36°/37°/38°	CORNER RADIUS	5	★	★	★		★	
6-20	OSAWA	VH	MG PV300	<40	36°/37°/38°	CORNER RADIUS	5	★	★	★		★	
6-20	OSAWA	VH	MG PV300	<40	36°/37°/38°	CORNER RADIUS	5	★	★	★		★	
1-20	OSAWA	VH/UP	MG PV300	<40	36°/39°	CR+C45°	4	★	★	★		★	
3-20	OSAWA	UP	MG PV300	35÷55	40°	CHAMFER 45°	4	★	★	★		★	★
3-20	OSAWA	UP	MG PV300	35÷55	40°	CHAMFER 45°	4	★	★	★		★	★
3-20	OSAWA	UP	MG PV300	35÷55	40°	CHAMFER 45°	4	★	★	★		★	★
4-20	OSAWA	UP	MG PV300	35÷55	40°	CORNER RADIUS	4	★	★	★		★	★
3-20	OSAWA	UP	MG PV300	35÷55	40°	CORNER RADIUS	4	★	★	★		★	★
1-16	OSAWA	VA	UMG ENDLESS	<45	35°	SQUARE	2	★	★			★	
6-20	OSAWA	VA	UMG ENDLESS	<45	50°	SQUARE	3	★	★			★	
2-20	OSAWA	VA	UMG ENDLESS	<45	35°	SQUARE	4	★	★			★	
6-20	OSAWA	VA	UMG ENDLESS	<45	50°	SQUARE	6-8	★	★			★	
4-20	OSAWA	VA - HR	UMG ENDLESS	<45	45°	SQUARE	3-6	★	★			★	
6-20	OSAWA	VA - HR	UMG ENDLESS	<45	45°	SQUARE	4-6	★	★			★	
3-20	OSAWA	UP ALU	MG BR		40°	SQUARE	4				★		
2-20	OSAWA	UP ALU	MG POLISHED		30°	CORNER RADIUS	3				★		
3-20	OSAWA	UP ALU	MG BR		30°	CORNER RADIUS	3				★		
2-12	OSAWA	ALU	MG POLISHED		25°	SQUARE	1				★		
1-20	OSAWA	ALU	MG POLISHED		45°	SQUARE	2				★		
1-20	OSAWA	ALU	MG POLISHED		55°	SQUARE	3				★		
3-6	OSAWA	ALU	MG POLISHED		55°	SQUARE	3				★		
3-12	OSAWA	ALU	MG POLISHED		55°	SQUARE	3				★		
8-20	OSAWA	ALU	MG POLISHED		55°	SQUARE	3				★		
6-12	OSAWA	ALU	MG POLISHED		50°	SQUARE	6				★		
2-12	OSAWA	ALU	MG PV200		25°	CORNER RADIUS	2				★		

★ 1st choice ☆ suitable

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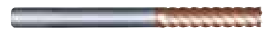
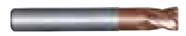
	ITEM No.	PAGE	
ALU ball nose	MDCAB2	521	
MEX 30÷55 HRC, square	MEXM2	524	
	MEXM2SC	526	
	MEXLN2	528	
	MEXCS2	533	
	MEXCL2	535	
MEX 30÷55 HRC, square	MEXCS4	537	
	MEXCL4	539	
	MEXCSHM	541	
	MEXCLHM	543	
MEX 30÷55 HRC, roughing	MEXCSFR	545	
MEX 30÷55 HRC, corner radius	MEXLN2R	547	
	MEXLS2R	553	
	MEXCS4R	555	
	MEX410R	558	
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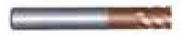
	MEX610R	562	
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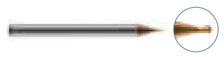
MEX 30÷55 HRC, ball nose	MEXMB2	566	
	MEXMB2SC	568	
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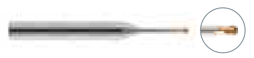
	MEXLNB206	575	
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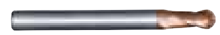
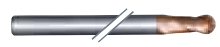
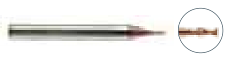
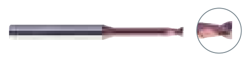
	MEXCLSB2	579	
	MEX253	581	
UH < 70 HRC, square	UHM204	584	
	UHLN2	586	

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RANGE	NORM	TYPE	MATERIAL / COATING	HRC	HELIX ANGLE	GEOMETRY	Z	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H
1-12	OSAWA	ALU	MG POLISHED		40°	BALL NOSE	2				★		
0.3-2	OSAWA	MEX	UMG ENDLESS ORANGE	<55	40°	SQUARE	2	★		★			★
0.2-0.9	OSAWA	MEX	UMG ENDLESS ORANGE	<55	40°	SQUARE	2	★		★			★
0.2-4	OSAWA	MEX	UMG ENDLESS ORANGE	<55	40°	SQUARE	2	★		★			★
1-20	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	SQUARE	2	★		★			★
1-12	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	SQUARE	2	★		★			★
1-25	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	SQUARE	4	★		★			★
2-25	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°-40°	SQUARE	4	★		★			★
3-20	OSAWA	MEX	UMG ENDLESS ORANGE	<55	50°	SQUARE	6-8	★		★			★
3-20	OSAWA	MEX	UMG ENDLESS ORANGE	<55	45°	SQUARE	6-8	★		★			★
6-20	OSAWA	MEX - HR	UMG ENDLESS ORANGE	<55	20°	SQUARE	3-4	★		★			★
0.3-4	OSAWA	MEX	UMG ENDLESS ORANGE	<55	40°	CORNER RADIUS	2	★		★			★
2-16	OSAWA	MEX	UMG ENDLESS ORANGE	<55	40°	CORNER RADIUS	2	★		★			★
1-20	OSAWA	MEX	UMG ENDLESS ORANGE	<55	40°	CORNER RADIUS	4	★		★			★
2-12	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	CORNER RADIUS	4	★		★			★
2-16	OSAWA	MEX	UMG ENDLESS ORANGE	<55	40°	CORNER RADIUS	4	★		★			★
6-12	OSAWA	MEX	UMG ENDLESS ORANGE	<55	45°	CORNER RADIUS	6	★		★			★
6-12	OSAWA	MEX	UMG ENDLESS ORANGE	<55	45°	CORNER RADIUS	6	★		★			★
0.2-2	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	BALL NOSE	2	★		★			★
0.2-0.8	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	BALL NOSE	2	★		★			★
0.2-4	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	BALL NOSE	2	★		★			★
0.5-2	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	BALL NOSE	2	★		★			★
1-20	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	BALL NOSE	2	★		★			★
1-20	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	BALL NOSE	2	★		★			★
1-20	OSAWA	MEX	UMG ENDLESS ORANGE	<55	30°	BALL NOSE	2	★		★			★
0.1-0.9	OSAWA	UH	NMG UH RED	<70	40°	SQUARE	2	☆		☆			★
0.2-4	OSAWA	UH	NMG UH RED	<70	40°	SQUARE	2	☆		☆			★

★ 1st choice ☆ suitable

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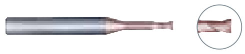
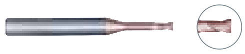
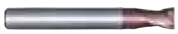
	ITEM No.	PAGE	
UH < 70 HRC, square	**UH600**	591	
	UH612	593	
UH < 70 HRC, corner radius	**UHM206**	595	
	UH211	597	
	UH212	599	
	UHCS2	604	
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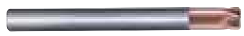
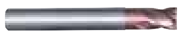
	UHF4	610	
	UHCS4	612	
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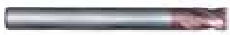
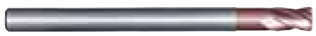
	UH411	617	
	UH412	619	
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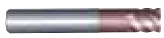
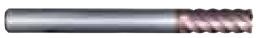
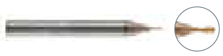
	UH610R	623	
	UH611R	625	
UH < 70 HRC, ball nose	**UHMB204**	627	
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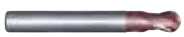
	UHLNB2	631	
	UHCRB2	636	
	UHCSB2	638	
	UH250	640	
	UH253	642	

OSAWA

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RANGE	NORM	TYPE	MATERIAL / COATING	HRC	HELIX ANGLE	GEOMETRY	Z	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H
3-20	OSAWA	UH	NMG UH RED	<70	50°	SQUARE	6-8	☆		☆			★
3-20	OSAWA	UH	NMG UH RED	<70	50°	SQUARE	6-8	☆		☆			★
0.3-2	OSAWA	UH	NMG UH RED	<70	40°	CORNER RADIUS	2	☆		☆			★
1-6	OSAWA	UH	NMG UH RED	<70	30°	CORNER RADIUS	2	☆		☆			★
0.2-4	OSAWA	UH	NMG UH RED	<70	40°	CORNER RADIUS	2	☆		☆			★
1-12	OSAWA	UH	NMG UH RED	<70	30°	CORNER RADIUS	2	☆		☆			★
1-4	OSAWA	UP - UH	NMG UH RED	<70	25°	CORNER RADIUS	4	☆		☆			★
2-12	OSAWA	UH	NMG UH RED	<70	25°	CORNER RADIUS	4	☆		☆			★
1-12	OSAWA	UH	NMG UH RED	<70	30°	CORNER RADIUS	4	☆		☆			★
1-20	OSAWA	UH	NMG UH RED	<70	40°	CORNER RADIUS	4	☆		☆			★
3-12	OSAWA	UH	NMG UH RED	<70	30°	CORNER RADIUS	4	☆		☆			★
2-12	OSAWA	UH	NMG UH RED	<70	40°	CORNER RADIUS	4	☆		☆			★
6-16	OSAWA	UH	NMG UH RED	<70	40°	CORNER RADIUS	4	☆		☆			★
6-12	OSAWA	UH	NMG UH RED	<70	45°	CORNER RADIUS	6	☆		☆			★
6-20	OSAWA	UH	NMG UH RED	<70	45°	CORNER RADIUS	6	☆		☆			★
0.2-0.8	OSAWA	UH	NMG UH RED	<70	30°	BALL NOSE	2	☆		☆			★
0.4-0.8	OSAWA	UH	NMG UH RED	<70	30°	BALL NOSE	2	☆		☆			★
0.2-4	OSAWA	UH	NMG UH RED	<70	30°	BALL NOSE	2	☆		☆			★
0.5-2	OSAWA	UH	NMG UH RED	<70	30°	BALL NOSE	2	☆		☆			★
1-20	OSAWA	UH	NMG UH RED	<70	30°	BALL NOSE	2	☆		☆			★
1-20	OSAWA	UH	NMG UH RED	<70	30°	BALL NOSE	2	☆		☆			★
1-20	OSAWA	UH	NMG UH RED	<70	30°	BALL NOSE	2	☆		☆			★

★ 1st choice ☆ suitable

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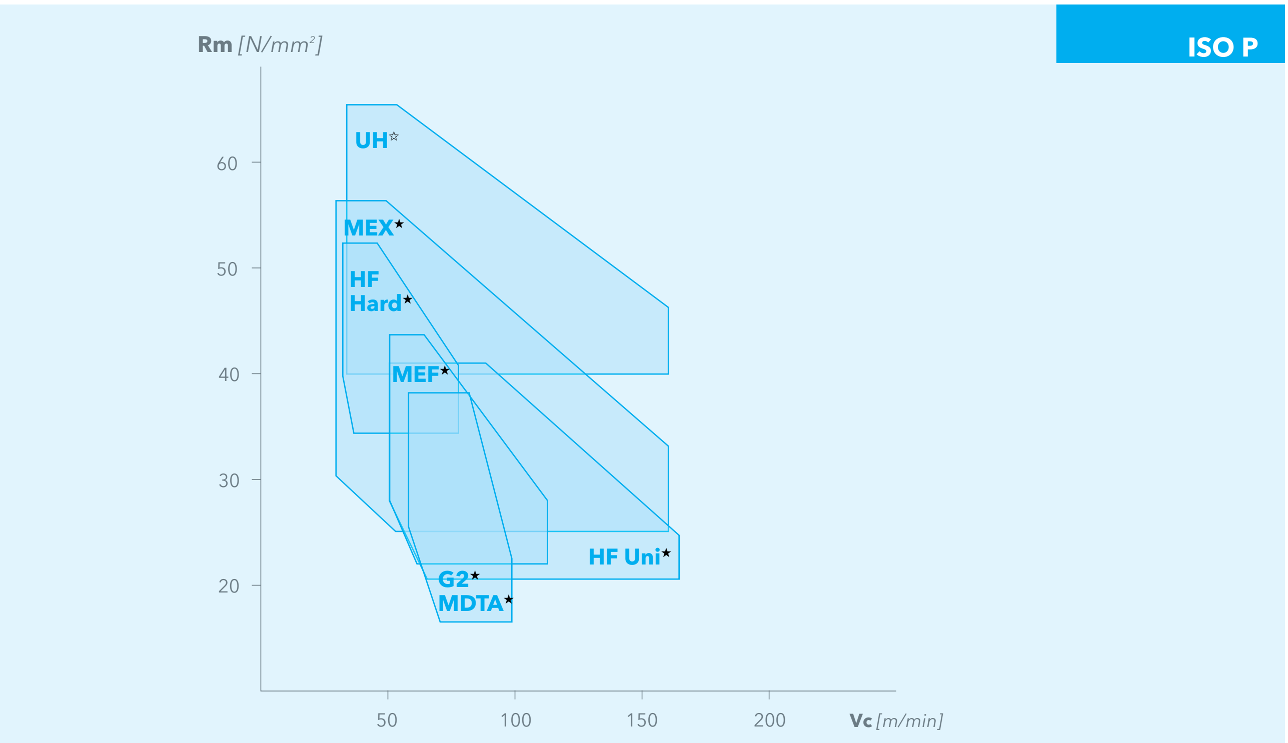
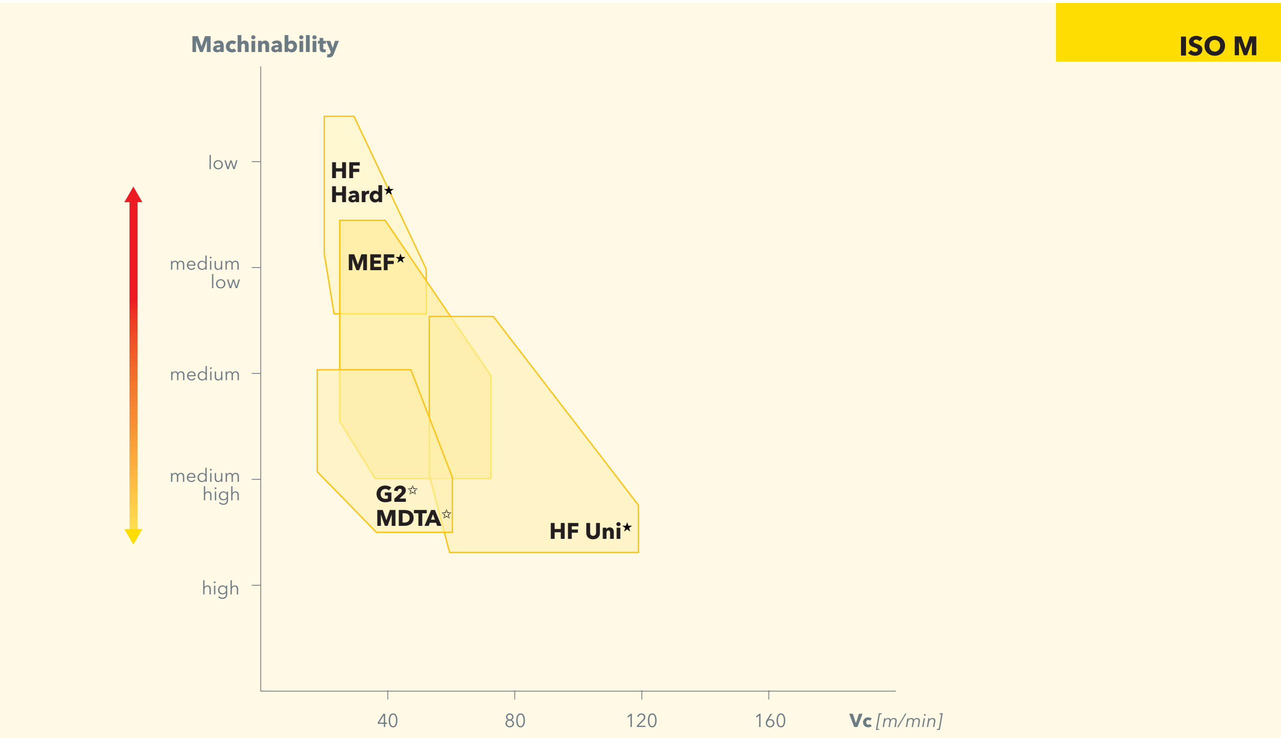
STEEL APPLICATION



★ 1st choice ☆ suitable

STAINLESS STEEL APPLICATION



★ 1st choice ☆ suitable

G2 : general purpose (page 317)
MDTA : general purpose (page 363)
HF UNI : universal purpose (page 387)
HF HARD : special purpose (page 463)
MEF : special purpose (page 483)
MEX : special purpose (page 523)
UH :special purpose (page 583)

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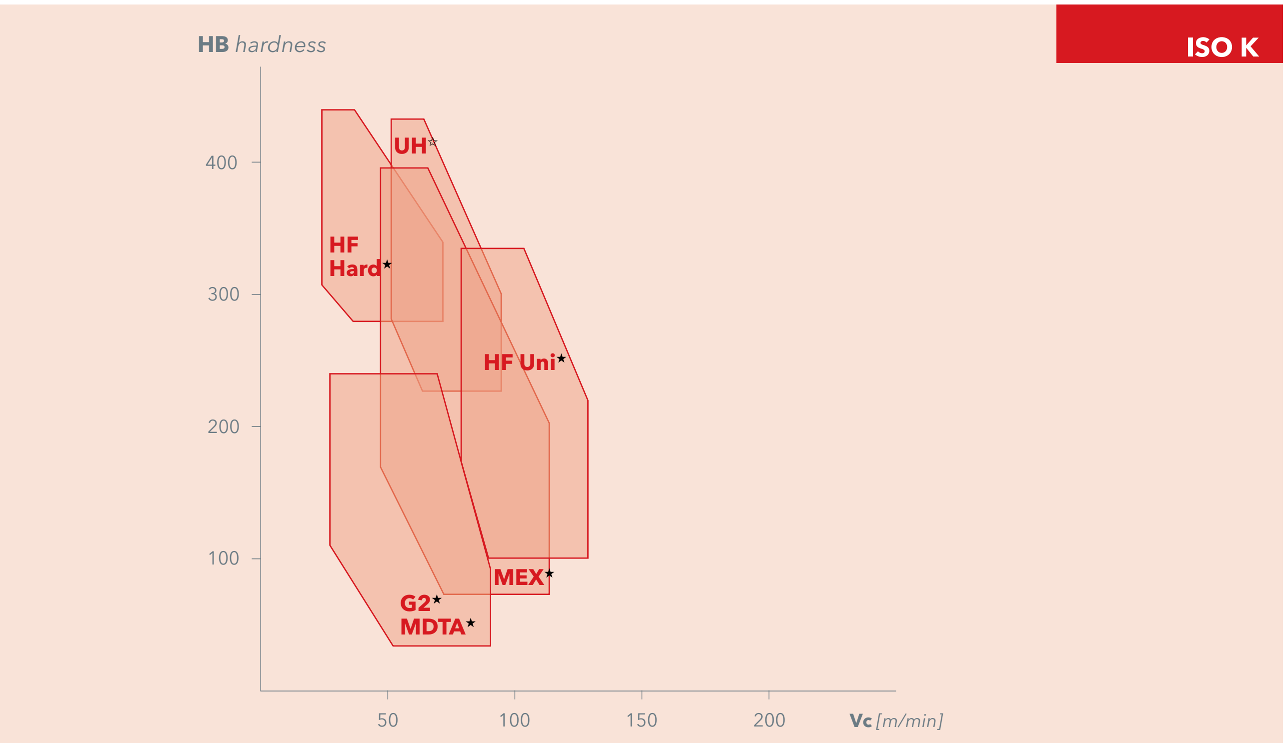
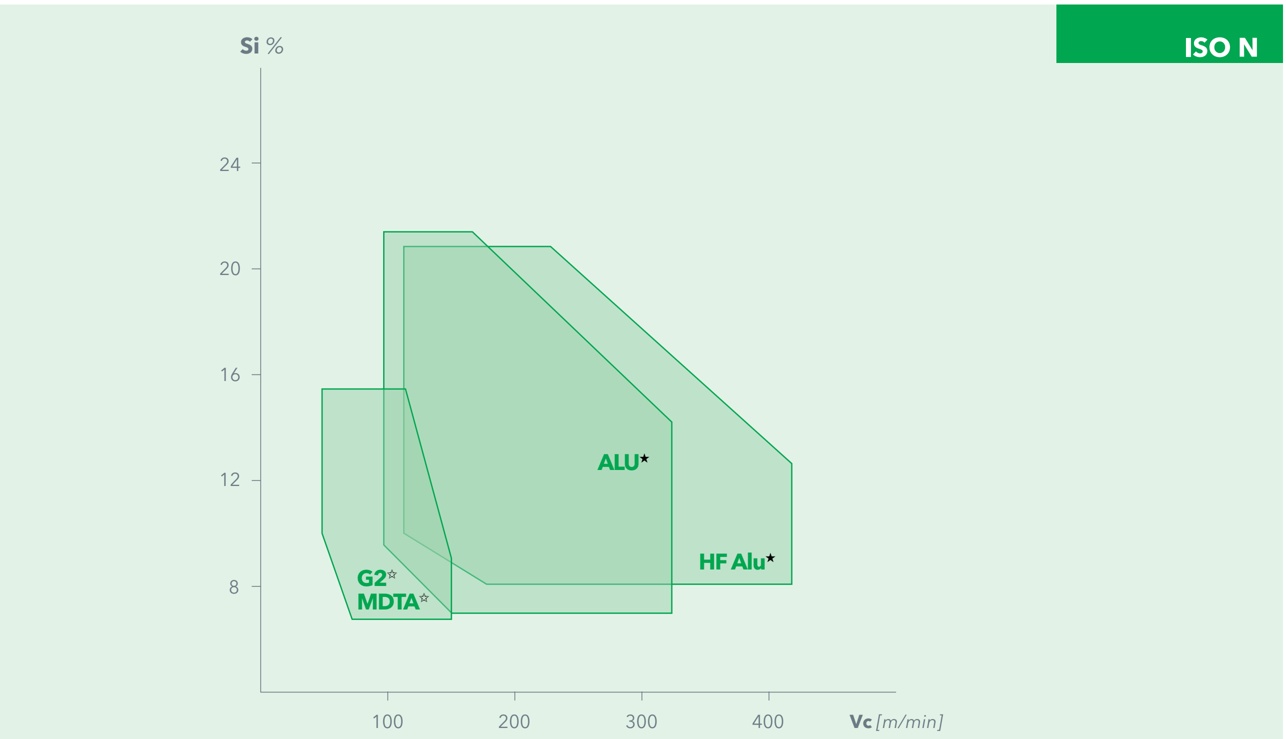
CAST IRON APPLICATION



★ 1st choice ☆ suitable

NON-FERROUS MATERIALS APPLICATION



★ 1st choice ☆ suitable

G2 : general purpose (page 317)
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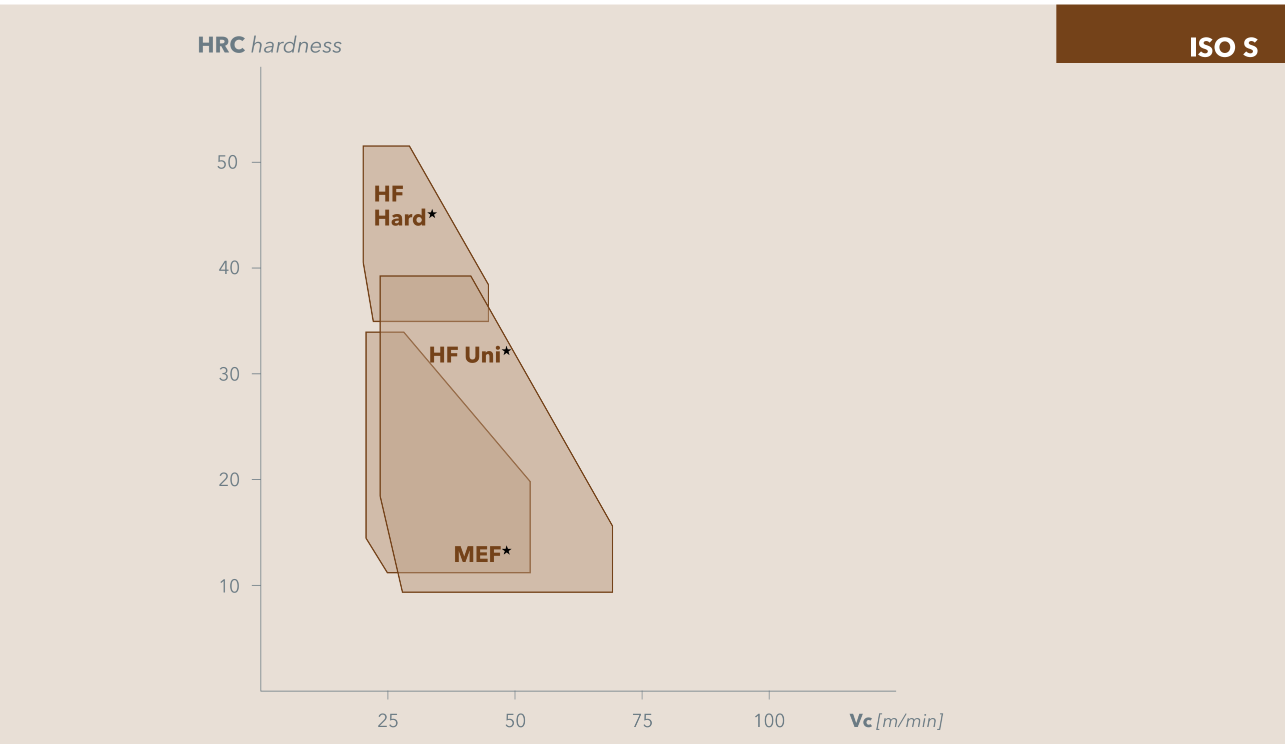
HF HARD : special purpose (page 463)
ALU : special purpose (page 497)
MEX : special purpose (page 523)
UH :special purpose (page 583)

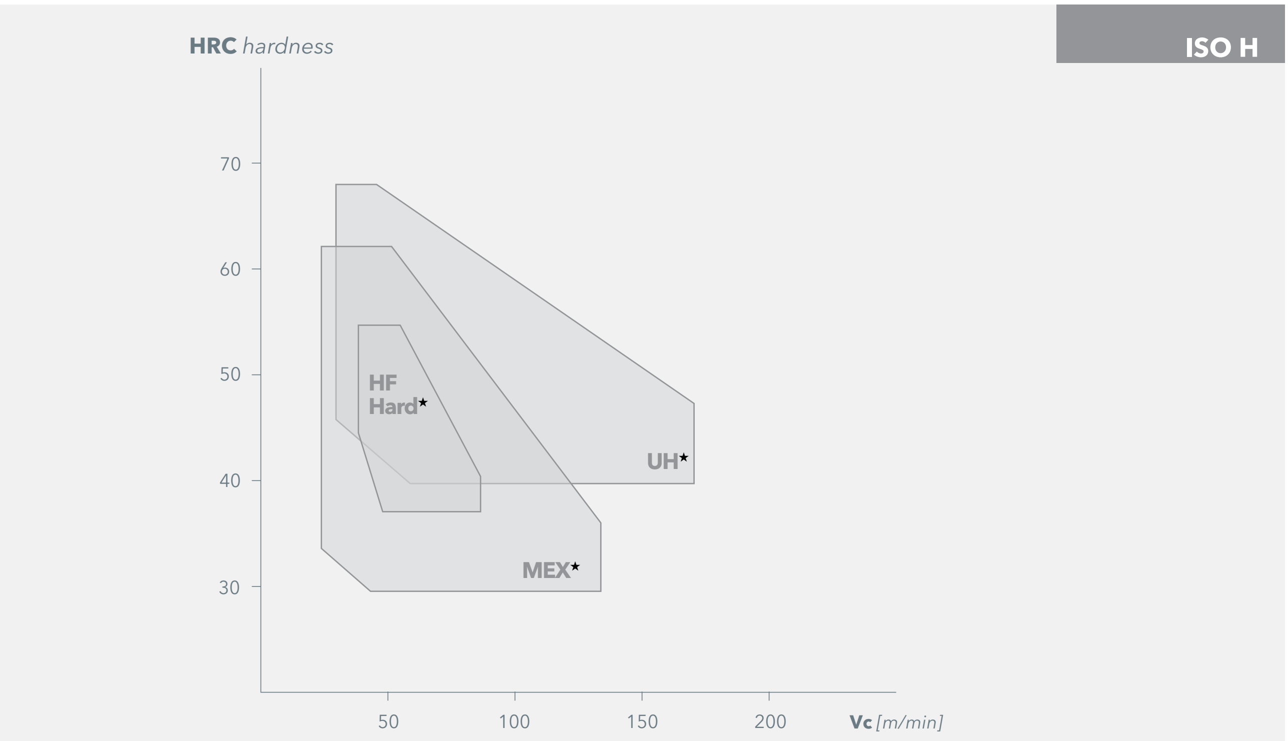
Grafici applicativi Anwendungsgrafiken Graphiques d'application Gráficos aplicativos Диаграммы

SUPER ALLOYS APPLICATION



★ 1st choice ☆ suitable

HARDENED STEEL APPLICATION



★ 1st choice ☆ suitable

HF UNI : universal purpose (page 387)
HF HARD : special purpose (page 463)
MEF : special purpose (page 483)
MEX : special purpose (page 523)
UH :special purpose (page 583)

G2
GENERAL PURPOSE

Range of general-purpose endmills, featuring new cutting geometries and innovative coatings for enhanced performance. The answer given by Osawa to the market demand for higher performance tools. Thanks to a fully optimized manufacturing process and to large production batches the G2 range excels in the cost-performance ratio.

Gamma di frese per uso generico, dotate di geometria di taglio e rivestimenti innovativi per garantire prestazioni ancora più elevate. La risposta di Osawa ad un mercato che chiede utensili sempre più performanti e competitivi. L'innovazione nei processi produttivi consente alla gamma G2 di eccellere nel rapporto qualità-prezzo.

Produktpalette von Fräser für allgemeine Anwendungen, ausgestattet mit einer Schnittgeometrie und innovativen Beschichtungen zur Gewährleistung noch höherer Leistungen. Die Antwort von Osawa auf einen Markt, der immer leistungsstärkere und wettbewerbsfähigere Werkzeuge fordert. Dank der Innovation der Produktionsprozesse zeichnet sich die Produktreihe G2 durch ein außergewöhnliches Preis-Leistungsverhältnis aus.

Gamme de fraises pour un usage général, dotées de géométrie de coupe et de revêtements innovants pour garantir des prestations encore plus élevées. C'est la réponse d'Osawa à un marché qui nécessite d'outils de plus en plus performants et compétitifs. L'innovation des processus de production permet à la gamme G2 d'avoir un rapport qualité-prix excellent.

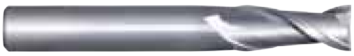
Gama de fresas para uso genérico, provistas de geometría de corte y revestimientos innovadores para garantizar prestaciones aún más elevadas. La respuesta de Osawa a un mercado que pide herramientas cada vez con mayor rendimiento y más competitivas. La innovación en los procesos de producción permite a la gama G2 sobresalir en la relación calidad-precio.

Ассортимент фрез общего назначения, с новой геометрией и покрытиями, гарантирующими высокоэффективную работу. Это ответ компании Osawa на запросы рынка, который требует всё более конкурентоспособные инструменты с высокими эксплуатационными характеристиками. Инновации в производственных процессах и большие изготавливаемые партии позволяют серии G2 иметь превосходное соотношение цена-качество.

GB205

cylindrical shank, 2 flutes

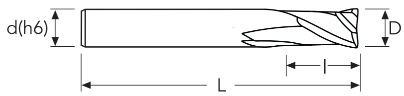
OSAWA NORM | N | MG BR | <45 HRC | 30° | SQUARE | Z2



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		50	2	GB205010	h
1.5	0/-0.020			4	4.5		50	2	GB205015	h
2	0/-0.020			4	6		50	2	GB205020	h
3	0/-0.020			4	8		50	2	GB205030	h
4	0/-0.020			4	11		50	2	GB205040	h
5	0/-0.020			6	13		50	2	GB205050	h
6	0/-0.020			6	15		50	2	GB205060	h
8	0/-0.025			8	20		60	2	GB205080	h
10	0/-0.025			10	30		75	2	GB205100	h
12	0/-0.025			12	30		75	2	GB205120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

GB205

SLOTTING

Material Group ISO 513	P1 K1			P2 M1 K2			P3 M2			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	0.5D x D			0.5D x D			0.3D x D			0.5D x D		
Vc (m/min)	50-60			30-50			20-40			70-90		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	17520	0.004	120	12740	0.003	80	9550	0.003	50	25480	0.005	230
2	8760	0.007	120	6370	0.006	80	4780	0.005	50	12740	0.009	230
3	5840	0.010	120	4250	0.009	70	3180	0.008	50	8490	0.013	220
4	4380	0.014	120	3180	0.012	80	2390	0.011	50	6370	0.018	230
5	3500	0.018	130	2550	0.015	80	1910	0.014	50	5100	0.023	240
6	2920	0.023	130	2120	0.020	80	1590	0.017	50	4250	0.030	250
8	2190	0.030	130	1590	0.026	80	1190	0.023	50	3180	0.039	250
10	1750	0.038	130	1270	0.032	80	960	0.029	50	2550	0.049	250
12	1460	0.045	130	1060	0.038	80	800	0.034	50	2120	0.059	250

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 K1			P2 M1 K2			P3 M2			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.2D			1.5D x 0.3D		
Vc (m/min)	50-60			30-50			20-40			70-90		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	17520	0.004	150	12740	0.004	90	9550	0.003	60	25480	0.006	290
2	8760	0.009	150	6370	0.007	90	4780	0.007	60	12740	0.011	290
3	5840	0.013	150	4250	0.011	90	3180	0.009	60	8490	0.016	280
4	4380	0.018	150	3180	0.015	90	2390	0.013	60	6370	0.023	290
5	3500	0.023	160	2550	0.019	100	1910	0.017	60	5100	0.029	300
6	2920	0.029	170	2120	0.024	100	1590	0.022	70	4250	0.037	320
8	2190	0.038	160	1590	0.032	100	1190	0.028	70	3180	0.049	310
10	1750	0.048	170	1270	0.040	100	960	0.036	70	2550	0.062	310
12	1460	0.056	160	1060	0.048	100	800	0.042	70	2120	0.073	310

< D3 mm: ae = 0.2D

DRILLING

Material Group ISO 513	P1 K1			P2 M1 K2			P3 M2			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	D X D			D X D			0.5D X D			D X D		
Vc (m/min)	40-50			30-40			20-30			60-80		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	14330	0.002	60	11150	0.002	40	7960	0.002	30	22290	0.003	130
2	7170	0.004	60	5570	0.004	40	3980	0.003	30	11150	0.006	130
3	4780	0.006	60	3720	0.005	40	2650	0.005	20	7430	0.008	120
4	3580	0.009	60	2790	0.007	40	1990	0.007	30	5570	0.011	130
5	2870	0.011	60	2230	0.010	40	1590	0.008	30	4460	0.015	130
6	2390	0.014	70	1860	0.012	50	1330	0.011	30	3720	0.019	140
8	1790	0.019	70	1390	0.016	40	1000	0.014	30	2790	0.024	140
10	1430	0.024	70	1110	0.020	40	800	0.018	30	2230	0.031	140
12	1190	0.028	70	930	0.024	40	660	0.021	30	1860	0.037	140

< D3 mm: ap = 0.5D

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

G2CS2

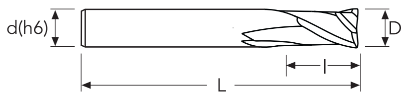
cylindrical shank, 2 flutes

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		50	2	G2CS2010	h
1.5	0/-0.020			4	4.5		50	2	G2CS2015	h
2	0/-0.020			4	6		50	2	G2CS2020	h
2.5	0/-0.020			4	7		50	2	G2CS2025	h
3	0/-0.020			4	8		50	2	G2CS2030	h
3.5	0/-0.020			4	10		50	2	G2CS2035	h
4	0/-0.020			4	11		50	2	G2CS2040	h
4.5	0/-0.020			6	13		50	2	G2CS2045	h
5	0/-0.020			6	13		50	2	G2CS2050	h
5.5	0/-0.020			6	13		50	2	G2CS2055	h
6	0/-0.020			6	15		50	2	G2CS2060	h
6.5	0/-0.025			8	17		60	2	G2CS2065	h
7	0/-0.025			8	17		60	2	G2CS2070	h
7.5	0/-0.025			8	17		60	2	G2CS2075	h
8	0/-0.025			8	20		60	2	G2CS2080	h
8.5	0/-0.025			10	23		75	2	G2CS2085	h
9	0/-0.025			10	23		75	2	G2CS2090	h
10	0/-0.025			10	30		75	2	G2CS2100	h
10.5	0/-0.025			12	25		75	2	G2CS2105	h
11	0/-0.025			12	28		75	2	G2CS2110	h
12	0/-0.025			12	30		75	2	G2CS2120	h
13	0/-0.030			16	33		100	2	G2CS2130	h
14	0/-0.030			14	26		83	2	G2CS2140	h
15	0/-0.030			16	40		100	2	G2CS2150	h
16	0/-0.030			16	32		92	2	G2CS2160	h
17	0/-0.030			20	40		100	2	G2CS2170	h
18	0/-0.030			20	40		100	2	G2CS2180	h
20	0/-0.030			20	40		100	2	G2CS2200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2CS2

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	80-100			50-70			30-50			100-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.004	230	19110	0.003	130	12740	0.003	80	35030	0.005	360
2	14330	0.008	230	9550	0.007	130	6370	0.006	80	17520	0.010	360
3	9550	0.012	230	6370	0.010	130	4250	0.009	80	11680	0.016	360
4	7170	0.016	230	4780	0.014	130	3180	0.012	80	8760	0.021	360
5	5730	0.020	230	3820	0.017	130	2550	0.015	80	7010	0.026	360
6	4780	0.025	240	3180	0.021	140	2120	0.019	80	5840	0.033	380
8	3580	0.032	230	2390	0.027	130	1590	0.024	80	4380	0.042	360
10	2870	0.038	220	1910	0.032	120	1270	0.029	70	3500	0.049	350
12	2390	0.045	220	1590	0.038	120	1060	0.034	70	2920	0.059	340
14	2050	0.052	210	1360	0.044	120	910	0.039	70	2500	0.068	340
16	1790	0.060	210	1190	0.051	120	800	0.045	70	2190	0.078	340
18	1590	0.070	220	1060	0.060	130	710	0.053	70	1950	0.091	350
20	1430	0.080	230	960	0.068	130	640	0.060	80	1750	0.104	360

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D		
Vc (m/min)	80-100			50-70			30-50			100-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.005	280	19110	0.004	160	12740	0.004	90	35030	0.006	440
2	14330	0.010	280	9550	0.008	160	6370	0.007	90	17520	0.012	440
3	9550	0.014	280	6370	0.012	160	4250	0.011	90	11680	0.019	440
4	7170	0.019	280	4780	0.016	160	3180	0.014	90	8760	0.025	440
5	5730	0.024	280	3820	0.020	160	2550	0.018	90	7010	0.031	440
6	4780	0.030	290	3180	0.026	160	2120	0.023	100	5840	0.039	460
8	3580	0.038	270	2390	0.033	160	1590	0.029	90	4380	0.050	440
10	2870	0.046	260	1910	0.039	150	1270	0.034	90	3500	0.059	410
12	2390	0.054	260	1590	0.046	150	1060	0.041	90	2920	0.070	410
14	2050	0.062	260	1360	0.053	140	910	0.047	90	2500	0.081	410
16	1790	0.072	260	1190	0.061	150	800	0.054	90	2190	0.094	410
18	1590	0.084	270	1060	0.071	150	710	0.063	90	1950	0.109	430
20	1430	0.096	270	960	0.082	160	640	0.072	90	1750	0.125	440

< D3 mm: ae = 0.2D

DRILLING

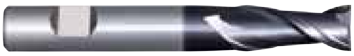
Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	70-90			40-60			25-35			80-100		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	25480	0.002	120	15920	0.002	60	9550	0.002	30	28660	0.003	180
2	12740	0.005	120	7960	0.004	60	4780	0.004	30	14330	0.006	180
3	8490	0.007	120	5310	0.006	60	3180	0.005	30	9550	0.009	180
4	6370	0.010	120	3980	0.008	60	2390	0.007	30	7170	0.012	180
5	5100	0.012	120	3180	0.010	60	1910	0.009	30	5730	0.016	180
6	4250	0.015	130	2650	0.013	70	1590	0.011	40	4780	0.020	190
8	3180	0.019	120	1990	0.016	60	1190	0.014	30	3580	0.025	180
10	2550	0.023	120	1590	0.019	60	960	0.017	30	2870	0.030	170
12	2120	0.027	110	1330	0.023	60	800	0.020	30	2390	0.035	170
14	1820	0.031	110	1140	0.027	60	680	0.023	30	2050	0.041	170
16	1590	0.036	110	1000	0.031	60	600	0.027	30	1790	0.047	170
18	1420	0.042	120	880	0.036	60	530	0.032	30	1590	0.055	170
20	1270	0.048	120	800	0.041	70	480	0.036	30	1430	0.062	180

< D3 mm: ap = 0.5D

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

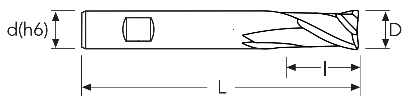
G2WS2

weldon shank, 2 flutes



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.020			6	8		57	2	G2WS2030	h
4	0/-0.020			6	11		57	2	G2WS2040	h
5	0/-0.020			6	13		57	2	G2WS2050	h
6	0/-0.020			6	13		57	2	G2WS2060	h
8	0/-0.025			8	19		63	2	G2WS2080	h
10	0/-0.025			10	22		72	2	G2WS2100	h
12	0/-0.025			12	26		83	2	G2WS2120	h
14	0/-0.030			14	26		83	2	G2WS2140	h
16	0/-0.030			16	32		92	2	G2WS2160	h
20	0/-0.030			20	38		104	2	G2WS2200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2WS2

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	80-100			50-70			30-50			100-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	9550	0.012	230	6370	0.010	130	4250	0.009	80	11680	0.016	360
4	7170	0.016	230	4780	0.014	130	3180	0.012	80	8760	0.021	360
5	5730	0.020	230	3820	0.017	130	2550	0.015	80	7010	0.026	360
6	4780	0.025	240	3180	0.021	140	2120	0.019	80	5840	0.033	380
8	3580	0.032	230	2390	0.027	130	1590	0.024	80	4380	0.042	360
10	2870	0.038	220	1910	0.032	120	1270	0.029	70	3500	0.049	350
12	2390	0.045	220	1590	0.038	120	1060	0.034	70	2920	0.059	340
14	2050	0.052	210	1360	0.044	120	910	0.039	70	2500	0.068	340
16	1790	0.060	210	1190	0.051	120	800	0.045	70	2190	0.078	340
18	1590	0.070	220	1060	0.060	130	710	0.053	70	1950	0.091	350
20	1430	0.080	230	960	0.068	130	640	0.060	80	1750	0.104	360

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	1.5D x 0.3D			1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D		
Vc (m/min)	80-100			50-70			30-50			100-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	9550	0.014	280	6370	0.012	160	4250	0.011	90	11680	0.019	440
4	7170	0.019	280	4780	0.016	160	3180	0.014	90	8760	0.025	440
5	5730	0.024	280	3820	0.020	160	2550	0.018	90	7010	0.031	440
6	4780	0.030	290	3180	0.026	160	2120	0.023	100	5840	0.039	460
8	3580	0.038	270	2390	0.033	160	1590	0.029	90	4380	0.050	440
10	2870	0.046	260	1910	0.039	150	1270	0.034	90	3500	0.059	410
12	2390	0.054	260	1590	0.046	150	1060	0.041	90	2920	0.070	410
14	2050	0.062	260	1360	0.053	140	910	0.047	90	2500	0.081	410
16	1790	0.072	260	1190	0.061	150	800	0.054	90	2190	0.094	410
18	1590	0.084	270	1060	0.071	150	710	0.063	90	1950	0.109	430
20	1430	0.096	270	960	0.082	160	640	0.072	90	1750	0.125	440

< D3 mm: ae = 0.2D

DRILLING

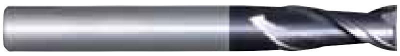
Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	D x D			D x D			0.5D x D			D x D		
Vc (m/min)	70-90			40-60			25-35			80-100		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	8490	0.007	120	5310	0.006	60	3180	0.005	30	9550	0.009	180
4	6370	0.010	120	3980	0.008	60	2390	0.007	30	7170	0.012	180
5	5100	0.012	120	3180	0.010	60	1910	0.009	30	5730	0.016	180
6	4250	0.015	130	2650	0.013	70	1590	0.011	40	4780	0.020	190
8	3180	0.019	120	1990	0.016	60	1190	0.014	30	3580	0.025	180
10	2550	0.023	120	1590	0.019	60	960	0.017	30	2870	0.030	170
12	2120	0.027	110	1330	0.023	60	800	0.020	30	2390	0.035	170
14	1820	0.031	110	1140	0.027	60	680	0.023	30	2050	0.041	170
16	1590	0.036	110	1000	0.031	60	600	0.027	30	1790	0.047	170
18	1420	0.042	120	880	0.036	60	530	0.032	30	1590	0.055	170
20	1270	0.048	120	800	0.041	70	480	0.036	30	1430	0.062	180

< D3 mm: ap = 0.5D

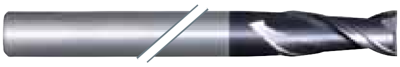
G2210-11-12

cylindrical shank, 2 flutes, long

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2



G2210

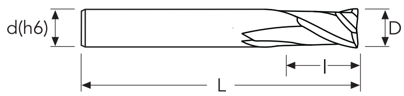


G2211-G2212

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.030			4	9		75	2	G2210020	h
3	0/-0.030			4	15		75	2	G2210030	h
4	0/-0.030			4	20		75	2	G2210040	h
5	0/-0.030			6	25		75	2	G2210050	h
6	0/-0.030			6	25		75	2	G2210060	h
5	0/-0.030			6	30		100	2	G2211050	h
6	0/-0.030			6	30		100	2	G2211060	h
8	0/-0.035			8	35		100	2	G2211080	h
10	0/-0.035			10	40		100	2	G2211100	h
12	0/-0.035			12	45		100	2	G2211120	h
8	0/-0.035			8	40		150	2	G2212080	h
10	0/-0.035			10	50		150	2	G2212100	h
12	0/-0.035			12	50		150	2	G2212120	h
16	0/-0.040			16	70		150	2	G2212160	h

h stock standard f non-standard stock m stock exhaustion

G2210-G2211

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	70-90			45-65			30-50			80-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	12740	0.007	180	8760	0.006	100	6370	0.005	70	15920	0.009	290
3	8490	0.010	170	5840	0.009	100	4250	0.008	60	10620	0.013	280
4	6370	0.014	180	4380	0.012	100	3180	0.011	70	7960	0.018	290
5	5100	0.018	180	3500	0.015	110	2550	0.014	70	6370	0.023	300
6	4250	0.023	190	2920	0.019	110	2120	0.017	70	5310	0.029	310
8	3180	0.030	190	2190	0.026	110	1590	0.023	70	3980	0.039	310
10	2550	0.035	180	1750	0.030	100	1270	0.026	70	3180	0.046	290
12	2120	0.041	170	1460	0.035	100	1060	0.031	70	2650	0.053	280

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D		
Vc (m/min)	70-90			45-65			30-50			80-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	12740	0.008	210	8760	0.007	130	6370	0.006	80	15920	0.011	350
3	8490	0.012	200	5840	0.010	120	4250	0.009	80	10620	0.016	330
4	6370	0.017	210	4380	0.014	130	3180	0.013	80	7960	0.022	350
5	5100	0.022	220	3500	0.018	130	2550	0.016	80	6370	0.028	360
6	4250	0.027	230	2920	0.023	130	2120	0.020	90	5310	0.035	370
8	3180	0.036	230	2190	0.031	130	1590	0.027	90	3980	0.047	370
10	2550	0.042	210	1750	0.036	120	1270	0.032	80	3180	0.055	350
12	2120	0.049	210	1460	0.042	120	1060	0.037	80	2650	0.064	340

< D3 mm: ae = 0.2D

DRILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	D X D			D X D			0.5D X D			D X D		
Vc (m/min)	60-80			40-60			25-45			70-110		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	11150	0.004	90	7960	0.004	60	5570	0.003	40	14330	0.005	160
3	7430	0.006	90	5310	0.005	50	3720	0.005	30	9550	0.008	150
4	5570	0.008	90	3980	0.007	60	2790	0.006	40	7170	0.011	160
5	4460	0.011	100	3180	0.009	60	2230	0.008	40	5730	0.014	160
6	3720	0.014	100	2650	0.011	60	1860	0.010	40	4780	0.018	170
8	2790	0.018	100	1990	0.015	60	1390	0.014	40	3580	0.023	170
10	2230	0.021	90	1590	0.018	60	1110	0.016	30	2870	0.027	160
12	1860	0.025	90	1330	0.021	60	930	0.018	30	2390	0.032	150

< D3 mm: ap = 0.5D

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

G2212

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.3D x D**			**0.3D x D**			**0.3D x D**			**0.3D x D**		
Vc (m/min)	**55-75**			**40-60**			**20-40**			**70-90**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	2590	0.026	130	1990	0.022	90	1190	0.020	50	3180	0.034	210
10	2070	0.032	130	1590	0.027	90	960	0.024	50	2550	0.042	210
12	1730	0.036	120	1330	0.031	80	800	0.027	40	2120	0.047	200
14	1480	0.042	120	1140	0.036	80	680	0.032	40	1820	0.055	200
16	1290	0.048	120	1000	0.041	80	600	0.036	40	1590	0.062	200

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**		
Vc (m/min)	**55-75**			**40-60**			**20-40**			**70-90**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	2590	0.031	160	1990	0.027	110	1190	0.023	60	3180	0.041	260
10	2070	0.038	160	1590	0.033	100	960	0.029	60	2550	0.050	250
12	1730	0.043	150	1330	0.037	100	800	0.032	50	2120	0.056	240
14	1480	0.050	150	1140	0.043	100	680	0.038	50	1820	0.066	240
16	1290	0.058	150	1000	0.049	100	600	0.043	50	1590	0.075	240

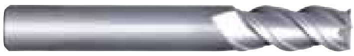
DRILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**D X D**			**D X D**			**0.5D X D**			**D X D**		
Vc (m/min)	**50-70**			**35-55**			**20-30**			**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	2390	0.016	70	1790	0.013	50	1000	0.012	20	2790	0.020	110
10	1910	0.019	70	1430	0.016	50	800	0.014	20	2230	0.025	110
12	1590	0.022	70	1190	0.018	40	660	0.016	20	1860	0.028	100
14	1360	0.025	70	1020	0.021	40	570	0.019	20	1590	0.033	100
16	1190	0.029	70	900	0.024	40	500	0.022	20	1390	0.037	100

GB305

cylindrical shank, 3 flutes

OSAWA NORM | N | MG BR | <45 HRC | 45° | SQUARE | Z3



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		50	3	GB305010	h
1.5	0/-0.020			4	4.5		50	3	GB305015	h
2	0/-0.020			4	6		50	3	GB305020	h
3	0/-0.020			4	8		50	3	GB305030	h
4	0/-0.020			4	11		50	3	GB305040	h
5	0/-0.020			6	13		50	3	GB305050	h
6	0/-0.020			6	15		50	3	GB305060	h
8	0/-0.025			8	20		60	3	GB305080	h
10	0/-0.025			10	30		75	3	GB305100	h
12	0/-0.025			12	30		75	3	GB305120	h

h stock standard f non-standard stock m stock exhaustion

GB305

SLOTTING

Material Group ISO 513	P1 K1			P2 M1 K2			P3 M2			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.5D x D**		
Vc (m/min)	**50-60**			**30-50**			**20-40**			**70-90**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	17520	0.003	160	12740	0.003	100	9550	0.002	60	25480	0.004	300
2	8760	0.006	160	6370	0.005	100	4780	0.004	60	12740	0.008	300
3	5840	0.009	150	4250	0.007	90	3180	0.006	60	8490	0.011	280
4	4380	0.012	160	3180	0.010	100	2390	0.009	60	6370	0.016	300
5	3500	0.015	160	2550	0.013	100	1910	0.012	70	5100	0.020	310
6	2920	0.020	170	2120	0.017	110	1590	0.015	70	4250	0.026	330
8	2190	0.026	170	1590	0.022	100	1190	0.019	70	3180	0.033	320
10	1750	0.032	170	1270	0.028	110	960	0.024	70	2550	0.042	320
12	1460	0.038	170	1060	0.033	100	800	0.029	70	2120	0.050	320

< D3 mm: ap = 0.2D

SIDE MILLING

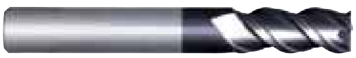
Material Group ISO 513	P1 K1			P2 M1 K2			P3 M2			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.2D**			**1.5D x 0.3D**		
Vc (m/min)	**50-70**			**40-50**			**20-40**			**80-100**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	19110	0.004	210	14330	0.003	130	9550	0.003	80	28660	0.005	400
2	9550	0.007	210	7170	0.006	130	4780	0.005	80	14330	0.009	400
3	6370	0.010	200	4780	0.009	130	3180	0.008	70	9550	0.013	380
4	4780	0.014	210	3580	0.012	130	2390	0.011	80	7170	0.019	400
5	3820	0.018	210	2870	0.016	140	1910	0.014	80	5730	0.024	410
6	3180	0.024	230	2390	0.020	140	1590	0.018	80	4780	0.031	440
8	2390	0.031	220	1790	0.026	140	1190	0.023	80	3580	0.040	430
10	1910	0.039	220	1430	0.033	140	960	0.029	80	2870	0.051	440
12	1590	0.046	220	1190	0.039	140	800	0.035	80	2390	0.060	430

< D3 mm: ae = 0.1D

G2CSH3

cylindrical shank, 3 flutes

OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		50	3	G2CSH3010	h
1.5	0/-0.020			4	4.5		50	3	G2CSH3015	h
2	0/-0.020			4	6		50	3	G2CSH3020	h
2.5	0/-0.020			4	7		50	3	G2CSH3025	h
3	0/-0.020			4	8		50	3	G2CSH3030	h
3.5	0/-0.020			4	10		50	3	G2CSH3035	h
4	0/-0.020			4	11		50	3	G2CSH3040	h
4.5	0/-0.020			6	13		50	3	G2CSH3045	h
5	0/-0.020			6	13		50	3	G2CSH3050	h
5.5	0/-0.020			6	13		50	3	G2CSH3055	h
6	0/-0.020			6	15		50	3	G2CSH3060	h
6.5	0/-0.025			8	17		60	3	G2CSH3065	h
7	0/-0.025			8	17		60	3	G2CSH3070	h
7.5	0/-0.025			8	17		60	3	G2CSH3075	h
8	0/-0.025			8	20		60	3	G2CSH3080	h
8.5	0/-0.025			10	23		75	3	G2CSH3085	h
9	0/-0.025			10	23		75	3	G2CSH3090	h
10	0/-0.025			10	30		75	3	G2CSH3100	h
11	0/-0.025			12	28		75	3	G2CSH3110	h
12	0/-0.025			12	30		75	3	G2CSH3120	h
14	0/-0.030			14	26		83	3	G2CSH3140	h
16	0/-0.030			16	32		92	3	G2CSH3160	h
18	0/-0.030			20	40		100	3	G2CSH3180	h
20	0/-0.030			20	40		100	3	G2CSH3200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2CSH3

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**80-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.003	260	19110	0.003	150	12740	0.002	90	31850	0.004	370
2	14330	0.006	270	9550	0.005	150	6370	0.005	90	15920	0.008	390
3	9550	0.009	270	6370	0.008	150	4250	0.007	90	10620	0.012	390
4	7170	0.013	270	4780	0.011	150	3180	0.009	90	7960	0.016	390
5	5730	0.016	270	3820	0.013	150	2550	0.012	90	6370	0.020	390
6	4780	0.019	270	3180	0.016	150	2120	0.014	90	5310	0.024	390
8	3580	0.025	270	2390	0.021	150	1590	0.019	90	3980	0.033	390
10	2870	0.031	270	1910	0.027	150	1270	0.023	90	3180	0.041	390
12	2390	0.040	290	1590	0.034	160	1060	0.030	100	2650	0.052	410
14	2050	0.046	280	1360	0.039	160	910	0.035	90	2270	0.060	410
16	1790	0.056	300	1190	0.048	170	800	0.042	100	1990	0.073	440
18	1590	0.065	310	1060	0.055	180	710	0.049	100	1770	0.085	450
20	1430	0.075	320	960	0.064	180	640	0.056	110	1590	0.098	470

< D3 mm: ap = 0.2D

SIDE MILLING

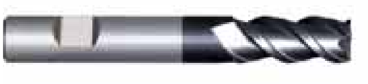
Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**110-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	31850	0.004	340	22290	0.003	200	15920	0.003	130	38220	0.005	540
2	15920	0.008	360	11150	0.006	210	7960	0.006	130	19110	0.010	560
3	10620	0.011	360	7430	0.010	210	5310	0.008	130	12740	0.015	560
4	7960	0.015	360	5570	0.013	210	3980	0.011	130	9550	0.020	560
5	6370	0.019	360	4460	0.016	210	3180	0.014	130	7640	0.024	560
6	5310	0.023	360	3720	0.019	210	2650	0.017	130	6370	0.029	560
8	3980	0.030	360	2790	0.026	210	1990	0.023	130	4780	0.039	560
10	3180	0.038	360	2230	0.032	210	1590	0.028	130	3820	0.049	560
12	2650	0.048	380	1860	0.041	230	1330	0.036	140	3180	0.062	600
14	2270	0.056	380	1590	0.047	230	1140	0.042	140	2730	0.072	590
16	1990	0.068	400	1390	0.057	240	1000	0.051	150	2390	0.088	630
18	1770	0.078	410	1240	0.066	250	880	0.059	150	2120	0.101	640
20	1590	0.090	430	1110	0.077	250	800	0.068	160	1910	0.117	670

< D3 mm: ae = 0.1D

G2WSH3

weldon shank, 3 flutes

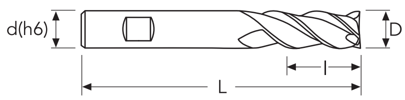
OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.020			6	8		57	3	G2WSH3030	h
4	0/-0.020			6	11		57	3	G2WSH3040	h
5	0/-0.020			6	13		57	3	G2WSH3050	h
6	0/-0.020			6	13		57	3	G2WSH3060	h
8	0/-0.025			8	19		63	3	G2WSH3080	h
10	0/-0.025			10	22		72	3	G2WSH3100	h
12	0/-0.025			12	26		83	3	G2WSH3120	h
14	0/-0.030			14	26		83	3	G2WSH3140	h
16	0/-0.030			16	32		92	3	G2WSH3160	h
20	0/-0.030			20	38		104	3	G2WSH3200	h

h stock standard f non-standard stock m stock exhaustion

G2WSH3

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	80-100			50-70			30-50			80-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	9550	0.009	270	6370	0.008	150	4250	0.007	90	10620	0.012	390
4	7170	0.013	270	4780	0.011	150	3180	0.009	90	7960	0.016	390
5	5730	0.016	270	3820	0.013	150	2550	0.012	90	6370	0.020	390
6	4780	0.019	270	3180	0.016	150	2120	0.014	90	5310	0.024	390
8	3580	0.025	270	2390	0.021	150	1590	0.019	90	3980	0.033	390
10	2870	0.031	270	1910	0.027	150	1270	0.023	90	3180	0.041	390
12	2390	0.040	290	1590	0.034	160	1060	0.030	100	2650	0.052	410
14	2050	0.046	280	1360	0.039	160	910	0.035	90	2270	0.060	410
16	1790	0.056	300	1190	0.048	170	800	0.042	100	1990	0.073	440
18	1590	0.065	310	1060	0.055	180	710	0.049	100	1770	0.085	450
20	1430	0.075	320	960	0.064	180	640	0.056	110	1590	0.098	470

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D		
Vc (m/min)	90-110			60-80			40-60			110-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10620	0.011	360	7430	0.010	210	5310	0.008	130	12740	0.015	560
4	7960	0.015	360	5570	0.013	210	3980	0.011	130	9550	0.020	560
5	6370	0.019	360	4460	0.016	210	3180	0.014	130	7640	0.024	560
6	5310	0.023	360	3720	0.019	210	2650	0.017	130	6370	0.029	560
8	3980	0.030	360	2790	0.026	210	1990	0.023	130	4780	0.039	560
10	3180	0.038	360	2230	0.032	210	1590	0.028	130	3820	0.049	560
12	2650	0.048	380	1860	0.041	230	1330	0.036	140	3180	0.062	600
14	2270	0.056	380	1590	0.047	230	1140	0.042	140	2730	0.072	590
16	1990	0.068	400	1390	0.057	240	1000	0.051	150	2390	0.088	630
18	1770	0.078	410	1240	0.066	250	880	0.059	150	2120	0.101	640
20	1590	0.090	430	1110	0.077	250	800	0.068	160	1910	0.117	670

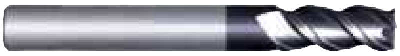
< D3 mm: ae = 0.1D

OSAWA

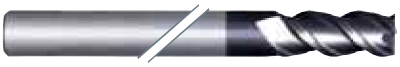
G2310-11-12

cylindrical shank, 3 flutes, long

OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



G2310



G2311-G2312

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.030			4	9		75	3	G2310020	h
3	0/-0.030			4	15		75	3	G2310030	h
4	0/-0.030			4	20		75	3	G2310040	h
5	0/-0.030			6	25		75	3	G2310050	h
6	0/-0.030			6	25		75	3	G2310060	h
4	0/-0.030			6	25		100	3	G2311040	h
5	0/-0.030			6	30		100	3	G2311050	h
6	0/-0.030			6	30		100	3	G2311060	h
7	0/-0.030			8	35		100	3	G2311070	h
8	0/-0.035			8	35		100	3	G2311080	h
9	0/-0.035			10	40		100	3	G2311090	h
10	0/-0.035			10	40		100	3	G2311100	h
11	0/-0.035			12	45		100	3	G2311110	h
12	0/-0.035			12	45		100	3	G2311120	h
8	0/-0.035			8	40		150	3	G2312080	h
10	0/-0.035			10	50		150	3	G2312100	h
12	0/-0.035			12	50		150	3	G2312120	h
16	0/-0.040			16	70		150	3	G2312160	h
20	0/-0.040			20	80		150	3	G2312200	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

G2310-G2311

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**60-80**			**35-55**			**25-35**			**80-100**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	11150	0.006	190	7170	0.005	100	4780	0.004	60	14330	0.007	310
3	7430	0.008	190	4780	0.007	100	3180	0.006	60	9550	0.011	310
4	5570	0.011	190	3580	0.010	100	2390	0.008	60	7170	0.015	310
5	4460	0.014	190	2870	0.012	100	1910	0.011	60	5730	0.018	310
6	3720	0.017	190	2390	0.014	100	1590	0.013	60	4780	0.022	310
8	2790	0.023	190	1790	0.019	100	1190	0.017	60	3580	0.029	310
10	2230	0.028	190	1430	0.024	100	960	0.021	60	2870	0.037	310
12	1860	0.036	200	1190	0.031	110	800	0.027	60	2390	0.047	340

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**		
Vc (m/min)	**70-90**			**45-65**			**30-50**			**80-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	12740	0.007	270	8760	0.006	160	6370	0.005	100	15920	0.009	440
3	8490	0.011	270	5840	0.009	160	4250	0.008	100	10620	0.014	440
4	6370	0.014	270	4380	0.012	160	3180	0.011	100	7960	0.018	440
5	5100	0.018	270	3500	0.015	160	2550	0.013	100	6370	0.023	440
6	4250	0.021	270	2920	0.018	160	2120	0.016	100	5310	0.027	440
8	3180	0.028	270	2190	0.024	160	1590	0.021	100	3980	0.037	440
10	2550	0.035	270	1750	0.030	160	1270	0.026	100	3180	0.046	440
12	2120	0.045	290	1460	0.038	170	1060	0.034	110	2650	0.059	470

< D3 mm: ae = 0.1D

G2312

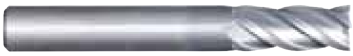
SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**		
Vc (m/min)	**55-75**			**40-60**			**20-40**			**70-90**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	2590	0.020	160	1990	0.017	100	1190	0.015	50	3180	0.026	250
10	2070	0.025	160	1590	0.021	100	960	0.019	50	2550	0.033	250
12	1730	0.032	170	1330	0.027	110	800	0.024	60	2120	0.042	260
14	1480	0.037	160	1140	0.031	110	680	0.028	60	1820	0.048	260
16	1290	0.045	170	1000	0.038	110	600	0.034	60	1590	0.059	280

GB405

cylindrical shank, 4 flutes

OSAWA NORM | N | MG BR | <45 HRC | 30° | SQUARE | Z4



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		50	4	GB405010	h
1.5	0/-0.020			4	4.5		50	4	GB405015	h
2	0/-0.020			4	6		50	4	GB405020	h
3	0/-0.020			4	8		50	4	GB405030	h
4	0/-0.020			4	11		50	4	GB405040	h
5	0/-0.020			6	13		50	4	GB405050	h
6	0/-0.020			6	15		50	4	GB405060	h
8	0/-0.025			8	20		60	4	GB405080	h
10	0/-0.025			10	30		75	4	GB405100	h
12	0/-0.025			12	30		75	4	GB405120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

GB405

SIDE MILLING	Material Group ISO 513	P1 K1			P2 M1 K2			P3 M2			N1 N2 N3 N4		
	Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
	ap x ae	**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**		
	Vc (m/min)	**50-70**			**40-50**			**20-40**			**80-100**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	1	19110	0.003	250	14330	0.003	160	9550	0.002	90	28660	0.004	480
	2	9550	0.006	250	7170	0.006	160	4780	0.005	90	14330	0.008	480
	3	6370	0.010	250	4780	0.008	160	3180	0.007	90	9550	0.013	480
	4	4780	0.013	250	3580	0.011	160	2390	0.010	90	7170	0.017	480
	5	3820	0.016	250	2870	0.014	160	1910	0.012	90	5730	0.021	480
	6	3180	0.020	260	2390	0.017	160	1590	0.015	100	4780	0.026	500
	8	2390	0.026	250	1790	0.022	160	1190	0.019	90	3580	0.034	480
	10	1910	0.031	240	1430	0.026	150	960	0.023	90	2870	0.040	460
	12	1590	0.036	230	1190	0.031	150	800	0.027	90	2390	0.047	450

< D3 mm: ae = 0.1D

G2CS4

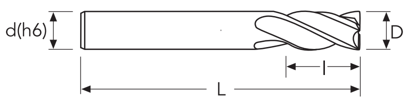
cylindrical shank, 4 flutes

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		50	4	G2CS4010	h
1.5	0/-0.020			4	4.5		50	4	G2CS4015	h
2	0/-0.020			4	6		50	4	G2CS4020	h
2.5	0/-0.020			4	7		50	4	G2CS4025	h
3	0/-0.020			4	8		50	4	G2CS4030	h
3.5	0/-0.020			4	10		50	4	G2CS4035	h
4	0/-0.020			4	11		50	4	G2CS4040	h
4.5	0/-0.020			6	13		50	4	G2CS4045	h
5	0/-0.020			6	13		50	4	G2CS4050	h
5.5	0/-0.020			6	13		50	4	G2CS4055	h
6	0/-0.020			6	15		50	4	G2CS4060	h
6.5	0/-0.025			8	17		60	4	G2CS4065	h
7	0/-0.025			8	17		60	4	G2CS4070	h
7.5	0/-0.025			8	17		60	4	G2CS4075	h
8	0/-0.025			8	20		60	4	G2CS4080	h
8.5	0/-0.025			10	23		75	4	G2CS4085	h
9	0/-0.025			10	23		75	4	G2CS4090	h
9.5	0/-0.025			10	25		75	4	G2CS4095	h
10	0/-0.025			10	30		75	4	G2CS4100	h
10.5	0/-0.025			12	25		75	4	G2CS4105	h
11	0/-0.025			12	30		75	4	G2CS4110	h
11.5	0/-0.025			12	28		75	4	G2CS4115	h
12	0/-0.025			12	30		75	4	G2CS4120	h
12.5	0/-0.030			14	26		83	4	G2CS4125	h
13	0/-0.030			14	26		83	4	G2CS4130	h
13.5	0/-0.030			14	26		83	4	G2CS4135	h
14	0/-0.030			14	26		83	4	G2CS4140	h
14.5	0/-0.030			16	32		92	4	G2CS4145	h
15	0/-0.030			16	32		92	4	G2CS4150	h
15.5	0/-0.030			16	32		92	4	G2CS4155	h
16	0/-0.030			16	32		92	4	G2CS4160	h
17	0/-0.030			20	40		100	4	G2CS4170	h
18	0/-0.030			20	40		100	4	G2CS4180	h
19	0/-0.030			20	40		100	4	G2CS4190	h
20	0/-0.030			20	40		100	4	G2CS4200	h
22	0/-0.030			25	40		100	4	G2CS4220	h
25	0/-0.030			25	40		100	4	G2CS4250	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

G2CS4

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.004	400	19110	0.003	230	12740	0.003	130	35030	0.005	640
2	14330	0.007	400	9550	0.006	230	6370	0.005	130	17520	0.009	640
3	9550	0.010	380	6370	0.009	220	4250	0.008	130	11680	0.013	610
4	7170	0.013	370	4780	0.011	210	3180	0.010	120	8760	0.017	590
5	5730	0.016	370	3820	0.014	210	2550	0.012	120	7010	0.021	580
6	4780	0.019	360	3180	0.016	210	2120	0.014	120	5840	0.025	580
8	3580	0.025	360	2390	0.021	200	1590	0.019	120	4380	0.033	570
10	2870	0.032	370	1910	0.027	210	1270	0.024	120	3500	0.042	580
12	2390	0.040	380	1590	0.034	220	1060	0.030	130	2920	0.052	610
14	2050	0.047	390	1360	0.040	220	910	0.035	130	2500	0.061	610
16	1790	0.054	390	1190	0.046	220	800	0.041	130	2190	0.070	610
18	1590	0.060	380	1060	0.051	220	710	0.045	130	1950	0.078	610
20	1430	0.065	370	960	0.055	210	640	0.049	120	1750	0.085	590
22	1300	0.073	380	870	0.062	220	580	0.055	130	1590	0.095	600
25	1150	0.083	380	760	0.071	210	510	0.062	130	1400	0.108	600

< D3 mm: ae = 0.1D

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

G2WS4

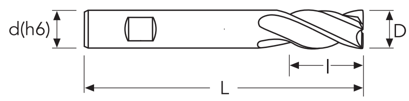
weldon shank, 4 flutes

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.020			6	8		57	4	G2WS4030	h
4	0/-0.020			6	11		57	4	G2WS4040	h
5	0/-0.020			6	13		57	4	G2WS4050	h
6	0/-0.020			6	13		57	4	G2WS4060	h
8	0/-0.025			8	19		63	4	G2WS4080	h
10	0/-0.025			10	22		72	4	G2WS4100	h
12	0/-0.025			12	26		83	4	G2WS4120	h
14	0/-0.030			14	26		83	4	G2WS4140	h
16	0/-0.030			16	32		92	4	G2WS4160	h
20	0/-0.030			20	38		104	4	G2WS4200	h

h stock standard f non-standard stock m stock exhaustion

G2WS4

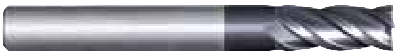
Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	9550	0.01	380	6370	0.0085	220	4250	0.0075	130	11680	0.013	610
4	7170	0.013	370	4780	0.011	210	3180	0.010	120	8760	0.017	590
5	5730	0.016	370	3820	0.014	210	2550	0.012	120	7010	0.021	580
6	4780	0.019	360	3180	0.016	210	2120	0.014	120	5840	0.025	580
8	3580	0.025	360	2390	0.021	200	1590	0.019	120	4380	0.033	570
10	2870	0.032	370	1910	0.027	210	1270	0.024	120	3500	0.042	580
12	2390	0.040	380	1590	0.034	220	1060	0.030	130	2920	0.052	610
14	2050	0.047	390	1360	0.040	220	910	0.035	130	2500	0.061	610
16	1790	0.054	390	1190	0.046	220	800	0.041	130	2190	0.070	610
18	1590	0.060	380	1060	0.051	220	710	0.045	130	1950	0.078	610
20	1430	0.065	370	960	0.055	210	640	0.049	120	1750	0.085	590

OSAWA

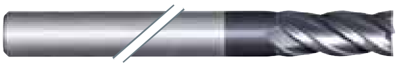
G2410-11-12-13

cylindrical shank, 4 flutes, long

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4



G2410



G2411-G2412-G2413

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.030			4	9		75	4	G2410020	h
2.5	0/-0.030			4	10		75	4	G2410025	h
3	0/-0.030			4	15		75	4	G2410030	h
3.5	0/-0.030			4	15		75	4	G2410035	h
4	0/-0.030			4	20		75	4	G2410040	h
4.5	0/-0.030			6	20		75	4	G2410045	h
5	0/-0.030			6	25		75	4	G2410050	h
6	0/-0.030			6	25		75	4	G2410060	h
3	0/-0.030			6	15		100	4	G2411030	h
4	0/-0.030			6	25		100	4	G2411040	h
5	0/-0.030			6	30		100	4	G2411050	h
6	0/-0.030			6	30		100	4	G2411060	h
7	0/-0.030			8	35		100	4	G2411070	h
8	0/-0.035			8	35		100	4	G2411080	h
9	0/-0.035			10	40		100	4	G2411090	h
10	0/-0.035			10	40		100	4	G2411100	h
11	0/-0.035			12	45		100	4	G2411110	h
12	0/-0.035			12	45		100	4	G2411120	h
8	0/-0.035			8	40		150	4	G2412080	h
10	0/-0.035			10	50		150	4	G2412100	h
12	0/-0.035			12	50		150	4	G2412120	h
16	0/-0.040			16	70		150	4	G2412160	h
18	0/-0.040			20	80		150	4	G2412180	h
20	0/-0.040			20	80		150	4	G2412200	h
16	0/-0.040			16	40		200	4	G2413160	h
20	0/-0.040			20	40		200	4	G2413200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2410-G2411

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**70-90**			**45-65**			**30-50**			**80-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
mm	*rpm*	*mm/rev*	*mm/min*	*rpm*	*mm/rev*	*mm/min*	*rpm*	*mm/rev*	*mm/min*	*rpm*	*mm/rev*	*mm/min*
2	12740	0.006	320	8760	0.005	190	6370	0.005	120	15920	0.008	520
3	8490	0.009	310	5840	0.008	180	4250	0.007	110	10620	0.012	500
4	6370	0.012	300	4380	0.010	170	3180	0.009	110	7960	0.015	480
5	5100	0.014	290	3500	0.012	170	2550	0.011	110	6370	0.019	480
6	4250	0.017	290	2920	0.015	170	2120	0.013	110	5310	0.022	470
8	3180	0.023	290	2190	0.019	170	1590	0.017	110	3980	0.029	470
10	2550	0.029	290	1750	0.024	170	1270	0.022	110	3180	0.037	480
12	2120	0.036	310	1460	0.031	180	1060	0.027	110	2650	0.047	500

G2412-G2413

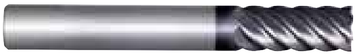
SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**55-75**			**40-60**			**20-40**			**70-90**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	2590	0.020	210	1990	0.017	140	1190	0.015	70	3180	0.026	330
10	2070	0.026	210	1590	0.022	140	960	0.019	70	2550	0.033	340
12	1730	0.032	220	1330	0.027	140	800	0.024	80	2120	0.042	350
14	1480	0.038	220	1140	0.032	150	680	0.028	80	1820	0.049	360
16	1290	0.043	220	1000	0.037	150	600	0.032	80	1590	0.056	360
20	1040	0.065	270	800	0.055	180	480	0.049	90	1270	0.085	430

G2CSHM

cylindrical shank, multi flute

OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z6



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.020			6	15		50	6	G2CSHM060	h
8	0/-0.025			8	20		60	6	G2CSHM080	h
10	0/-0.025			10	30		75	6	G2CSHM100	h
12	0/-0.025			12	30		75	6	G2CSHM120	h
14	0/-0.030			14	30		83	6	G2CSHM140	h
16	0/-0.030			16	35		92	6	G2CSHM160	h
20	0/-0.030			20	40		100	6	G2CSHM200	h

h stock standard f non-standard stock m stock exhaustion

OSAWA

CUTTING PARAMETERS

G2CSHM

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3					
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**					
Vc (m/min)	**100-120**			**70-90**			**50-70**					
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)			
6	5840	0.016	560	4250	0.014	350	3180	0.012	230			
8	4380	0.020	530	3180	0.017	320	2390	0.015	220			
10	3500	0.025	530	2550	0.021	330	1910	0.019	210			
12	2920	0.030	530	2120	0.026	320	1590	0.023	210			
14	2500	0.035	530	1820	0.030	320	1360	0.026	210			
16	2190	0.040	530	1590	0.034	320	1190	0.030	210			
20	1750	0.050	530	1270	0.043	320	960	0.038	220			

G2CSFR

cylindrical shank, roughing HR

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | HR FINE | Z3~Z4

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.070			6	11		50	3	G2CSFR040	h
5	0/-0.070			6	13		50	3	G2CSFR050	h
6	0/-0.070			6	15		50	3	G2CSFR060	h
7	0/-0.070			8	20		60	3	G2CSFR070	h
8	0/-0.070			8	20		60	3	G2CSFR080	h
9	0/-0.070			10	25		75	3	G2CSFR090	h
10	0/-0.070			10	30		75	4	G2CSFR100	h
11	0/-0.070			12	30		75	4	G2CSFR110	h
12	0/-0.070			12	30		75	4	G2CSFR120	h
13	0/-0.070			14	30		83	4	G2CSFR130	h
14	0/-0.070			14	30		83	4	G2CSFR140	h
15	0/-0.070			16	30		92	4	G2CSFR150	h
16	0/-0.070			16	35		92	4	G2CSFR160	h
20	0/-0.070			20	40		100	4	G2CSFR200	h

h stock standard f non-standard stock m stock exhaustion

G2CSFR

	Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3					
	Hardness/Rm	< 700 N/mm^2			700-1000 N/mm^2			< 40 HRC					
	ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**					
	Vc (m/min)	**70-90**			**50-70**			**30-50**					
SIDE MILLING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)			
	6	4250	0.030	380	3180	0.026	320	2120	0.023	190			
	8	3180	0.045	430	2390	0.038	370	1590	0.034	210			
	10	2550	0.060	610	1910	0.051	390	1270	0.045	230			
	12	2120	0.072	610	1590	0.061	390	1060	0.054	230			
	14	1820	0.085	620	1360	0.072	390	910	0.064	230			
	16	1590	0.096	610	1190	0.082	390	800	0.072	230			
	20	1270	0.120	610	960	0.102	390	640	0.090	230			

D6-9: Z3
D10-20: Z4

G2WSFR

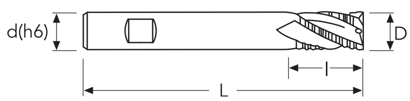
weldon shank, roughing HR

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | HR FINE | Z3~Z4

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.070			6	13		57	3	G2WSFR060	h
8	0/-0.070			8	19		63	3	G2WSFR080	h
10	0/-0.070			10	22		72	4	G2WSFR100	h
12	0/-0.070			12	26		83	4	G2WSFR120	h
14	0/-0.070			14	26		83	4	G2WSFR140	h
16	0/-0.070			16	32		92	4	G2WSFR160	h
20	0/-0.070			20	38		104	4	G2WSFR200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2WSFR

	Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3					
	Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
	ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**					
	Vc (m/min)	**70-90**			**50-70**			**30-50**					
SIDE MILLING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)			
	6	4250	0.030	380	3180	0.026	320	2120	0.023	190			
	8	3180	0.045	430	2390	0.038	370	1590	0.034	210			
	10	2550	0.060	610	1910	0.051	390	1270	0.045	230			
	12	2120	0.072	610	1590	0.061	390	1060	0.054	230			
	14	1820	0.085	620	1360	0.072	390	910	0.064	230			
	16	1590	0.096	610	1190	0.082	390	800	0.072	230			
	20	1270	0.120	610	960	0.102	390	640	0.090	230			

D6-8: Z3
D10-20: Z4

G2CS2R

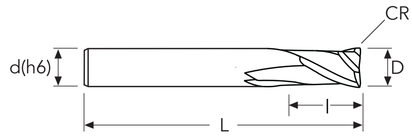
cylindrical shank, 2 flutes, corner radius

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | RADIUS | Z2

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.20	+/-0.010	4	2		50	2	G2CS2R02010	h
1.5	0/-0.020	0.20	+/-0.010	4	3		50	2	G2CS2R02015	h
1.5	0/-0.020	0.50	+/-0.010	4	3		50	2	G2CS2R05015	h
2	0/-0.020	0.20	+/-0.010	4	4		50	2	G2CS2R02020	h
2	0/-0.020	0.50	+/-0.010	4	4		50	2	G2CS2R05020	h
2.5	0/-0.020	0.20	+/-0.010	4	5		50	2	G2CS2R02025	h
2.5	0/-0.020	0.50	+/-0.010	4	5		50	2	G2CS2R05025	h
3	0/-0.020	0.20	+/-0.010	4	6		50	2	G2CS2R02030	h
3	0/-0.020	0.50	+/-0.010	4	6		50	2	G2CS2R05030	h
3	0/-0.020	1.00	+/-0.010	4	6		50	2	G2CS2R10030	h
4	0/-0.020	0.20	+/-0.010	4	8		50	2	G2CS2R02040	h
4	0/-0.020	0.50	+/-0.010	4	8		50	2	G2CS2R05040	h
4	0/-0.020	1.00	+/-0.010	4	8		50	2	G2CS2R10040	h
5	0/-0.020	0.50	+/-0.010	6	10		50	2	G2CS2R05050	h
5	0/-0.020	1.00	+/-0.010	6	10		50	2	G2CS2R10050	h
6	0/-0.020	0.20	+/-0.010	6	12		50	2	G2CS2R02060	h
6	0/-0.020	0.50	+/-0.010	6	12		50	2	G2CS2R05060	h
6	0/-0.020	1.00	+/-0.010	6	12		50	2	G2CS2R10060	h
6	0/-0.020	1.50	+/-0.010	6	12		50	2	G2CS2R15060	h
6	0/-0.020	2.00	+/-0.010	6	12		50	2	G2CS2R20060	h
8	0/-0.025	0.50	+/-0.010	8	16		60	2	G2CS2R05080	h
8	0/-0.025	1.00	+/-0.010	8	16		60	2	G2CS2R10080	h
8	0/-0.025	1.50	+/-0.010	8	16		60	2	G2CS2R15080	h
8	0/-0.025	2.00	+/-0.010	8	16		60	2	G2CS2R20080	h
10	0/-0.025	0.50	+/-0.010	10	20		75	2	G2CS2R05100	h
10	0/-0.025	1.00	+/-0.010	10	20		75	2	G2CS2R10100	h
10	0/-0.025	1.50	+/-0.010	10	20		75	2	G2CS2R15100	h
10	0/-0.025	2.00	+/-0.010	10	20		75	2	G2CS2R20100	h
12	0/-0.025	0.50	+/-0.010	12	24		75	2	G2CS2R05120	h
12	0/-0.025	1.00	+/-0.010	12	24		75	2	G2CS2R10120	h
12	0/-0.025	1.50	+/-0.010	12	24		75	2	G2CS2R15120	h
12	0/-0.025	2.00	+/-0.010	12	24		75	2	G2CS2R20120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2CS2R

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.004	230	19110	0.003	130	12740	0.003	80	35030	0.005	360
2	14330	0.008	230	9550	0.007	130	6370	0.006	80	17520	0.010	360
3	9550	0.012	230	6370	0.010	130	4250	0.009	80	11680	0.016	360
4	7170	0.016	230	4780	0.014	130	3180	0.012	80	8760	0.021	360
5	5730	0.020	230	3820	0.017	130	2550	0.015	80	7010	0.026	360
6	4780	0.025	240	3180	0.021	140	2120	0.019	80	5840	0.033	380
8	3580	0.032	230	2390	0.027	130	1590	0.024	80	4380	0.042	360
10	2870	0.038	220	1910	0.032	120	1270	0.029	70	3500	0.049	350
12	2390	0.045	220	1590	0.038	120	1060	0.034	70	2920	0.059	340

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.005	280	19110	0.004	160	12740	0.004	90	35030	0.006	440
2	14330	0.010	280	9550	0.008	160	6370	0.007	90	17520	0.012	440
3	9550	0.014	280	6370	0.012	160	4250	0.011	90	11680	0.019	440
4	7170	0.019	280	4780	0.016	160	3180	0.014	90	8760	0.025	440
5	5730	0.024	280	3820	0.020	160	2550	0.018	90	7010	0.031	440
6	4780	0.030	290	3180	0.026	160	2120	0.023	100	5840	0.039	460
8	3580	0.038	270	2390	0.033	160	1590	0.029	90	4380	0.050	440
10	2870	0.046	260	1910	0.039	150	1270	0.034	90	3500	0.059	410
12	2390	0.054	260	1590	0.046	150	1060	0.041	90	2920	0.070	410

< D3 mm: ae = 0.2D

DRILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**D x D**			**D x D**			**0.5D x D**			**D x D**		
Vc (m/min)	**70-90**			**40-60**			**25-35**			**80-100**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	25480	0.002	120	15920	0.002	60	9550	0.002	30	28660	0.003	180
2	12740	0.005	120	7960	0.004	60	4780	0.004	30	14330	0.006	180
3	8490	0.007	120	5310	0.006	60	3180	0.005	30	9550	0.009	180
4	6370	0.010	120	3980	0.008	60	2390	0.007	30	7170	0.012	180
5	5100	0.012	120	3180	0.010	60	1910	0.009	30	5730	0.016	180
6	4250	0.015	130	2650	0.013	70	1590	0.011	40	4780	0.020	190
8	3180	0.019	120	1990	0.016	60	1190	0.014	30	3580	0.025	180
10	2550	0.023	120	1590	0.019	60	960	0.017	30	2870	0.030	170
12	2120	0.027	110	1330	0.023	60	800	0.020	30	2390	0.035	170

< D3 mm: ap = 0.5D

G2CS4R

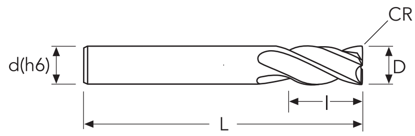
cylindrical shank, 4 flutes, corner radius

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | RADIUS | Z4

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.20	+/-0.010	4	2		50	4	G2CS4R02010	h
1.5	0/-0.020	0.20	+/-0.010	4	3		50	4	G2CS4R02015	h
1.5	0/-0.020	0.50	+/-0.010	4	3		50	4	G2CS4R05015	h
2	0/-0.020	0.20	+/-0.010	4	4		50	4	G2CS4R02020	h
2	0/-0.020	0.50	+/-0.010	4	4		50	4	G2CS4R05020	h
2.5	0/-0.020	0.20	+/-0.010	4	5		50	4	G2CS4R02025	h
2.5	0/-0.020	0.50	+/-0.010	4	5		50	4	G2CS4R05025	h
3	0/-0.020	0.20	+/-0.010	4	6		50	4	G2CS4R02030	h
3	0/-0.020	0.50	+/-0.010	4	6		50	4	G2CS4R05030	h
3	0/-0.020	1.00	+/-0.010	4	6		50	4	G2CS4R10030	h
4	0/-0.020	0.20	+/-0.010	4	8		50	4	G2CS4R02040	h
4	0/-0.020	0.50	+/-0.010	4	8		50	4	G2CS4R05040	h
4	0/-0.020	1.00	+/-0.010	4	8		50	4	G2CS4R10040	h
5	0/-0.020	0.50	+/-0.010	6	10		50	4	G2CS4R05050	h
5	0/-0.020	1.00	+/-0.010	6	10		50	4	G2CS4R10050	h
6	0/-0.020	0.20	+/-0.010	6	12		50	4	G2CS4R02060	h
6	0/-0.020	0.50	+/-0.010	6	12		50	4	G2CS4R05060	h
6	0/-0.020	1.00	+/-0.010	6	12		50	4	G2CS4R10060	h
6	0/-0.020	1.50	+/-0.010	6	12		50	4	G2CS4R15060	h
6	0/-0.020	2.00	+/-0.010	6	12		50	4	G2CS4R20060	h
8	0/-0.025	0.50	+/-0.010	8	16		60	4	G2CS4R05080	h
8	0/-0.025	1.00	+/-0.010	8	16		60	4	G2CS4R10080	h
8	0/-0.025	1.50	+/-0.010	8	16		60	4	G2CS4R15080	h
8	0/-0.025	2.00	+/-0.010	8	16		60	4	G2CS4R20080	h
10	0/-0.025	0.50	+/-0.010	10	20		75	4	G2CS4R05100	h
10	0/-0.025	1.00	+/-0.010	10	20		75	4	G2CS4R10100	h
10	0/-0.025	1.50	+/-0.010	10	20		75	4	G2CS4R15100	h
10	0/-0.025	2.00	+/-0.010	10	20		75	4	G2CS4R20100	h
10	0/-0.025	2.50	+/-0.010	10	20		75	4	G2CS4R25100	h
10	0/-0.025	3.00	+/-0.010	10	20		75	4	G2CS4R30100	h
12	0/-0.025	0.50	+/-0.010	12	24		75	4	G2CS4R05120	h
12	0/-0.025	1.00	+/-0.010	12	24		75	4	G2CS4R10120	h
12	0/-0.025	1.50	+/-0.010	12	24		75	4	G2CS4R15120	h
12	0/-0.025	2.00	+/-0.010	12	24		75	4	G2CS4R20120	h
12	0/-0.025	2.50	+/-0.010	12	24		75	4	G2CS4R25120	h
12	0/-0.025	3.00	+/-0.010	12	24		75	4	G2CS4R30120	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

G2CS4R

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.004	400	19110	0.003	230	12740	0.003	130	35030	0.005	640
2	14330	0.007	400	9550	0.006	230	6370	0.005	130	17520	0.009	640
3	9550	0.010	380	6370	0.009	220	4250	0.008	130	11680	0.013	610
4	7170	0.013	370	4780	0.011	210	3180	0.010	120	8760	0.017	590
5	5730	0.016	370	3820	0.014	210	2550	0.012	120	7010	0.021	580
6	4780	0.019	360	3180	0.016	210	2120	0.014	120	5840	0.025	580
8	3580	0.025	360	2390	0.021	200	1590	0.019	120	4380	0.033	570
10	2870	0.032	370	1910	0.027	210	1270	0.024	120	3500	0.042	580
12	2390	0.040	380	1590	0.034	220	1060	0.030	130	2920	0.052	610

< D3 mm: ae = 0.1D

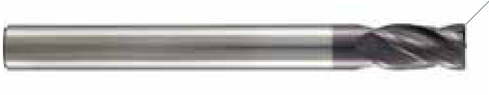
OSAWA

G2CL4R

cylindrical shank, 4 flutes, long, corner radius

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | RADIUS | Z4

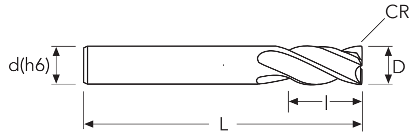
CR



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.030	0.20	+/-0.010	4	4		75	4	G2CL4R02020	h
2	0/-0.030	0.50	+/-0.010	4	4		75	4	G2CL4R05020	h
3	0/-0.030	0.20	+/-0.010	4	6		75	4	G2CL4R02030	h
3	0/-0.030	0.50	+/-0.010	4	6		75	4	G2CL4R05030	h
3	0/-0.030	1.00	+/-0.010	4	6		75	4	G2CL4R10030	h
4	0/-0.030	0.20	+/-0.010	4	8		75	4	G2CL4R02040	h
4	0/-0.030	0.50	+/-0.010	4	8		75	4	G2CL4R05040	h
4	0/-0.030	1.00	+/-0.010	4	8		75	4	G2CL4R10040	h
5	0/-0.030	0.50	+/-0.010	6	10		75	4	G2CL4R05050	h
5	0/-0.030	1.00	+/-0.010	6	10		75	4	G2CL4R10050	h
6	0/-0.030	0.50	+/-0.010	6	12		75	4	G2CL4R05060	h
6	0/-0.030	1.00	+/-0.010	6	12		75	4	G2CL4R10060	h
8	0/-0.035	0.50	+/-0.010	8	16		100	4	G2CL4R05080	h
8	0/-0.035	1.00	+/-0.010	8	16		100	4	G2CL4R10080	h
8	0/-0.035	2.00	+/-0.010	8	16		100	4	G2CL4R20080	h
10	0/-0.035	0.50	+/-0.010	10	20		100	4	G2CL4R05100	h
10	0/-0.035	1.00	+/-0.010	10	20		100	4	G2CL4R10100	h
10	0/-0.035	2.00	+/-0.010	10	20		100	4	G2CL4R20100	h
12	0/-0.035	0.50	+/-0.010	12	24		100	4	G2CL4R05120	h
12	0/-0.035	1.00	+/-0.010	12	24		100	4	G2CL4R10120	h
12	0/-0.035	2.00	+/-0.010	12	24		100	4	G2CL4R20120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2CL4R

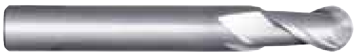
SIDE MILLING	Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
	Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
	ap x ae	**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**		
	Vc (m/min)	**55-75**			**40-60**			**20-40**			**70-90**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	2	10350	0.006	250	7960	0.005	160	4780	0.005	90	12740	0.007	340
	3	6900	0.009	250	5310	0.008	160	3180	0.007	90	8490	0.010	340
	4	5180	0.012	250	3980	0.010	160	2390	0.009	90	6370	0.013	340
	5	4140	0.015	250	3180	0.013	160	1910	0.011	90	5100	0.017	340
	6	3450	0.017	230	2650	0.014	150	1590	0.013	80	4250	0.019	320
	8	2590	0.023	240	1990	0.020	160	1190	0.017	80	3180	0.030	380
	10	2070	0.029	240	1590	0.025	160	960	0.022	80	2550	0.038	380
	12	1730	0.036	250	1330	0.031	160	800	0.027	90	2120	0.047	400

< D3 mm: ae = 0.1D

GB255

cylindrical shank, 2 flutes ball nose

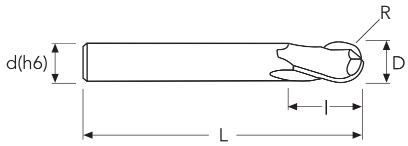
OSAWA NORM | N | MG BR | <45 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.50	+/-0.015	4	2		50	2	GB255010	h
1.5	0/-0.020	0.75	+/-0.015	4	3		50	2	GB255015	h
2	0/-0.020	1.00	+/-0.015	4	4		50	2	GB255020	h
3	0/-0.020	1.50	+/-0.015	4	6		50	2	GB255030	h
4	0/-0.020	2.00	+/-0.015	4	8		50	2	GB255040	h
5	0/-0.020	2.50	+/-0.015	6	10		50	2	GB255050	h
6	0/-0.020	3.00	+/-0.015	6	12		50	2	GB255060	h
8	0/-0.025	4.00	+/-0.015	8	16		60	2	GB255080	h
10	0/-0.025	5.00	+/-0.015	10	20		75	2	GB255100	h
12	0/-0.025	6.00	+/-0.015	12	24		75	2	GB255120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

GB255

COPYING

Material Group ISO 513		P1 K1			P2 M1 K2			P3 M2			N1 N2 N3 N4		
Hardness/Rm		< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae		**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**		
Vc (m/min)		**50-70**			**35-55**			**20-40**			**80-120**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.60**	19110	0.030	1150	14330	0.023	640	9550	0.021	400	31850	0.036	2290
2	**1.20**	9550	0.040	760	7170	0.030	430	4780	0.028	270	15920	0.048	1530
3	**1.80**	6370	0.050	640	4780	0.038	360	3180	0.035	220	10620	0.060	1270
4	**2.40**	4780	0.060	570	3580	0.045	320	2390	0.042	200	7960	0.072	1150
5	**3.00**	3820	0.070	530	2870	0.053	300	1910	0.049	190	6370	0.084	1070
6	**3.60**	3180	0.080	510	2390	0.060	290	1590	0.056	180	5310	0.096	1020
8	**4.80**	2390	0.090	430	1790	0.068	240	1190	0.063	150	3980	0.108	860
10	**6.00**	1910	0.105	400	1430	0.079	230	960	0.074	140	3180	0.126	800
12	**7.20**	1590	0.120	380	1190	0.090	210	800	0.084	130	2650	0.144	760

G2CSB2

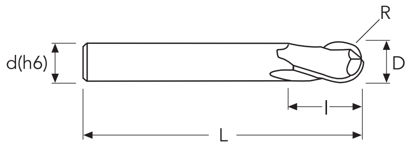
cylindrical shank, 2 flutes ball nose

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z2 BALL

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.50	+/-0.015	4	2		50	2	G2CSB2010	h
1.5	0/-0.020	0.75	+/-0.015	4	3		50	2	G2CSB2015	h
2	0/-0.020	1.00	+/-0.015	4	4		50	2	G2CSB2020	h
2.5	0/-0.020	1.25	+/-0.015	4	5		50	2	G2CSB2025	h
3	0/-0.020	1.50	+/-0.015	4	6		50	2	G2CSB2030	h
3.5	0/-0.020	1.75	+/-0.015	4	7		50	2	G2CSB2035	h
4	0/-0.020	2.00	+/-0.015	4	8		50	2	G2CSB2040	h
4.5	0/-0.020	2.25	+/-0.015	6	9		50	2	G2CSB2045	h
5	0/-0.020	2.50	+/-0.015	6	10		50	2	G2CSB2050	h
5.5	0/-0.020	2.75	+/-0.015	6	11		50	2	G2CSB2055	h
6	0/-0.020	3.00	+/-0.015	6	12		50	2	G2CSB2060	h
6.5	0/-0.025	3.25	+/-0.015	8	13		60	2	G2CSB2065	h
7	0/-0.025	3.50	+/-0.015	8	14		60	2	G2CSB2070	h
8	0/-0.025	4.00	+/-0.015	8	16		60	2	G2CSB2080	h
9	0/-0.025	4.50	+/-0.015	10	18		75	2	G2CSB2090	h
10	0/-0.025	5.00	+/-0.015	10	20		75	2	G2CSB2100	h
12	0/-0.025	6.00	+/-0.015	12	24		75	2	G2CSB2120	h
16	0/-0.030	8.00	+/-0.015	16	30		92	2	G2CSB2160	h
20	0/-0.030	10.00	+/-0.015	20	30		100	2	G2CSB2200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2CSB2

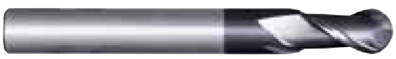
COPYING

Material Group ISO 513		P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm		< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae		**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**		
Vc (m/min)		**80-100**			**60-80**			**40-60**			**110-130**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.60**	28660	0.030	1720	22290	0.023	1000	15920	0.021	670	38220	0.036	2750
2	**1.20**	14330	0.040	1150	11150	0.030	670	7960	0.028	450	19110	0.048	1830
3	**1.80**	9550	0.050	960	7430	0.038	560	5310	0.035	370	12740	0.060	1530
4	**2.40**	7170	0.060	860	5570	0.045	500	3980	0.042	330	9550	0.072	1380
5	**3.00**	5730	0.070	800	4460	0.053	470	3180	0.049	310	7640	0.084	1280
6	**3.60**	4780	0.080	760	3720	0.060	450	2650	0.056	300	6370	0.096	1220
8	**4.80**	3580	0.090	640	2790	0.068	380	1990	0.063	250	4780	0.108	1030
10	**6.00**	2870	0.105	600	2230	0.079	350	1590	0.074	230	3820	0.126	960
12	**7.20**	2390	0.120	570	1860	0.090	330	1330	0.084	220	3180	0.144	920
16	**9.60**	1790	0.150	540	1390	0.113	310	1000	0.105	210	2390	0.180	860
20	**12.00**	1430	0.180	510	1110	0.135	300	800	0.126	200	1910	0.216	830

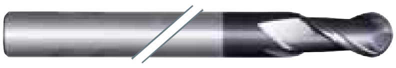
G2250-51

cylindrical shank, 2 flutes ball nose, long

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z2 BALL



G2250

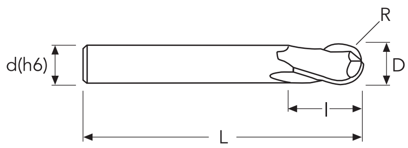


G2251

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.025	0.50	+/-0.015	4	2		75	2	G2250010	h
1.5	0/-0.025	0.75	+/-0.015	4	3		75	2	G2250015	h
2	0/-0.025	1.00	+/-0.015	4	4		75	2	G2250020	h
3	0/-0.025	1.50	+/-0.015	4	6		75	2	G2250030	h
4	0/-0.025	2.00	+/-0.015	4	8		75	2	G2250040	h
5	0/-0.025	2.50	+/-0.015	6	10		75	2	G2250050	h
6	0/-0.025	3.00	+/-0.015	6	12		100	2	G2250060	h
8	0/-0.030	4.00	+/-0.015	8	16		100	2	G2250080	h
10	0/-0.030	5.00	+/-0.015	10	20		100	2	G2250100	h
12	0/-0.030	6.00	+/-0.015	12	24		100	2	G2250120	h
6	0/-0.025	3.00	+/-0.015	6	12		150	2	G2251060	h
8	0/-0.030	4.00	+/-0.015	8	16		150	2	G2251080	h
10	0/-0.030	5.00	+/-0.015	10	20		150	2	G2251100	h
12	0/-0.030	6.00	+/-0.015	12	24		150	2	G2251120	h
16	0/-0.035	8.00	+/-0.015	16	30		150	2	G2251160	h
20	0/-0.035	10.00	+/-0.015	20	30		150	2	G2251200	h

h stock standard f non-standard stock m stock exhaustion

G2250

COPYING

Material Group ISO 513		P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm		< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae		**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**		
Vc (m/min)		**70-90**			**50-70**			**40-50**			**100-120**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.60**	25480	0.027	1380	19110	0.020	770	14330	0.019	540	35030	0.032	2270
2	**1.20**	12740	0.036	920	9550	0.027	520	7170	0.025	360	17520	0.043	1510
3	**1.80**	8490	0.045	760	6370	0.034	430	4780	0.032	300	11680	0.054	1260
4	**2.40**	6370	0.054	690	4780	0.041	390	3580	0.038	270	8760	0.065	1140
5	**3.00**	5100	0.063	640	3820	0.047	360	2870	0.044	250	7010	0.076	1060
6	**3.60**	4250	0.072	610	3180	0.054	340	2390	0.050	240	5840	0.086	1010
8	**4.80**	3180	0.081	520	2390	0.061	290	1790	0.057	200	4380	0.097	850
10	**6.00**	2550	0.095	480	1910	0.071	270	1430	0.066	190	3500	0.113	790
12	**7.20**	2120	0.108	460	1590	0.081	260	1190	0.076	180	2920	0.130	760

G2251

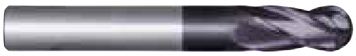
COPYING

Material Group ISO 513		P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm		< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae		**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**		
Vc (m/min)		**60-80**			**40-60**			**35-45**			**90-110**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	**3.60**	3720	0.058	430	2650	0.044	230	2120	0.041	170	5310	0.070	740
8	**4.80**	2790	0.066	370	1990	0.049	200	1590	0.046	150	3980	0.079	630
10	**6.00**	2230	0.077	340	1590	0.057	180	1270	0.054	140	3180	0.092	580
12	**7.20**	1860	0.087	330	1330	0.066	170	1060	0.061	130	2650	0.105	560
16	**9.60**	1390	0.122	340	1000	0.092	180	800	0.085	140	1990	0.146	580
20	**12.00**	1110	0.146	320	800	0.110	180	640	0.102	130	1590	0.175	560

G2CSB4

cylindrical shank, 4 flutes ball nose

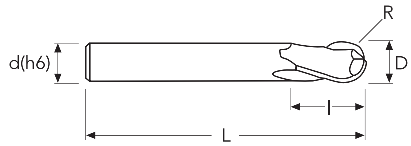
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z4 BALL



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.50	+/-0.015	4	2		50	2	G2CSB4010	h
1.5	0/-0.020	0.75	+/-0.015	4	3		50	2	G2CSB4015	h
2	0/-0.020	1.00	+/-0.015	4	4		50	2	G2CSB4020	h
3	0/-0.020	1.50	+/-0.015	4	6		50	2	G2CSB4030	h
4	0/-0.020	2.00	+/-0.015	4	8		50	2	G2CSB4040	h
5	0/-0.020	2.50	+/-0.015	6	10		50	2	G2CSB4050	h
6	0/-0.020	3.00	+/-0.015	6	12		50	2	G2CSB4060	h
8	0/-0.025	4.00	+/-0.015	8	16		60	2	G2CSB4080	h
10	0/-0.025	5.00	+/-0.015	10	20		75	2	G2CSB4100	h
12	0/-0.025	6.00	+/-0.015	12	24		75	2	G2CSB4120	h
16	0/-0.030	8.00	+/-0.015	16	30		92	2	G2CSB4160	h
20	0/-0.030	10.00	+/-0.015	20	30		100	2	G2CSB4200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

G2CSB4

COPYING

Material Group ISO 513		P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm		< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae		**0.1D x 0.3D**			**0.1D x 0.3D**			**0.1D x 0.3D**			**0.1D x 0.3D**		
Vc (m/min)		**80-100**			**60-80**			**40-60**			**110-130**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.60**	28660	0.030	3440	22290	0.023	2010	15920	0.021	1340	38220	0.036	5500
2	**1.20**	14330	0.040	2290	11150	0.030	1340	7960	0.028	890	19110	0.048	3670
3	**1.80**	9550	0.050	1910	7430	0.038	1110	5310	0.035	740	12740	0.060	3060
4	**2.40**	7170	0.060	1720	5570	0.045	1000	3980	0.042	670	9550	0.072	2750
5	**3.00**	5730	0.070	1600	4460	0.053	940	3180	0.049	620	7640	0.084	2570
6	**3.60**	4780	0.080	1530	3720	0.060	890	2650	0.056	590	6370	0.096	2450
8	**4.80**	3580	0.090	1290	2790	0.068	750	1990	0.063	500	4780	0.108	2060
10	**6.00**	2870	0.105	1210	2230	0.079	700	1590	0.074	470	3820	0.126	1930
12	**7.20**	2390	0.120	1150	1860	0.090	670	1330	0.084	450	3180	0.144	1830
16	**9.60**	1790	0.150	1070	1390	0.113	630	1000	0.105	420	2390	0.180	1720
20	**12.00**	1430	0.180	1030	1110	0.135	600	800	0.126	400	1910	0.216	1650

MDTA
GENERAL PURPOSE

MDTA is the Osawa range of micrograin carbide with PV200 coating. MDTA endmills have been developed for general purpose milling up to 45 HRC. The exclusive and innovative PV200 coating (3500HV) ensures the best performance, even in applications with air blow or MQL (Minimum Quantity Lubrication).

MDTA sono le frese Osawa in metallo duro micrograna con rivestimento PV200 sviluppate per la fresatura di materiali generici sino a 45 HRC. L'esclusivo e innovativo rivestimento PV200 (3500HV) garantisce performance elevate anche in lavorazioni con impiego di refrigerazione con getto d'aria o MQL (Minimum Quantity Lubrication).

MDTA sind Fräser von Osawa aus Mikrokörnungs-Hartmetall mit Beschichtung PV200, die für das Fräsen von allgemeinen Materialien bis zu 45 HRC entwickelt wurden. Die exklusive und innovative Beschichtung PV200 (3500HV) gewährleistet auch bei Bearbeitungen mit Kühlung durch Luftstrahl oder MQL (Minimum Quantity Lubrication) hohe Leistungen.

MDTA sont les fraises Osawa en carbure micrograin avec revêtement PV200 développées pour le fraisage de matériaux génériques jusqu'à 45 HRC. Le revêtement PV200 (3500HV) exclusif et innovant garantit des performances élevées même pour les usinages employant un système de lubrification avec jet d'air ou MQL (Minimum Quantity Lubrication).

MDTA son las fresas Osawa de metal duro micrograno con revestimiento PV200 desarrolladas para el fresado de materiales genéricos hasta 45 HRC. Su exclusivo e innovador revestimiento PV200 (3500HV) garantiza rendimientos elevados incluso en elaboraciones con el uso de refrigeración con chorro de aire o MQL (Minimum Quantity Lubrication).

MDTA - это фрезы фирмы Osawa из твёрдого сплава с мелкозернистой структурой и покрытием PV200, предназначенные для стандартной обработки материалов с твёрдостью до 45 HRC. Эксклюзивное и инновационное покрытие PV200 (3500HV) гарантирует высокую производительность, даже, при обработке с обдувом воздухом или с масляным туманом.

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MDTACS2

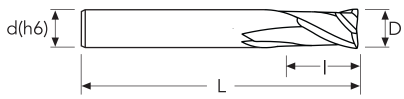
cylindrical shank, 2 flutes

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			3	3		40	2	MDTACS2010403	h
1	0/-0.020			4	3		40	2	MDTACS2010404	h
1.5	0/-0.020			3	4.5		40	2	MDTACS2015403	h
1.5	0/-0.020			4	4.5		40	2	MDTACS2015404	h
2	0/-0.030			2	8		32	2	MDTACS2020	h
2	0/-0.020			3	6.5		40	2	MDTACS2020403	h
2	0/-0.020			4	6.5		40	2	MDTACS2020404	h
2.5	0/-0.020			3	6.5		40	2	MDTACS2025403	h
2.5	0/-0.020			4	6.5		40	2	MDTACS2025404	h
3	0/-0.025			3	9		40	2	MDTACS2030403	h
4	0/-0.025			4	12		50	2	MDTACS2040504	h
5	0/-0.025			6	15		50	2	MDTACS2050506	h
6	0/-0.025			6	16		50	2	MDTACS2060	h
8	0/-0.030			8	20		64	2	MDTACS208064	h
10	0/-0.030			10	22		70	2	MDTACS2100	h
12	0/-0.030			12	25		75	2	MDTACS212075	h
14	0/-0.030			14	25		75	2	MDTACS2140	h
16	0/-0.030			16	32		90	2	MDTACS216090	h
20	0/-0.030			20	38		100	2	MDTACS220038	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MDTACS2

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.004	230	19110	0.003	130	12740	0.003	80	35030	0.005	360
2	14330	0.008	230	9550	0.007	130	6370	0.006	80	17520	0.010	360
3	9550	0.012	230	6370	0.010	130	4250	0.009	80	11680	0.016	360
4	7170	0.016	230	4780	0.014	130	3180	0.012	80	8760	0.021	360
5	5730	0.020	230	3820	0.017	130	2550	0.015	80	7010	0.026	360
6	4780	0.025	240	3180	0.021	140	2120	0.019	80	5840	0.033	380
8	3580	0.032	230	2390	0.027	130	1590	0.024	80	4380	0.042	360
10	2870	0.038	220	1910	0.032	120	1270	0.029	70	3500	0.049	350
12	2390	0.045	220	1590	0.038	120	1060	0.034	70	2920	0.059	340
14	2050	0.052	210	1360	0.044	120	910	0.039	70	2500	0.068	340
16	1790	0.060	210	1190	0.051	120	800	0.045	70	2190	0.078	340
18	1590	0.070	220	1060	0.060	130	710	0.053	70	1950	0.091	350
20	1430	0.080	230	960	0.068	130	640	0.060	80	1750	0.104	360

< D3 mm: ap = 0.2D

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.005	280	19110	0.004	160	12740	0.004	90	35030	0.006	440
2	14330	0.010	280	9550	0.008	160	6370	0.007	90	17520	0.012	440
3	9550	0.014	280	6370	0.012	160	4250	0.011	90	11680	0.019	440
4	7170	0.019	280	4780	0.016	160	3180	0.014	90	8760	0.025	440
5	5730	0.024	280	3820	0.020	160	2550	0.018	90	7010	0.031	440
6	4780	0.030	290	3180	0.026	160	2120	0.023	100	5840	0.039	460
8	3580	0.038	270	2390	0.033	160	1590	0.029	90	4380	0.050	440
10	2870	0.046	260	1910	0.039	150	1270	0.034	90	3500	0.059	410
12	2390	0.054	260	1590	0.046	150	1060	0.041	90	2920	0.070	410
14	2050	0.062	260	1360	0.053	140	910	0.047	90	2500	0.081	410
16	1790	0.072	260	1190	0.061	150	800	0.054	90	2190	0.094	410
18	1590	0.084	270	1060	0.071	150	710	0.063	90	1950	0.109	430
20	1430	0.096	270	960	0.082	160	640	0.072	90	1750	0.125	440

< D3 mm: ae = 0.2D

DRILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**D x D**			**D x D**			**0.5D x D**			**D x D**		
Vc (m/min)	**70-90**			**40-60**			**25-35**			**80-100**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	25480	0.002	120	15920	0.002	60	9550	0.002	30	28660	0.003	180
2	12740	0.005	120	7960	0.004	60	4780	0.004	30	14330	0.006	180
3	8490	0.007	120	5310	0.006	60	3180	0.005	30	9550	0.009	180
4	6370	0.010	120	3980	0.008	60	2390	0.007	30	7170	0.012	180
5	5100	0.012	120	3180	0.010	60	1910	0.009	30	5730	0.016	180
6	4250	0.015	130	2650	0.013	70	1590	0.011	40	4780	0.020	190
8	3180	0.019	120	1990	0.016	60	1190	0.014	30	3580	0.025	180
10	2550	0.023	120	1590	0.019	60	960	0.017	30	2870	0.030	170
12	2120	0.027	110	1330	0.023	60	800	0.020	30	2390	0.035	170
14	1820	0.031	110	1140	0.027	60	680	0.023	30	2050	0.041	170
16	1590	0.036	110	1000	0.031	60	600	0.027	30	1790	0.047	170
18	1420	0.042	120	880	0.036	60	530	0.032	30	1590	0.055	170
20	1270	0.048	120	800	0.041	70	480	0.036	30	1430	0.062	180

< D3 mm: ap = 0.5D

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MDTA210

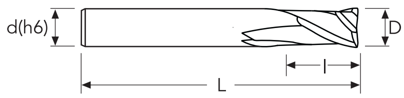
cylindrical shank, 2 flutes, long

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.030			3	20		60	2	MDTA210030	h
4	0/-0.030			4	20		60	2	MDTA210040	h
5	0/-0.030			5	25		75	2	MDTA210050	h
6	0/-0.030			6	30		75	2	MDTA210060	h
8	0/-0.030			8	30		75	2	MDTA210080	h
10	0/-0.030			10	40		100	2	MDTA210100	h
12	0/-0.030			12	45		100	2	MDTA210120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MDTA210

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**60-80**			**40-60**			**30-40**			**70-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	7430	0.011	160	5310	0.009	100	3720	0.008	60	8490	0.014	240
4	5570	0.014	160	3980	0.012	100	2790	0.011	60	6370	0.019	240
5	4460	0.018	160	3180	0.015	100	2230	0.014	60	5100	0.023	240
6	3720	0.023	170	2650	0.019	100	1860	0.017	60	4250	0.029	250
8	2790	0.029	160	1990	0.024	100	1390	0.022	60	3180	0.037	240
10	2230	0.034	150	1590	0.029	90	1110	0.026	60	2550	0.044	230
12	1860	0.041	150	1330	0.034	90	930	0.030	60	2120	0.053	220

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**		
Vc (m/min)	**60-80**			**40-60**			**30-40**			**70-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	7430	0.014	200	5310	0.011	120	3720	0.010	80	8490	0.018	300
4	5570	0.018	200	3980	0.015	120	2790	0.014	80	6370	0.023	300
5	4460	0.023	200	3180	0.019	120	2230	0.017	80	5100	0.029	300
6	3720	0.028	210	2650	0.024	130	1860	0.021	80	4250	0.037	310
8	2790	0.036	200	1990	0.031	120	1390	0.027	80	3180	0.047	300
10	2230	0.043	190	1590	0.036	120	1110	0.032	70	2550	0.056	280
12	1860	0.051	190	1330	0.043	110	930	0.038	70	2120	0.066	280

DRILLING

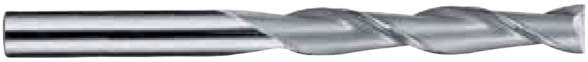
Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**D x D**			**D x D**			**0.5D x D**			**D x D**		
Vc (m/min)	**50-70**			**35-45**			**25-35**			**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	6370	0.007	90	4250	0.006	50	3180	0.005	30	7430	0.009	130
4	4780	0.009	90	3180	0.008	50	2390	0.007	30	5570	0.012	130
5	3820	0.011	90	2550	0.010	50	1910	0.008	30	4460	0.015	130
6	3180	0.014	90	2120	0.012	50	1590	0.011	30	3720	0.018	140
8	2390	0.018	90	1590	0.015	50	1190	0.014	30	2790	0.023	130
10	1910	0.021	80	1270	0.018	50	960	0.016	30	2230	0.028	120
12	1590	0.025	80	1060	0.022	50	800	0.019	30	1860	0.033	120

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MDCL2

cylindrical shank, 2 flutes, long

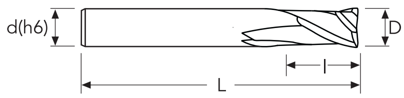
OSAWA NORM | N | MG BR | <45 HRC | 30° | SQUARE | Z2



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.040			3	30		75	2	MDCL2030	h
4	0/-0.048			4	30		75	2	MDCL2040	h
5	0/-0.048			5	40		100	2	MDCL2050	h
6	0/-0.048			6	50		150	2	MDCL2060	h
8	0/-0.058			8	50		150	2	MDCL2080	h
10	0/-0.058			10	60		150	2	MDCL2100	h
12	0/-0.070			12	75		150	2	MDCL2120	h

h stock standard f non-standard stock m stock exhaustion

MDCL2

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm^2			700-1000 N/mm^2			< 40 HRC					
ap x ae	**0.3D x D**			**0.3D x D**			**0.3D x D**			**0.3D x D**		
Vc (m/min)	**40-50**			**25-35**			**20-30**			**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	4780	0.010	90	3180	0.008	50	2650	0.007	40	7430	0.011	160
4	3580	0.013	90	2390	0.011	50	1990	0.010	40	5570	0.014	160
5	2870	0.016	90	1910	0.014	50	1590	0.012	40	4460	0.018	160
6	2390	0.020	100	1590	0.017	50	1330	0.015	40	3720	0.022	160
8	1790	0.026	90	1190	0.022	50	1000	0.019	40	2790	0.033	190
10	1430	0.030	90	960	0.026	50	800	0.023	40	2230	0.040	180
12	1190	0.036	90	800	0.031	50	660	0.027	40	1860	0.047	170

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm^2			700-1000 N/mm^2			< 40 HRC					
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**		
Vc (m/min)	**45-55**			**30-40**			**25-35**			**70-90**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	5310	0.012	120	3720	0.010	70	3180	0.009	50	8490	0.013	220
4	3980	0.015	120	2790	0.013	70	2390	0.012	60	6370	0.017	220
5	3180	0.019	120	2230	0.016	70	1910	0.014	60	5100	0.021	220
6	2650	0.024	130	1860	0.020	80	1590	0.018	60	4250	0.027	230
8	1990	0.031	120	1390	0.026	70	1190	0.023	50	3180	0.040	250
10	1590	0.036	120	1110	0.031	70	960	0.027	50	2550	0.047	240
12	1330	0.043	110	930	0.037	70	800	0.032	50	2120	0.056	240

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MDTACS3

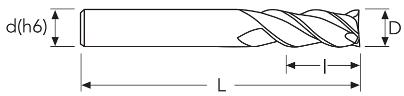
cylindrical shank, 3 flutes

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z3

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			3	3		40	3	MDTACS3010403	h
1	0/-0.020			4	3		40	3	MDTACS3010404	h
1.5	0/-0.020			3	4.5		40	3	MDTACS3015403	h
1.5	0/-0.020			4	4.5		40	3	MDTACS3015404	h
2	0/-0.020			3	6.5		40	3	MDTACS3020403	h
2	0/-0.020			4	6.5		40	3	MDTACS3020404	h
2.5	0/-0.020			3	6.5		40	3	MDTACS3025403	h
2.5	0/-0.020			4	6.5		40	3	MDTACS3025404	h
3	0/-0.025			3	9		40	3	MDTACS3030403	h
4	0/-0.025			4	12		50	3	MDTACS3040504	h
5	0/-0.025			6	15		50	3	MDTACS3050506	h
6	0/-0.025			6	16		50	3	MDTACS3060	h
8	0/-0.030			8	20		64	3	MDTACS308064	h
10	0/-0.030			10	22		70	3	MDTACS3100	h
12	0/-0.030			12	25		75	3	MDTACS312075	h
14	0/-0.030			14	25		75	3	MDTACS3140	h
16	0/-0.030			16	32		90	3	MDTACS316090	h
20	0/-0.030			20	38		100	3	MDTACS320038	h

h stock standard f non-standard stock m stock exhaustion

MDTACS3

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.004	330	19110	0.003	190	12740	0.003	110	35030	0.005	530
2	14330	0.008	330	9550	0.007	190	6370	0.006	110	17520	0.010	530
3	9550	0.011	320	6370	0.009	180	4250	0.008	110	11680	0.014	500
4	7170	0.014	310	4780	0.012	170	3180	0.011	100	8760	0.019	490
5	5730	0.018	300	3820	0.015	170	2550	0.013	100	7010	0.023	480
6	4780	0.021	300	3180	0.018	170	2120	0.016	100	5840	0.027	480
8	3580	0.028	300	2390	0.023	170	1590	0.021	100	4380	0.036	470
10	2870	0.035	300	1910	0.030	170	1270	0.026	100	3500	0.046	480
12	2390	0.044	320	1590	0.037	180	1060	0.033	100	2920	0.057	500
14	2050	0.052	320	1360	0.044	180	910	0.039	110	2500	0.067	500
16	1790	0.059	320	1190	0.050	180	800	0.045	110	2190	0.077	510
18	1590	0.066	310	1060	0.056	180	710	0.050	110	1950	0.086	500
20	1430	0.072	310	960	0.061	180	640	0.054	100	1750	0.093	490

< D3 mm: ap = 0.2D

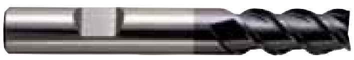
Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.005	400	19110	0.004	230	12740	0.003	130	35030	0.006	630
2	14330	0.009	400	9550	0.008	230	6370	0.007	130	17520	0.012	630
3	9550	0.013	380	6370	0.011	210	4250	0.010	130	11680	0.017	600
4	7170	0.017	370	4780	0.015	210	3180	0.013	120	8760	0.022	590
5	5730	0.021	360	3820	0.018	210	2550	0.016	120	7010	0.027	580
6	4780	0.025	360	3180	0.021	200	2120	0.019	120	5840	0.033	570
8	3580	0.033	350	2390	0.028	200	1590	0.025	120	4380	0.043	560
10	2870	0.042	360	1910	0.036	210	1270	0.032	120	3500	0.055	580
12	2390	0.053	380	1590	0.045	210	1060	0.040	130	2920	0.069	600
14	2050	0.062	380	1360	0.053	220	910	0.047	130	2500	0.081	600
16	1790	0.071	380	1190	0.061	220	800	0.053	130	2190	0.093	610
18	1590	0.079	380	1060	0.067	210	710	0.059	130	1950	0.103	600
20	1430	0.086	370	960	0.073	210	640	0.064	120	1750	0.112	590

< D3 mm: ae = 0.1D

MDTAWSH3

weldon shank, 3 flutes

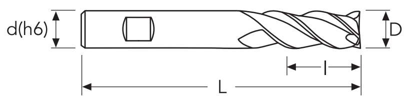
OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.030			6	7		57	3	MDTAWSH3030	h
4	0/-0.030			6	8		57	3	MDTAWSH3040	h
5	0/-0.030			6	10		57	3	MDTAWSH3050	h
6	0/-0.030			6	10		57	3	MDTAWSH3060	h
8	0/-0.030			8	16		63	3	MDTAWSH3080	h
10	0/-0.030			10	19		72	3	MDTAWSH3100	h
12	0/-0.030			12	22		83	3	MDTAWSH3120	h
14	0/-0.030			14	22		83	3	MDTAWSH3140	h
16	0/-0.030			16	26		92	3	MDTAWSH3160	h
20	0/-0.030			20	32		104	3	MDTAWSH3200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MDTAWSH3

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	80-100			50-70			30-50			80-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	9550	0.011	320	6370	0.009	180	4250	0.008	110	10620	0.014	460
4	7170	0.014	310	4780	0.012	170	3180	0.011	100	7960	0.019	440
5	5730	0.018	300	3820	0.015	170	2550	0.013	100	6370	0.023	440
6	4780	0.021	300	3180	0.018	170	2120	0.016	100	5310	0.027	430
8	3580	0.028	300	2390	0.023	170	1590	0.021	100	3980	0.036	430
10	2870	0.035	300	1910	0.030	170	1270	0.026	100	3180	0.046	440
12	2390	0.044	320	1590	0.037	180	1060	0.033	100	2650	0.057	450
14	2050	0.052	320	1360	0.044	180	910	0.039	110	2270	0.067	460
16	1790	0.059	320	1190	0.050	180	800	0.045	110	1990	0.077	460
18	1590	0.066	310	1060	0.056	180	710	0.050	110	1770	0.086	460
20	1430	0.072	310	960	0.061	180	640	0.054	100	1590	0.093	440

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D		
Vc (m/min)	90-110			60-80			40-60			110-120		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10620	0.013	420	7430	0.011	250	5310	0.010	160	12740	0.017	660
4	7960	0.017	410	5570	0.015	240	3980	0.013	150	9550	0.022	640
5	6370	0.021	400	4460	0.018	240	3180	0.016	150	7640	0.027	630
6	5310	0.025	400	3720	0.021	240	2650	0.019	150	6370	0.033	620
8	3980	0.033	390	2790	0.028	230	1990	0.025	150	4780	0.043	620
10	3180	0.042	400	2230	0.036	240	1590	0.032	150	3820	0.055	630
12	2650	0.053	420	1860	0.045	250	1330	0.040	160	3180	0.069	650
14	2270	0.062	420	1590	0.053	250	1140	0.047	160	2730	0.081	660
16	1990	0.071	430	1390	0.061	250	1000	0.053	160	2390	0.093	660
18	1770	0.079	420	1240	0.067	250	880	0.059	160	2120	0.103	650
20	1590	0.086	410	1110	0.073	240	800	0.064	150	1910	0.112	640

MDTACS4

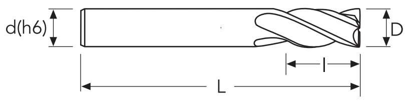
cylindrical shank, 4 flutes

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			3	3		40	4	MDTACS4010403	h
1	0/-0.020			4	3		40	4	MDTACS4010404	h
1.5	0/-0.020			3	4.5		40	4	MDTACS4015403	h
1.5	0/-0.020			4	4.5		40	4	MDTACS4015404	h
2	0/-0.030			2	8		32	4	MDTACS4020	h
2	0/-0.020			3	6.5		40	4	MDTACS4020403	h
2	0/-0.020			4	6.5		40	4	MDTACS4020404	h
2.5	0/-0.020			3	6.5		40	4	MDTACS4025403	h
2.5	0/-0.020			4	6.5		40	4	MDTACS4025404	h
3	0/-0.025			3	9		40	4	MDTACS4030403	h
4	0/-0.025			4	12		50	4	MDTACS4040504	h
5	0/-0.025			6	15		50	4	MDTACS4050506	h
6	0/-0.030			6	16		50	4	MDTACS4060	h
8	0/-0.030			8	20		64	4	MDTACS408064	h
10	0/-0.030			10	22		70	4	MDTACS4100	h
12	0/-0.030			12	25		75	4	MDTACS412075	h
14	0/-0.030			14	25		75	4	MDTACS4140	h
16	0/-0.030			16	32		90	4	MDTACS416090	h
20	0/-0.030			20	38		100	4	MDTACS420038	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MDTACS4

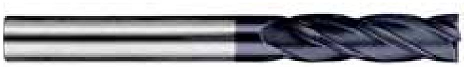
Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm^2			700-1000 N/mm^2			< 40 HRC					
ap x ae	**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**			**1.5D x 0.2D**		
Vc (m/min)	**80-100**			**50-70**			**30-50**			**100-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.004	400	19110	0.003	230	12740	0.003	130	35030	0.005	640
2	14330	0.007	400	9550	0.006	230	6370	0.005	130	17520	0.009	640
3	9550	0.010	380	6370	0.009	220	4250	0.008	130	11680	0.013	610
4	7170	0.013	370	4780	0.011	210	3180	0.010	120	8760	0.017	590
5	5730	0.016	370	3820	0.014	210	2550	0.012	120	7010	0.021	580
6	4780	0.019	360	3180	0.016	210	2120	0.014	120	5840	0.025	580
8	3580	0.025	360	2390	0.021	200	1590	0.019	120	4380	0.033	570
10	2870	0.032	370	1910	0.027	210	1270	0.024	120	3500	0.042	580
12	2390	0.040	380	1590	0.034	220	1060	0.030	130	2920	0.052	610
14	2050	0.047	390	1360	0.040	220	910	0.035	130	2500	0.061	610
16	1790	0.054	390	1190	0.046	220	800	0.041	130	2190	0.070	610
18	1590	0.060	380	1060	0.051	220	710	0.045	130	1950	0.078	610
20	1430	0.065	370	960	0.055	210	640	0.049	120	1750	0.085	590

< D3 mm: ae = 0.1D

MDTA410

cylindrical shank, 4 flutes, long

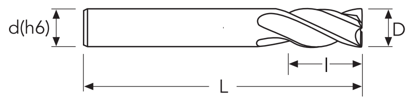
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.030			3	20		60	4	MDTA410030	h
4	0/-0.030			4	20		60	4	MDTA410040	h
5	0/-0.030			5	25		75	4	MDTA410050	h
6	0/-0.030			6	30		75	4	MDTA410060	h
8	0/-0.030			8	30		75	4	MDTA410080	h
10	0/-0.030			10	40		100	4	MDTA410100	h
12	0/-0.030			12	45		100	4	MDTA410120	h
14	0/-0.030			14	45		100	4	MDTA410140	h
16	0/-0.030			16	45		100	4	MDTA410160	h

h stock standard f non-standard stock m stock exhaustion

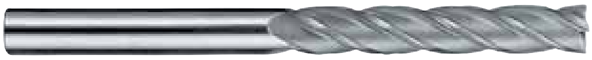
CUTTING PARAMETERS

MDTA410

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm^2			700-1000 N/mm^2			< 40 HRC					
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**70-90**			**45-65**			**30-50**			**80-120**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	8490	0.009	310	5840	0.008	180	4250	0.007	110	10620	0.012	500
4	6370	0.012	300	4380	0.010	170	3180	0.009	110	7960	0.015	480
5	5100	0.014	290	3500	0.012	170	2550	0.011	110	6370	0.019	480
6	4250	0.017	290	2920	0.015	170	2120	0.013	110	5310	0.022	470
8	3180	0.023	290	2190	0.019	170	1590	0.017	110	3980	0.029	470
10	2550	0.029	290	1750	0.024	170	1270	0.022	110	3180	0.037	480
12	2120	0.036	310	1460	0.031	180	1060	0.027	110	2650	0.047	500
14	1820	0.042	310	1250	0.036	180	910	0.032	110	2270	0.055	500
16	1590	0.048	310	1090	0.041	180	800	0.036	120	1990	0.062	500

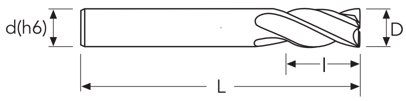
MDCL4

cylindrical shank, 4 flutes, long



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.040			3	30		75	4	MDCL4030	h
4	0/-0.048			4	30		75	4	MDCL4040	h
5	0/-0.048			5	40		100	4	MDCL4050	h
6	0/-0.048			6	50		150	4	MDCL4060	h
8	0/-0.058			8	50		150	4	MDCL4080	h
10	0/-0.058			10	60		150	4	MDCL4100	h
12	0/-0.030			12	75		150	4	MDCL4120	h
14	0/-0.030			14	75		150	4	MDCL4140	h
16	0/-0.030			16	75		150	4	MDCL4160	h
20	0/-0.030			20	75		150	4	MDCL4200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

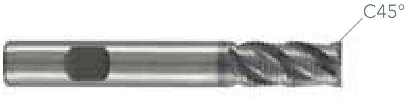
MDCL4

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm	< 700 N/mm^2			700-1000 N/mm^2			< 40 HRC					
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**40-50**			**25-35**			**20-30**			**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	4780	0.008	150	3180	0.007	90	2650	0.006	60	7430	0.009	260
4	3580	0.010	150	2390	0.009	80	1990	0.008	60	5570	0.011	260
5	2870	0.013	150	1910	0.011	80	1590	0.010	60	4460	0.014	250
6	2390	0.015	150	1590	0.013	80	1330	0.011	60	3720	0.017	250
8	1790	0.020	140	1190	0.017	80	1000	0.015	60	2790	0.026	290
10	1430	0.026	150	960	0.022	80	800	0.019	60	2230	0.033	300
12	1190	0.032	150	800	0.027	90	660	0.024	60	1860	0.042	310
14	1020	0.038	150	680	0.032	90	570	0.028	60	1590	0.049	310
16	900	0.043	160	600	0.037	90	500	0.032	60	1390	0.056	310
20	720	0.052	150	480	0.044	80	400	0.039	60	1110	0.068	300

MDTAUPR

weldon shank, roughing HR, unequal pitch

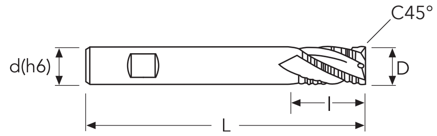
OSAWA NORM | N | MG PV200 | <45 HRC | 40° | C45° | Z3 UP ≤ Ø8 | Z4 UP > Ø8



P	M	K	N	S	H
★	☆	★			

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.030	0.10	+/-0.020	6	16		57	3	MDTAUPR060	h
8	0/-0.030	0.20	+/-0.020	8	16		63	3	MDTAUPR080	h
10	0/-0.030	0.20	+/-0.020	10	22		72	4	MDTAUPR100	h
12	0/-0.030	0.20	+/-0.020	12	26		83	4	MDTAUPR120	h
14	0/-0.030	0.30	+/-0.020	14	26		83	4	MDTAUPR140	h
16	0/-0.030	0.30	+/-0.020	16	32		92	4	MDTAUPR160	h
20	0/-0.030	0.40	+/-0.020	20	38		104	4	MDTAUPR200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MDTAUPR

SLOTTING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3					
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**					
Vc (m/min)	**80-100**			**50-70**			**30-50**					
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)			
6	4780	0.030	430	3180	0.026	240	2120	0.023	140			
8	3580	0.045	480	2390	0.038	270	1590	0.034	160			
10	2870	0.055	630	1910	0.047	360	1270	0.041	210			
12	2390	0.065	620	1590	0.055	350	1060	0.049	210			
14	2050	0.075	620	1360	0.064	350	910	0.056	200			
16	1790	0.085	610	1190	0.072	340	800	0.064	200			
20	1430	0.100	570	960	0.085	330	640	0.075	190			

D6-8: Z3
D10-20: Z4

SIDE MILLING

Material Group ISO 513	P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3					
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.3D**					
Vc (m/min)	**80-100**			**50-70**			**30-50**					
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)			
6	4780	0.040	570	3180	0.034	320	2120	0.030	190			
8	3580	0.055	590	2390	0.047	340	1590	0.041	200			
10	2870	0.065	750	1910	0.055	420	1270	0.049	250			
12	2390	0.080	760	1590	0.068	430	1060	0.060	250			
14	2050	0.090	740	1360	0.077	420	910	0.068	250			
16	1790	0.100	720	1190	0.085	400	800	0.075	240			
20	1430	0.120	690	960	0.102	390	640	0.090	230			

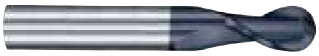
D6-8: Z3
D10-20: Z4

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MDTACSB2

cylindrical shank, 2 flutes ball nose

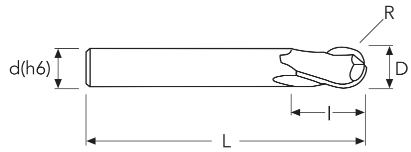
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.030	0.50	0/-0.020	3	3		40	2	MDTACSB2010	h
1.5	0/-0.030	0.75	0/-0.020	3	5		40	2	MDTACSB2015	h
2	0/-0.030	1.00	0/-0.020	3	7		40	2	MDTACSB2020	h
2.5	0/-0.030	1.25	0/-0.020	3	8		40	2	MDTACSB2025	h
3	0/-0.030	1.50	0/-0.020	3	10		40	2	MDTACSB2030	h
4	0/-0.030	2.00	0/-0.020	4	12		40	2	MDTACSB2040	h
5	0/-0.030	2.50	0/-0.020	5	14		50	2	MDTACSB2050	h
6	0/-0.030	3.00	0/-0.020	6	7		50	2	MDTACSB2060	h
8	0/-0.030	4.00	0/-0.020	8	9		60	2	MDTACSB2080	h
10	0/-0.030	5.00	0/-0.020	10	10		60	2	MDTACSB2100	h
12	0/-0.030	6.00	0/-0.020	12	14		70	2	MDTACSB2120	h

h stock standard f non-standard stock m stock exhaustion

MDTACSB2

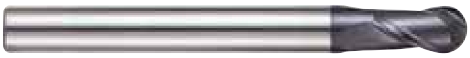
COPYING

Material Group ISO 513		P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm		< 700 N/mm^2			700-1000 N/mm^2			< 40 HRC					
ap x ae		**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**		
Vc (m/min)		**80-100**			**60-80**			**40-60**			**110-130**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.60**	28660	0.030	1720	22290	0.023	1000	15920	0.021	670	38220	0.036	2750
2	**1.20**	14330	0.040	1150	11150	0.030	670	7960	0.028	450	19110	0.048	1830
3	**1.80**	9550	0.050	960	7430	0.038	560	5310	0.035	370	12740	0.060	1530
4	**2.40**	7170	0.060	860	5570	0.045	500	3980	0.042	330	9550	0.072	1380
5	**3.00**	5730	0.070	800	4460	0.053	470	3180	0.049	310	7640	0.084	1280
6	**3.60**	4780	0.080	760	3720	0.060	450	2650	0.056	300	6370	0.096	1220
8	**4.80**	3580	0.090	640	2790	0.068	380	1990	0.063	250	4780	0.108	1030
10	**6.00**	2870	0.105	600	2230	0.079	350	1590	0.074	230	3820	0.126	960
12	**7.20**	2390	0.120	570	1860	0.090	330	1330	0.084	220	3180	0.144	920

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

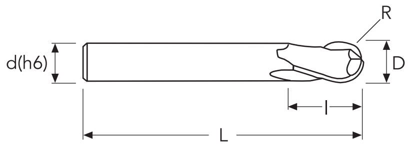
MDTA250

cylindrical shank, 2 flutes ball nose, long



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.030	1.50	0/-0.020	3	5		75	2	MDTA250030	h
4	0/-0.030	2.00	0/-0.020	4	8		75	2	MDTA250040	h
5	0/-0.030	2.50	0/-0.020	5	9		75	2	MDTA250050	h
6	0/-0.030	3.00	0/-0.020	6	10		100	2	MDTA250060	h
8	0/-0.030	4.00	0/-0.020	8	12		100	2	MDTA250080	h
10	0/-0.030	5.00	0/-0.020	10	14		100	2	MDTA250100	h
12	0/-0.030	6.00	0/-0.020	12	16		100	2	MDTA250120	h

h stock standard f non-standard stock m stock exhaustion

MDTA250

COPYING

Material Group ISO 513		P1 P2 K1			P3 P4 M1 M2 K2			P5 M3 K3			N1 N2 N3 N4		
Hardness/Rm		< 700 N/mm²			700-1000 N/mm²			< 40 HRC					
ap x ae		**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**			**0.1D x 0.1D**		
Vc (m/min)		**70-90**			**50-70**			**40-50**			**100-120**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	**1.80**	8490	0.045	760	6370	0.034	430	4780	0.032	300	11680	0.054	1260
4	**2.40**	6370	0.054	690	4780	0.041	390	3580	0.038	270	8760	0.065	1140
5	**3.00**	5100	0.063	640	3820	0.047	360	2870	0.044	250	7010	0.076	1060
6	**3.60**	4250	0.072	610	3180	0.054	340	2390	0.050	240	5840	0.086	1010
8	**4.80**	3180	0.081	520	2390	0.061	290	1790	0.057	200	4380	0.097	850
10	**6.00**	2550	0.095	480	1910	0.071	270	1430	0.066	190	3500	0.113	790
12	**7.20**	2120	0.108	460	1590	0.081	260	1190	0.076	180	2920	0.130	760

HF VH/UP
UNIVERSAL PURPOSE

HF EVOlution is the Osawa family of micrograin carbide endmills for universal application with coatings and cutting edges specifically designed for high performance machining of all ISO materials. The HF EVOlution endmills are available in a broad range of types, lengths and radii. They are the ideal tools for both mass production and small batch manufacturing, thanks to the outstanding performance delivered and the universal applicability.

HF EVOlution è la linea Osawa di frese universali in metallo duro micrograna con spoglie e rivestimenti specifici per la lavorazione ad alto rendimento di tutti i materiali della scala ISO. Le frese HF EVOlution sono disponibili in un'ampia gamma di tipologie, lunghezze e raggi torici. Sono gli utensili ideali sia per le superproduzioni di serie che per la produzione di piccoli lotti, grazie all'eccellenza del rendimento e all'universalità d'impiego.

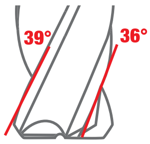
HF EVOlution heißt die Linie der Universalfräser aus mikrokörnigem Hartmetall von Osawa, mit Schneidekanten und spezifischen Beschichtungen zur Hochleistungsbearbeitung von allen Materialien der ISO-Skala. Die Fräser HF EVOlution sind in einer reichen Auswahl an Typologien, Längen und Torusradien erhältlich. Mit ihren ausgezeichneten Leistungen und dem universellen Einsatz sind sie die idealen Werkzeuge, sowohl für die Serienproduktion großer Mengen als auch für die Herstellung kleiner Lose.

HF EVOlution est la ligne Osawa de fraises universelles en carbure micrograin avec dépouilles et revêtements spécifiques pour l'usinage de haute performance de tous les matériaux de l'échelle ISO. Les fraises HF EVOlution sont disponibles dans une large gamme, longueurs et rayons. Ce sont des outils aussi bien pour les grandes séries que pour la production de prototypes, grâce à leur excellence de rendement et leur polyvalence.

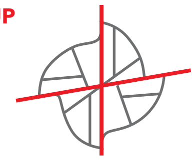
HF EVOlution es la línea de fresas universales de metal duro microgranulado con inclinación y revestimientos específicos para el mecanizado de alto rendimiento de todos los materiales de la escala ISO. Las fresas HF EVOlution están disponibles en una amplia gama de tipologías, longitudes y radios tóricos. Son las herramientas ideales tanto para las superproducciones en serie como para la producción de pequeños lotes, gracias a la excelencia del rendimiento y la universalidad de empleo.

HF EVOlution - это линейка универсальных фрез Osawa из мелкозернистого твердого сплава со специальным покрытием для высокопроизводительной обработки всех материалов по ISO. Доступна широкая гамма фрез этой серии, имеющих различную длину и радиусы на уголках. Благодаря высокой эффективности и универсальности, это идеальные инструменты как для массового, так и для мелкосерийного производства.

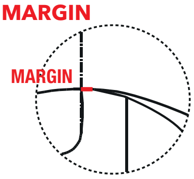
(1) VH



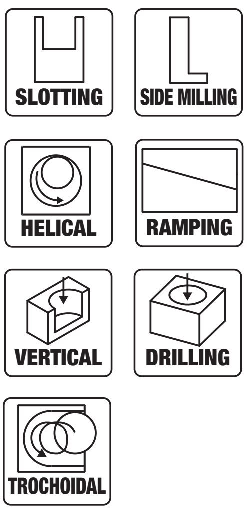
(2) UP



(3) MARGIN



ISO P
ISO M
ISO K
ISO S
ISO H



HIGH PERFORMANCE

Thanks to the variable helix geometry VH (1) with unequal pitch UP (2) and to the highly sophisticated cutting edge preparation (3), the HF EVOlution endmills enable the highest level of performances in terms of tool life, volume of chip removed, productivity and surface finishing.

Grâce à la géométrie à hélice variable VH (1) à pas décalé UP (2) et à la préparation technique de la partie coupante (3), les fraises HF EVOlution garantissent des performances de haut niveau en termes de durée, volume de débit copeau, productivité et finition superficielle.

Grazie alla geometria ad elica variabile VH (1) con passo differenziato UP (2) e alla sofisticata preparazione del tagliente (3), le frese HF EVOlution garantiscono performance di alto livello in termini di durata, volume truciolo asportato, produttività e finitura superficiale.

Gracias a la geometría de hélice variable VH (1) con paso diferenciado UP (2) y a la sofisticada preparación del filo (3), las fresas HF EVOlution garantizan rendimientos de alto nivel en términos de duración, volumen de la viruta extraída, productividad y acabado de la superficie.

Dank der Geometrie mit variabler Helix VH (1) mit ungleicher Teilung UP (2) und der sorgfältigen Herstellung der Schneide (3) gewährleisten die Fräser HF EVOlution Höchstleistungen, was die Dauer, das Volumen des abgetragenen Spans, die Produktivität und das Oberflächenfinish betrifft.

Благодаря геометрии с переменным углом наклона спирали VH (1) с неравномерным шагом UP (2) и сложной формой зубьев (3), фрезы HF EVOlution гарантируют высокую производительность, стойкость, объем удаляемого материала и низкую шероховатость обработанной поверхности.

UNIVERSAL

The HF EVOlution endmills are universal tools, both for the broad range of materials machineable, the type of applications and for the milling strategies applicable: slotting, side milling, helical interpolation, ramping, vertical milling, drilling and trochoidal milling. Just one single HF tool enables roughing, semi-finishing and finishing applications.

Les fraises HF EVOlution sont des outils universels aussi bien pour tous types de matériaux que pour tous types d'usinages et de stratégies de fraisages applicables : fraisage de pièces taillées dans la masse, contournage, interpolation hélicoïdale, entrée sur rampe, fraisage axial, perçage et fraisage trochoïdal. Un seul outil HF permet de réaliser des usinages d'ébauche, semi finition et finition.

Le frese HF EVOlution sono utensili universali sia per la gamma dei materiali lavorabili che per il tipo di lavorazione e strategia di fresatura applicabile: fresatura dal pieno, contornatura, interpolazione elicoidale, entrata in rampa, fresatura assiale, foratura e fresatura trocoidale. Un unico utensile HF permette lavorazioni di sgrossatura, semi-sgrossatura e finitura.

Las fresas HF EVOlution son herramientas universales tanto por su gama de materiales trabajables como por el tipo de elaboración y estrategia de fresado aplicable: fresado de una sola pieza, contorneado, interpolación helicoidal, entrada en rampa, fresado axial, perforación y fresado trocoidal. Un sola herramienta HF permite elaboraciones de desbastado, semidesbastado y acabado.

Die Fräser HF EVOlution sind universelle Werkzeuge, sowohl aufgrund der breiten Palette bearbeitbarer Materialien als auch dank der anwendbaren Bearbeitungsarten und Frässtrategien: Nutfräsen, Konturfräsen, Helixinterpolation, Rampenfräsen, Vertikalfräsen, Bohren und trochoidales Fräsen. Ein einziges HF Werkzeug kann zum Schruppen, Vorschlichten und Schlichten eingesetzt werden.

Фрезы HF EVOlution являются универсальными инструментами как для широкой гаммы обрабатываемых материалов, так и для многих стратегий фрезерования: фрезерование пазов, уступов, по спирали, под углом, вдоль оси, сверление и трохоидальное фрезерование. С помощью одной фрезы серии HF можно выполнять черновую, получистовую и чистовую обработку.

HF UNI ~40HRC

HF UNI SC ~40HRC

HF HARD 30÷55HRC

COMPLETE RANGE

2 families of tools with application-specific geometries.
- HF UNI (VH+UP), designed for milling of materials with hardness up to 40 HRC: steel (ISO P), stainless steel (ISO M), cast iron (ISO K) and super alloys (ISO S), such as Inconel or Titanium. The HF UNI range is now extended with the new HF UNI SC "smooth cut" which reduces significantly the cutting forces thanks to the cutting edge geometry, becoming particularly suitable in case of machining with less powerful machines.
- HF HARD (UP) for steel (ISO P), stainless steel (ISO M), cast iron (ISO K), super alloys (ISO S), hardened steel (ISO H) milling, with hardness up to 55 HRC.

2 familles d'outils avec des géométries spécifiques.
- HF UNI (VH+UP), pour fraisage de matériaux dont la dureté peut atteindre 40HRC : acier (ISO P), acier inoxydable (ISO M), fonte (ISO K) et super alliages (ISO S), tels que l' inconel ou titane.
La gamme HF UNI s'enrichit de la nouvelle HF UNI SC « smooth cut » qui, grâce à la géométrie de coupe, réduit considérablement les efforts de coupe, ce qui la rend particulièrement adaptée à l'utilisation sur des machines peu puissantes.
- HF HARD (UP), pour fraisage d'acier (ISO P), acier inoxydable (ISO M), fonte (ISO K) et super alliages (ISO S), acier trempé (ISO H), dont la dureté peut atteindre 55HRC.

2 famiglie di utensili con geometrie specifiche.
- HF UNI (VH+UP), per fresatura di materiali con durezza sino a 40 HRC: acciaio (ISO P), acciaio inossidabile (ISO M), ghisa (ISO K) e super leghe (ISO S), quali Inconel o titanio. La gamma HF UNI si arricchisce della nuova HF UNI SC "smooth cut" che, grazie alla geometria del tagliente, riduce notevolmente gli sforzi di taglio, risultando particolarmente adatta all'utilizzo su macchine poco potenti.
- HF HARD (UP) per fresatura di acciaio (ISO P), acciaio inossidabile (ISO M), ghisa (ISO K), super leghe (ISO S), acciaio temprato (ISO H), con durezza sino a 55 HRC.

2 familias de herramientas con geometrías específicas.
- HF UNI (VH+UP), para fresado de materiales con dureza hasta 40HRC: acero (ISO P), acero inoxidable (ISO M), fundición (ISO K) y súper aleaciones (ISO S), como Inconel o titanio. La gama HF UNI se enriquece con la nueva HF UNI SC «smooth cut», que, gracias a la geometría del filo cortante, reduce de forma importante los esfuerzos de corte, resultando especialmente adecuada para su uso en máquinas poco potentes.
- HF HARD (UP), para fresado de acero (ISO P), acero inoxidable (ISO M), fundición (ISO K) y súper aleaciones (ISO S), acero templado (ISO H), con duración de hasta 55 HRC.

2 Werkzeugfamilien mit spezifischen Geometrien.
- HF UNI (VH+UP), zum Fräsen von Materialien mit einer Härte bis zu 40HRC: Stahl (ISO P), korrosionsbeständiger Stahl (ISO M), Gusseisen (ISO K) und Superlegierungen (ISO S) wie Inconel oder Titan. Die Serie HF UNI wird durch den neuen Fräser HF UNI SC „Smooth Cut" erweitert, bei dem dank der Geometrie der Schneide die aufzubringende Schnittkraft wesentlich verringert werden konnte, so dass dieser Fräser besonders für den Einsatz auf weniger leistungsfähigen Maschinen geeignet ist.
- HF HARD (UP) für das Fräsen von Stahl (ISO P), korrosionsbeständigem Stahl (ISO M), Gusseisen (ISO K), Superlegierungen (ISO S), gehärtetem Stahl (ISO H) mit einer Härten bis zu 55HRC.

2 семейства инструментов со специальной геометрией.
- HF UNI (VH+UP), для фрезерования материалов твердостью до 40HRC: сталь (ISO P), нержавеющая сталь (ISO M), чугун (ISO K) и жаропрочные сплавы (ISO S), такие как инконель и титан.
К этому семейству добавлена новая фреза HF UNI SC «smooth cut» (плавное резание), которая, благодаря форме зубьев, значительно сокращает усилия резания, что делает ее пригодной для использования на маломощных станках.
- HF HARD (UP) для фрезерования стали (ISO P), нержавеющей стали (ISO M), чугуна (ISO K), жаропрочных сплавов (ISO S), закаленной стали (ISO H) твердостью до 55 HRC.

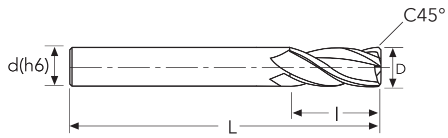
HF840

OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | Z4 UP

cylindrical shank, 45° chamfer

P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.030	0.10	+/-0.020	6	9		57	4	HF840030	h
4	0/-0.025	0.10	+/-0.020	6	11		57	4	HF840040	h
5	0/-0.025	0.10	+/-0.020	6	13		57	4	HF840050	h
6	0/-0.025	0.10	+/-0.020	6	13		57	4	HF840060	h
8	0/-0.030	0.20	+/-0.020	8	20		64	4	HF840080	h
10	0/-0.030	0.20	+/-0.020	10	22		72	4	HF840100	h
12	0/-0.030	0.20	+/-0.020	12	26		83	4	HF840120	h
14	0/-0.030	0.30	+/-0.020	14	32		90	4	HF840140	h
16	0/-0.030	0.30	+/-0.020	16	32		92	4	HF840160	h
18	0/-0.030	0.30	+/-0.020	18	32		92	4	HF840180	h
20	0/-0.030	0.40	+/-0.020	20	38		104	4	HF840200	h

h stock standard   f non-standard stock   m stock exhaustion

HF840

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
SLOTTING	**3**	14860	0.014	830	9550	0.013	480	7430	0.011	310	4250	0.010	170
	4	11150	0.019	830	7170	0.017	480	5570	0.014	310	3180	0.013	160
	5	8920	0.023	820	5730	0.021	470	4460	0.017	310	2550	0.016	160
	6	7430	0.027	800	4780	0.024	460	3720	0.020	300	2120	0.019	160
	8	5570	0.035	780	3580	0.032	450	2790	0.026	290	1590	0.025	160
	10	4460	0.042	750	2870	0.038	430	2230	0.032	280	1270	0.029	150
	12	3720	0.048	710	2390	0.043	410	1860	0.036	270	1060	0.034	140
	14	3180	0.054	690	2050	0.049	400	1590	0.041	260	910	0.038	140
	16	2790	0.060	670	1790	0.054	390	1390	0.045	250	800	0.042	130
	18	2480	0.066	650	1590	0.059	380	1240	0.050	250	710	0.046	130
	20	2230	0.073	650	1430	0.066	380	1110	0.055	240	640	0.051	130
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
	Vc (m/min)	**160-180**			**100-120**			**70-90**			**40-60**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
SIDE MILLING	**3**	18050	0.017	1210	11680	0.015	710	8490	0.013	460	5310	0.018	390
	4	13540	0.022	1200	8760	0.020	700	6370	0.018	450	3980	0.024	390
	5	10830	0.028	1200	7010	0.025	700	5100	0.022	450	3180	0.030	390
	6	9020	0.032	1170	5840	0.029	680	4250	0.026	440	2650	0.036	380
	8	6770	0.042	1140	4380	0.038	660	3180	0.034	430	1990	0.046	370
	10	5410	0.050	1090	3500	0.045	640	2550	0.040	410	1590	0.055	350
	12	4510	0.058	1040	2920	0.052	610	2120	0.046	390	1330	0.063	340
	14	3870	0.065	1000	2500	0.058	580	1820	0.052	380	1140	0.071	330
	16	3380	0.072	970	2190	0.065	570	1590	0.058	370	1000	0.079	320
	18	3010	0.079	950	1950	0.071	560	1420	0.063	360	880	0.087	310
	20	2710	0.088	950	1750	0.079	550	1270	0.070	360	800	0.096	310
ap x ae	**≤ D5**	1.5D x 0.25D			1.5D x 0.25D			1.2D x 0.1D			1.2D x 0.1D		

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
HELICAL	**3**	14860	0.010	605	9550	0.010	365	7430	0.008	250	4250	0.008	133
	4	11150	0.013	600	7170	0.013	360	5570	0.011	247	3180	0.010	132
	5	8920	0.017	600	5730	0.016	360	4460	0.014	246	2550	0.013	131
	6	7430	0.020	585	4780	0.018	350	3720	0.016	241	2120	0.015	128
	8	5570	0.025	570	3580	0.024	340	2790	0.021	235	1590	0.020	125
	10	4460	0.031	545	2870	0.029	325	2230	0.025	225	1270	0.024	120
	12	3720	0.035	520	2390	0.033	310	1860	0.029	214	1060	0.027	114
	14	3180	0.039	500	2050	0.037	300	1590	0.032	206	910	0.030	110
	16	2790	0.044	490	1790	0.041	290	1390	0.036	200	800	0.034	108
	18	2480	0.048	475	1590	0.045	285	1240	0.040	197	710	0.037	105
	20	2230	0.053	475	1430	0.050	285	1110	0.044	195	640	0.041	105
α° max	**≤ D5**	2°			2°			1°			1°		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF840

RAMPING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	7430	0.022	640	4780	0.020	380	3720	0.019	281	2120	0.026	220
	8	5570	0.028	620	3580	0.026	370	2790	0.024	273	1590	0.034	214
	10	4460	0.034	600	2870	0.031	355	2230	0.029	262	1270	0.040	205
	12	3720	0.038	570	2390	0.035	335	1860	0.034	250	1060	0.046	196
	14	3180	0.043	550	2050	0.040	325	1590	0.038	240	910	0.052	189
	16	2790	0.048	535	1790	0.044	315	1390	0.042	233	800	0.058	185
	18	2480	0.053	520	1590	0.048	310	1240	0.046	229	710	0.063	180
	20	2230	0.058	520	1430	0.054	305	1110	0.051	227	640	0.070	180

VERTICAL	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	7430	0.027	800	4780	0.024	460	3720	0.020	300	2120	0.019	160
	8	5570	0.035	780	3580	0.032	450	2790	0.026	290	1590	0.025	160
	10	4460	0.042	750	2870	0.038	430	2230	0.032	280	1270	0.029	150
	12	3720	0.048	710	2390	0.043	410	1860	0.036	270	1060	0.034	140
	14	3180	0.054	690	2050	0.049	400	1590	0.041	260	910	0.038	140
	16	2790	0.060	670	1790	0.054	390	1390	0.045	250	800	0.042	130
	18	2480	0.066	650	1590	0.059	380	1240	0.050	250	710	0.046	130
	20	2230	0.073	650	1430	0.066	380	1110	0.055	240	640	0.051	130

DRILLING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**100-120**			**60-80**			**45-65**			**590-690**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	11680	0.007	330	7430	0.006	190	5840	0.006	130	3180	0.008	100
	4	8760	0.009	320	5570	0.008	190	4380	0.007	130	2390	0.010	100
	5	7010	0.012	320	4460	0.010	180	3500	0.009	130	1910	0.013	100
	6	5840	0.014	320	3720	0.012	180	2920	0.011	130	1590	0.015	90
	8	4380	0.018	310	2790	0.016	180	2190	0.014	120	1190	0.019	90
	10	3500	0.021	290	2230	0.019	170	1750	0.017	120	960	0.023	90
	12	2920	0.024	280	1860	0.022	160	1460	0.019	110	800	0.026	80
	14	2500	0.027	270	1590	0.024	150	1250	0.022	110	680	0.030	80
	16	2190	0.030	260	1390	0.027	150	1090	0.024	100	600	0.033	80
	18	1950	0.033	260	1240	0.030	150	970	0.026	100	530	0.036	80
	20	1750	0.037	260	1110	0.033	150	880	0.029	100	480	0.040	80
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

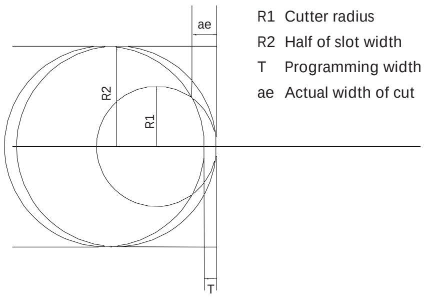
HF840

TROCHOIDAL

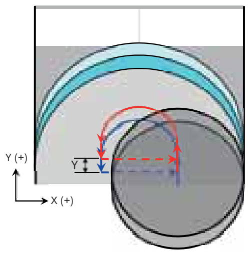
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.2D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**190-230**			**130-150**			**100-120**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	11680	0.035	1640	7430	0.032	940	5840	0.028	650	3180	0.039	490
4	8760	0.046	1620	5570	0.042	930	4380	0.037	650	2390	0.051	490
5	7010	0.058	1610	4460	0.052	920	3500	0.046	640	1910	0.063	480
6	5840	0.068	1580	3720	0.061	900	2920	0.054	630	1590	0.074	470
8	4380	0.088	1530	2790	0.079	880	2190	0.070	610	1190	0.096	460
10	3500	0.105	1470	2230	0.095	840	1750	0.084	590	960	0.116	440
12	2920	0.120	1400	1860	0.108	800	1460	0.096	560	800	0.132	420
14	2500	0.135	1350	1590	0.122	770	1250	0.108	540	680	0.149	400
16	2190	0.150	1310	1390	0.135	750	1090	0.120	520	600	0.165	400
18	1950	0.165	1290	1240	0.149	740	970	0.132	510	530	0.182	380
20	1750	0.183	1280	1110	0.164	730	880	0.146	510	480	0.201	390

ap x ae	≤ D5				
		1.5D x 0.1D	1.5D x 0.1D		

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



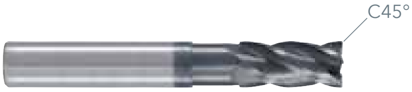
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

HF440

cylindrical shank and reduced neck, 45° chamfer

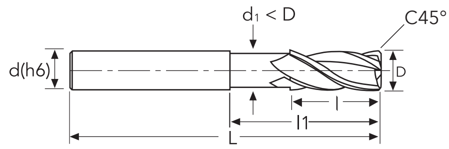
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | Z4 UP



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.10	+/-0.020	6	9	15	2.80	57	4	HF440030	h
4	0/-0.030	0.10	+/-0.020	6	11	18	3.80	57	4	HF440040	h
5	0/-0.030	0.10	+/-0.020	6	13	19	4.80	57	4	HF440050	h
6	0/-0.030	0.10	+/-0.020	6	13	20	5.80	57	4	HF440060	h
8	0/-0.030	0.20	+/-0.020	8	20	26	7.80	64	4	HF440080	h
10	0/-0.030	0.20	+/-0.020	10	22	30	9.80	72	4	HF440100	h
12	0/-0.030	0.20	+/-0.020	12	26	36	11.80	83	4	HF440120	h
14	0/-0.030	0.20	+/-0.020	14	26	36	13.70	83	4	HF440140	h
16	0/-0.030	0.30	+/-0.020	16	32	42	15.70	92	4	HF440160	h
20	0/-0.030	0.40	+/-0.020	20	38	50	19.70	104	4	HF440200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF440

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
SLOTTING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	12740	0.013	640	8490	0.011	390	6370	0.009	240	4250	0.009	150
	4	9550	0.017	640	6370	0.015	380	4780	0.012	240	3180	0.012	150
	5	7640	0.021	630	5100	0.019	380	3820	0.016	240	2550	0.014	150
	6	6370	0.024	620	4250	0.022	370	3180	0.018	230	2120	0.017	140
	8	4780	0.032	600	3180	0.028	360	2390	0.024	230	1590	0.022	140
	10	3820	0.038	580	2550	0.034	350	1910	0.028	220	1270	0.026	130
	12	3180	0.043	550	2120	0.039	330	1590	0.032	210	1060	0.030	130
	14	2730	0.049	530	1820	0.044	320	1360	0.036	200	910	0.034	120
	16	2390	0.054	520	1590	0.049	310	1190	0.041	190	800	0.038	120
	20	1910	0.066	500	1270	0.059	300	960	0.049	190	640	0.046	120
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3								
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2								
	ap x ae	**1.5D x D**			**1.5D x D**								
	Vc (m/min)	**85-105**			**55-75**								
SLOTTING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)						
	8	3780	0.025	380	2590	0.023	230						
	10	3030	0.030	370	2070	0.027	230						
	12	2520	0.035	350	1730	0.031	220						
	14	2160	0.039	340	1480	0.035	210						
	16	1890	0.043	330	1290	0.039	200						
	20	1510	0.053	320	1040	0.047	200						

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
	Vc (m/min)	**130-150**			**90-110**			**60-80**			**40-60**		
SIDE MILLING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	14860	0.015	900	10620	0.014	580	7430	0.012	360	5310	0.017	350
	4	11150	0.020	890	7960	0.018	570	5570	0.016	360	3980	0.022	350
	5	8920	0.025	890	6370	0.022	570	4460	0.020	350	3180	0.027	350
	6	7430	0.029	870	5310	0.026	560	3720	0.023	350	2650	0.032	340
	8	5570	0.038	840	3980	0.034	540	2790	0.030	340	1990	0.042	330
	10	4460	0.045	810	3180	0.041	520	2230	0.036	320	1590	0.050	320
	12	3720	0.052	770	2650	0.047	490	1860	0.041	310	1330	0.057	300
	14	3180	0.058	740	2270	0.052	480	1590	0.047	300	1140	0.064	290
	16	2790	0.065	720	1990	0.058	460	1390	0.052	290	1000	0.071	290
	20	2230	0.079	700	1590	0.071	450	1110	0.063	280	800	0.087	280
ap x ae	**≤ D5**	1.5D x 0.25D			1.5D x 0.25D			1.2D x 0.1D			1.2D x 0.1D		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

HF440

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
	Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
HELICAL	**3**	12740	0.009	470	8490	0.009	290	6370	0.008	193	4250	0.007	120
	4	9550	0.012	465	6370	0.011	290	4780	0.010	191	3180	0.009	119
	5	7640	0.015	460	5100	0.014	285	3820	0.012	190	2550	0.012	118
	6	6370	0.018	450	4250	0.016	280	3180	0.015	186	2120	0.014	115
	8	4780	0.023	440	3180	0.021	270	2390	0.019	181	1590	0.018	112
	10	3820	0.028	420	2550	0.026	260	1910	0.023	173	1270	0.021	108
	12	3180	0.031	400	2120	0.029	250	1590	0.026	165	1060	0.024	103
	14	2730	0.035	385	1820	0.033	240	1360	0.029	159	910	0.027	99
	16	2390	0.039	375	1590	0.037	235	1190	0.032	154	800	0.030	97
	20	1910	0.048	365	1270	0.045	225	960	0.039	151	640	0.037	94
α° max	**≤ D5**	2°			2°			1°			1°		

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
	Vc (m/min)	**100-120**			**60-80**			**45-65**			**30-40**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
RAMPING	**6**	5840	0.019	455	3720	0.018	265	2920	0.017	198	1860	0.023	174
	8	4380	0.025	440	2790	0.023	260	2190	0.022	193	1390	0.030	168
	10	3500	0.030	420	2230	0.028	250	1750	0.026	185	1110	0.036	161
	12	2920	0.034	405	1860	0.032	235	1460	0.030	176	930	0.042	154
	14	2500	0.039	390	1590	0.036	225	1250	0.034	170	800	0.047	149
	16	2190	0.043	375	1390	0.040	220	1090	0.038	165	700	0.052	145
	20	1750	0.052	365	1110	0.048	215	880	0.046	162	560	0.063	141

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²		
	α° x ae	**30° x D**			**15° x D**		
	Vc (m/min)	**80-100**			**45-65**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
RAMPING	**10**	2870	0.025	280	1750	0.023	160
	12	2390	0.028	270	1460	0.026	150
	14	2050	0.032	260	1250	0.029	145
	16	1790	0.035	250	1090	0.032	140
	20	1430	0.043	245	880	0.039	140

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF440

VERTICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
Vc (m/min)	**100-120**			**60-80**			**45-65**			**30-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.024	570	3720	0.022	330	2920	0.018	210	1860	0.017	130
8	4380	0.032	550	2790	0.028	320	2190	0.024	210	1390	0.022	120
10	3500	0.038	530	2230	0.034	300	1750	0.028	200	1110	0.026	120
12	2920	0.043	500	1860	0.039	290	1460	0.032	190	930	0.030	110
14	2500	0.049	490	1590	0.044	280	1250	0.036	180	800	0.034	110
16	2190	0.054	470	1390	0.049	270	1090	0.041	180	700	0.038	110
20	1750	0.066	460	1110	0.059	260	880	0.049	170	560	0.046	100

DRILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D x D**			**D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**85-105**			**55-75**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10080	0.006	250	6900	0.006	160	5310	0.005	110	3180	0.007	90
4	7560	0.008	250	5180	0.007	160	3980	0.007	110	2390	0.009	90
5	6050	0.010	250	4140	0.009	150	3180	0.008	110	1910	0.011	90
6	5040	0.012	240	3450	0.011	150	2650	0.010	100	1590	0.013	90
8	3780	0.016	240	2590	0.014	150	1990	0.013	100	1190	0.017	80
10	3030	0.019	230	2070	0.017	140	1590	0.015	100	960	0.021	80
12	2520	0.022	220	1730	0.019	130	1330	0.017	90	800	0.024	80
14	2160	0.024	210	1480	0.022	130	1140	0.019	90	680	0.027	70
16	1890	0.027	200	1290	0.024	130	1000	0.022	90	600	0.030	70
20	1510	0.033	200	1040	0.030	120	800	0.026	80	480	0.036	70

ap x ae	**≤ D5**				
		0.5D x D	0.5D x D	0.25D x D	0.25D x D

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

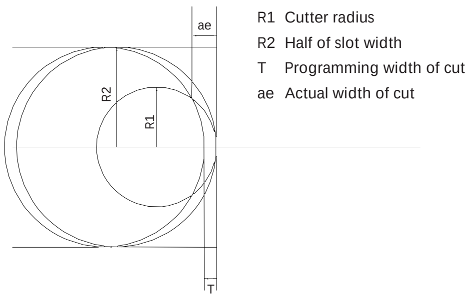
HF440

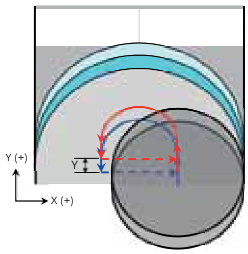
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10080	0.032	1270	6900	0.028	780	5310	0.025	540	3180	0.035	440
4	7560	0.042	1260	5180	0.037	780	3980	0.033	530	2390	0.046	440
5	6050	0.052	1250	4140	0.047	770	3180	0.041	530	1910	0.057	430
6	5040	0.061	1220	3450	0.055	750	2650	0.049	520	1590	0.067	430
8	3780	0.079	1190	2590	0.071	730	1990	0.063	500	1190	0.087	410
10	3030	0.095	1150	2070	0.085	700	1590	0.076	480	960	0.104	400
12	2520	0.108	1090	1730	0.097	670	1330	0.086	460	800	0.119	380
14	2160	0.122	1050	1480	0.109	650	1140	0.097	440	680	0.134	360
16	1890	0.135	1020	1290	0.122	630	1000	0.108	430	600	0.149	360
20	1510	0.164	990	1040	0.148	610	800	0.131	420	480	0.181	350

TROCHOIDAL

ap x ae	≤ D5	1.5D x 0.1D	1.5D x 0.1D		

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



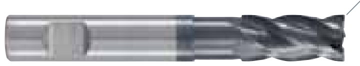


PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF441

OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | Z4 UP

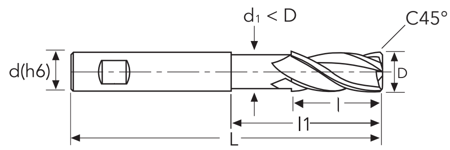
weldon shank and reduced neck, 45° chamfer



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.10	+/-0.020	6	9	15	2.80	57	4	HF441030	h
4	0/-0.030	0.10	+/-0.020	6	11	18	3.80	57	4	HF441040	h
5	0/-0.030	0.10	+/-0.020	6	13	19	4.80	57	4	HF441050	h
6	0/-0.030	0.10	+/-0.020	6	13	20	5.80	57	4	HF441060	h
8	0/-0.030	0.20	+/-0.020	8	20	26	7.80	64	4	HF441080	h
10	0/-0.030	0.20	+/-0.020	10	22	30	9.80	72	4	HF441100	h
12	0/-0.030	0.20	+/-0.020	12	26	36	11.80	83	4	HF441120	h
14	0/-0.030	0.20	+/-0.020	14	26	36	13.70	83	4	HF441140	h
16	0/-0.030	0.30	+/-0.020	16	32	42	15.70	92	4	HF441160	h
18	0/-0.030	0.30	+/-0.020	18	32	42	17.70	92	4	HF441180	h
20	0/-0.030	0.40	+/-0.020	20	38	50	19.70	104	4	HF441200	h

h stock standard   f non-standard stock   m stock exhaustion

HF441

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	12740	0.013	640	8490	0.011	390	6370	0.009	240	4250	0.009	150
4	9550	0.017	640	6370	0.015	380	4780	0.012	240	3180	0.012	150
5	7640	0.021	630	5100	0.019	380	3820	0.016	240	2550	0.014	150
6	6370	0.024	620	4250	0.022	370	3180	0.018	230	2120	0.017	140
8	4780	0.032	600	3180	0.028	360	2390	0.024	230	1590	0.022	140
10	3820	0.038	580	2550	0.034	350	1910	0.028	220	1270	0.026	130
12	3180	0.043	550	2120	0.039	330	1590	0.032	210	1060	0.030	130
14	2730	0.049	530	1820	0.044	320	1360	0.036	200	910	0.034	120
16	2390	0.054	520	1590	0.049	310	1190	0.041	190	800	0.038	120
18	2120	0.059	500	1420	0.053	300	1060	0.045	190	710	0.042	120
20	1910	0.066	500	1270	0.059	300	960	0.049	190	640	0.046	120
ap x ae ≤ D5	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2		
ap x ae	**1.5D x D**			**1.5D x D**		
Vc (m/min)	**85-105**			**55-75**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	3780	0.025	380	2590	0.023	230
10	3030	0.030	370	2070	0.027	230
12	2520	0.035	350	1730	0.031	220
14	2160	0.039	340	1480	0.035	210
16	1890	0.043	330	1290	0.039	200
18	1680	0.048	320	1150	0.043	200
20	1510	0.053	320	1040	0.047	200

SLOTTING

Material Group ISO 513	P1 P2 M1 K1		
Hardness/Rm	≤ 700 N/mm^2		
ap x ae	**2D x D**		
Vc (m/min)	**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)
10	2230	0.023	200
12	1860	0.026	190
14	1590	0.029	190
16	1390	0.032	180
18	1240	0.036	180
20	1110	0.039	180

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

HF441

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
Vc (m/min)	**130-150**			**90-110**			**60-80**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	14860	0.015	900	10620	0.014	580	7430	0.012	360	5310	0.017	350
4	11150	0.020	890	7960	0.018	570	5570	0.016	360	3980	0.022	350
5	8920	0.025	890	6370	0.022	570	4460	0.020	350	3180	0.027	350
6	7430	0.029	870	5310	0.026	560	3720	0.023	350	2650	0.032	340
8	5570	0.038	840	3980	0.034	540	2790	0.030	340	1990	0.042	330
10	4460	0.045	810	3180	0.041	520	2230	0.036	320	1590	0.050	320
12	3720	0.052	770	2650	0.047	490	1860	0.041	310	1330	0.057	300
14	3180	0.058	740	2270	0.052	480	1590	0.047	300	1140	0.064	290
16	2790	0.065	720	1990	0.058	460	1390	0.052	290	1000	0.071	290
18	2480	0.071	710	1770	0.064	450	1240	0.057	280	880	0.078	280
20	2230	0.079	700	1590	0.071	450	1110	0.063	280	800	0.087	280

ap x ae	≤ D5	1.5D x 0.25D	1.5D x 0.25D	1.2D x 0.1D	1.2D x 0.1D

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	12740	0.009	470	8490	0.009	290	6370	0.008	193	4250	0.007	120
4	9550	0.012	465	6370	0.011	290	4780	0.010	191	3180	0.009	119
5	7640	0.015	460	5100	0.014	285	3820	0.012	190	2550	0.012	118
6	6370	0.018	450	4250	0.016	280	3180	0.015	186	2120	0.014	115
8	4780	0.023	440	3180	0.021	270	2390	0.019	181	1590	0.018	112
10	3820	0.028	420	2550	0.026	260	1910	0.023	173	1270	0.021	108
12	3180	0.031	400	2120	0.029	250	1590	0.026	165	1060	0.024	103
14	2730	0.035	385	1820	0.033	240	1360	0.029	159	910	0.027	99
16	2390	0.039	375	1590	0.037	235	1190	0.032	154	800	0.030	97
18	2120	0.043	365	1420	0.040	230	1060	0.036	151	710	0.033	95
20	1910	0.048	365	1270	0.045	225	960	0.039	151	640	0.037	94

α° max	≤ D5	2°	2°	1°	1°

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF441

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	15° x D			10° x D			5° x D			5° x D		
Vc (m/min)	100-120			60-80			45-65			30-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.019	455	3720	0.018	265	2920	0.017	198	1860	0.023	174
8	4380	0.025	440	2790	0.023	260	2190	0.022	193	1390	0.030	168
10	3500	0.030	420	2230	0.028	250	1750	0.026	185	1110	0.036	161
12	2920	0.034	405	1860	0.032	235	1460	0.030	176	930	0.042	154
14	2500	0.039	390	1590	0.036	225	1250	0.034	170	800	0.047	149
16	2190	0.043	375	1390	0.040	220	1090	0.038	165	700	0.052	145
18	1950	0.047	370	1240	0.044	215	970	0.042	161	620	0.057	142
20	1750	0.052	365	1110	0.048	215	880	0.046	162	560	0.063	141

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²		
α° x ae	30° x D			15° x D		
Vc (m/min)	85-105			55-75		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
10	2870	0.025	280	1750	0.023	160
12	2390	0.028	270	1460	0.026	150
14	2050	0.032	260	1250	0.029	145
16	1790	0.035	250	1090	0.032	140
18	1590	0.039	245	970	0.036	140
20	1430	0.043	245	880	0.039	140

RAMPING

Material Group ISO 513	P1 P2 M1 K1		
Hardness/Rm	≤ 700 N/mm²		
α° x ae	45° x D		
Vc (m/min)	60-80		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)
10	2070	0.024	200
12	1730	0.028	195
14	1480	0.031	185
16	1290	0.035	180
18	1150	0.038	175
20	1040	0.042	175

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

CUTTING PARAMETERS

HF441

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
	Vc (m/min)	**100-120**			**60-80**			**45-65**			**30-40**		
VERTICAL	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	5840	0.024	570	3720	0.022	330	2920	0.018	210	1860	0.017	130
	8	4380	0.032	550	2790	0.028	320	2190	0.024	210	1390	0.022	120
	10	3500	0.038	530	2230	0.034	300	1750	0.028	200	1110	0.026	120
	12	2920	0.043	500	1860	0.039	290	1460	0.032	190	930	0.030	110
	14	2500	0.049	490	1590	0.044	280	1250	0.036	180	800	0.034	110
	16	2190	0.054	470	1390	0.049	270	1090	0.041	180	700	0.038	110
	18	1950	0.059	460	1240	0.053	270	970	0.045	170	620	0.042	100
	20	1750	0.066	460	1110	0.059	260	880	0.049	170	560	0.046	100

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**85-105**			**55-75**			**40-60**			**20-40**		
DRILLING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	10080	0.006	250	6900	0.006	160	5310	0.005	110	3180	0.007	90
	4	7560	0.008	250	5180	0.007	160	3980	0.007	110	2390	0.009	90
	5	6050	0.010	250	4140	0.009	150	3180	0.008	110	1910	0.011	90
	6	5040	0.012	240	3450	0.011	150	2650	0.010	100	1590	0.013	90
	8	3780	0.016	240	2590	0.014	150	1990	0.013	100	1190	0.017	80
	10	3030	0.019	230	2070	0.017	140	1590	0.015	100	960	0.021	80
	12	2520	0.022	220	1730	0.019	130	1330	0.017	90	800	0.024	80
	14	2160	0.024	210	1480	0.022	130	1140	0.019	90	680	0.027	70
	16	1890	0.027	200	1290	0.024	130	1000	0.022	90	600	0.030	70
	18	1680	0.030	200	1150	0.027	120	880	0.024	80	530	0.033	70
	20	1510	0.033	200	1040	0.030	120	800	0.026	80	480	0.036	70

ap x ae	**≤ D5**	0.5D x D	0.5D x D	0.25D x D	0.25D x D

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

CUTTING PARAMETERS

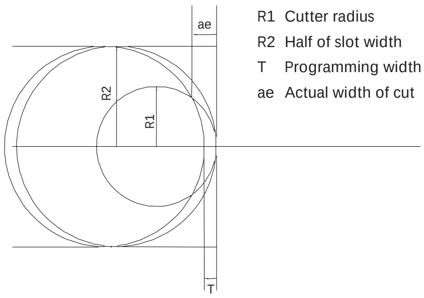
HF441

TROCHOIDAL

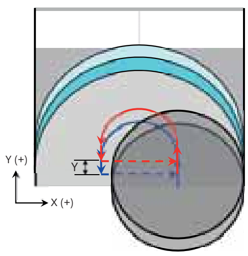
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10080	0.032	1270	6900	0.028	780	5310	0.025	540	3180	0.035	440
4	7560	0.042	1260	5180	0.037	780	3980	0.033	530	2390	0.046	440
5	6050	0.052	1250	4140	0.047	770	3180	0.041	530	1910	0.057	430
6	5040	0.061	1220	3450	0.055	750	2650	0.049	520	1590	0.067	430
8	3780	0.079	1190	2590	0.071	730	1990	0.063	500	1190	0.087	410
10	3030	0.095	1150	2070	0.085	700	1590	0.076	480	960	0.104	400
12	2520	0.108	1090	1730	0.097	670	1330	0.086	460	800	0.119	380
14	2160	0.122	1050	1480	0.109	650	1140	0.097	440	680	0.134	360
16	1890	0.135	1020	1290	0.122	630	1000	0.108	430	600	0.149	360
18	1680	0.149	1000	1150	0.134	610	880	0.119	420	530	0.163	350
20	1510	0.164	990	1040	0.148	610	800	0.131	420	480	0.181	350

ap x ae	**≤ D5**	1.5D x 0.1D	1.5D x 0.1D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



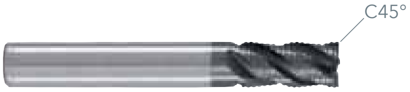
R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

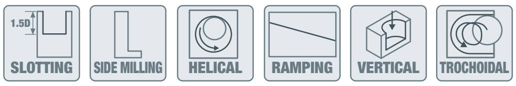
HF844

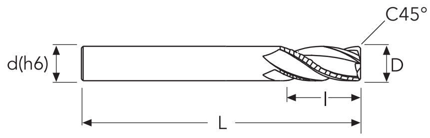
cylindrical shank, 45° chamfer, roughing HR



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable





D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.030	0.10	+/-0.020	6	16		57	4	HF844060	h
8	0/-0.030	0.20	+/-0.020	8	20		64	4	HF844080	h
10	0/-0.030	0.20	+/-0.020	10	22		72	4	HF844100	h
12	0/-0.030	0.20	+/-0.020	12	26		83	4	HF844120	h
14	0/-0.030	0.20	+/-0.020	14	26		83	4	HF844140	h
16	0/-0.030	0.30	+/-0.020	16	32		92	4	HF844160	h
18	0/-0.030	0.30	+/-0.020	18	32		92	4	HF844180	h
20	0/-0.030	0.40	+/-0.020	20	38		104	4	HF844200	h

h stock standard f non-standard stock m stock exhaustion

HF844

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
SLOTTING	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	6370	0.029	740	4250	0.026	450	3180	0.022	280	2120	0.020	170
	8	4780	0.038	720	3180	0.034	430	2390	0.028	270	1590	0.026	170
	10	3820	0.045	690	2550	0.041	420	1910	0.034	260	1270	0.032	160
	12	3180	0.052	660	2120	0.047	400	1590	0.039	250	1060	0.036	150
	14	2730	0.058	640	1820	0.052	380	1360	0.044	240	910	0.041	150
	16	2390	0.065	620	1590	0.058	370	1190	0.049	230	800	0.045	150
	18	2120	0.071	600	1420	0.064	360	1060	0.053	230	710	0.050	140
	20	1910	0.079	600	1270	0.071	360	960	0.059	230	640	0.055	140

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3								
SLOTTING	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²								
	ap x ae	**1.5D x D**			**1.5D x D**								
	Vc (m/min)	**85-105**			**55-75**								
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)						
	6	5040	0.023	470	3450	0.021	290						
	8	3780	0.030	460	2590	0.027	280						
	10	3030	0.036	440	2070	0.033	270						
	12	2520	0.041	420	1730	0.037	260						
	14	2160	0.047	400	1480	0.042	250						
	16	1890	0.052	390	1290	0.047	240						
	18	1680	0.057	380	1150	0.051	240						
	20	1510	0.063	380	1040	0.057	240						

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
SIDE MILLING	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
	Vc (m/min)	**130-150**			**90-110**			**60-80**			**40-60**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	7430	0.035	1040	5310	0.031	670	3720	0.028	420	2650	0.038	410
	8	5570	0.045	1010	3980	0.041	650	2790	0.036	400	1990	0.050	400
	10	4460	0.054	970	3180	0.049	620	2230	0.044	390	1590	0.060	380
	12	3720	0.062	930	2650	0.056	590	1860	0.050	370	1330	0.068	360
	14	3180	0.070	890	2270	0.063	570	1590	0.056	360	1140	0.077	350
	16	2790	0.078	870	1990	0.070	560	1390	0.062	350	1000	0.086	340
	18	2480	0.086	850	1770	0.077	550	1240	0.068	340	880	0.094	330
	20	2230	0.095	840	1590	0.085	540	1110	0.076	340	800	0.104	330

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF844

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	8° x 0.4D			6° x 0.4D			4° x 0.4D			3° x 0.4D		
Vc (m/min)	110-130			70-90			50-70			30-50		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.020	515	4250	0.019	315	3180	0.016	210	2120	0.016	139
8	4780	0.026	500	3180	0.024	310	2390	0.021	204	1590	0.021	135
10	3820	0.031	480	2550	0.029	295	1910	0.026	196	1270	0.025	129
12	3180	0.036	455	2120	0.033	280	1590	0.029	187	1060	0.029	123
14	2730	0.040	440	1820	0.037	270	1360	0.033	179	910	0.033	119
16	2390	0.045	430	1590	0.041	265	1190	0.037	174	800	0.036	116
18	2120	0.049	420	1420	0.046	260	1060	0.040	171	710	0.040	113
20	1910	0.055	415	1270	0.050	255	960	0.045	171	640	0.044	113

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	15° x D			10° x D			5° x D			5° x D		
Vc (m/min)	100-120			60-80			45-65			30-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.023	545	3720	0.021	320	2920	0.020	238	1860	0.028	209
8	4380	0.030	530	2790	0.028	310	2190	0.026	231	1390	0.036	202
10	3500	0.036	505	2230	0.033	295	1750	0.032	222	1110	0.044	194
12	2920	0.041	485	1860	0.038	285	1460	0.036	212	930	0.050	185
14	2500	0.047	465	1590	0.043	270	1250	0.041	204	800	0.056	179
16	2190	0.052	455	1390	0.048	265	1090	0.045	197	700	0.062	174
18	1950	0.057	445	1240	0.052	260	970	0.050	193	620	0.069	170
20	1750	0.063	440	1110	0.058	255	880	0.055	194	560	0.076	170

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²		
α° x ae	30° x D			15° x D		
Vc (m/min)	85-105			45-65		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
10	2870	0.030	340	1750	0.027	190
12	2390	0.034	320	1460	0.031	180
14	2050	0.038	310	1250	0.035	175
16	1790	0.042	300	1090	0.039	170
18	1590	0.046	295	970	0.043	165
20	1430	0.051	295	880	0.047	165

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF844

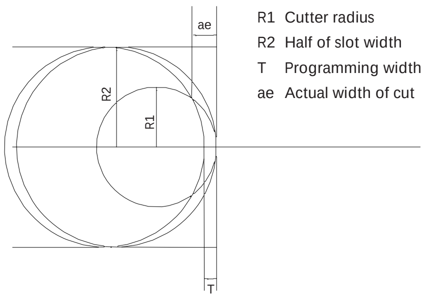
VERTICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	100-120			60-80			45-65			30-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.029	680	3720	0.026	390	2920	0.022	260	1860	0.020	150
8	4380	0.038	660	2790	0.034	380	2190	0.028	250	1390	0.026	150
10	3500	0.045	640	2230	0.041	360	1750	0.034	240	1110	0.032	140
12	2920	0.052	610	1860	0.047	350	1460	0.039	230	930	0.036	130
14	2500	0.058	580	1590	0.052	330	1250	0.044	220	800	0.041	130
16	2190	0.065	570	1390	0.058	320	1090	0.049	210	700	0.045	130
18	1950	0.071	560	1240	0.064	320	970	0.053	210	620	0.050	120
20	1750	0.079	550	1110	0.071	320	880	0.059	210	560	0.055	120

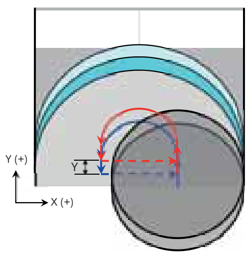
TROCHOIDAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	2D x 0.2D			2D x 0.1D			1.5D x 0.1D			1.5D x 0.1D		
Vc (m/min)	160-200			110-130			80-100			50-70		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5040	0.073	1470	3450	0.066	910	2650	0.058	620	1590	0.080	510
8	3780	0.095	1430	2590	0.085	880	1990	0.076	600	1190	0.104	490
10	3030	0.113	1370	2070	0.102	850	1590	0.091	580	960	0.125	480
12	2520	0.130	1310	1730	0.117	810	1330	0.104	550	800	0.143	460
14	2160	0.146	1260	1480	0.131	780	1140	0.117	530	680	0.160	440
16	1890	0.162	1220	1290	0.146	750	1000	0.130	520	600	0.178	430
18	1680	0.178	1200	1150	0.160	740	880	0.143	500	530	0.196	420
20	1510	0.197	1190	1040	0.177	740	800	0.158	500	480	0.217	420

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF444

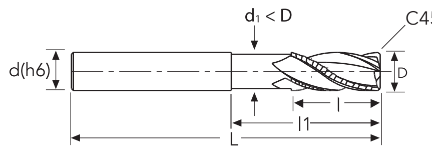
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | HR FINE | Z4 UP

cylindrical shank and reduced neck, 45° chamfer, roughing HR

P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
6	0/-0.030	0.10	+/-0.020	6	13	20	5.80	57	4	HF444060	h
8	0/-0.030	0.20	+/-0.020	8	20	26	7.80	64	4	HF444080	h
10	0/-0.030	0.20	+/-0.020	10	22	30	9.80	72	4	HF444100	h
12	0/-0.030	0.20	+/-0.020	12	26	36	11.80	83	4	HF444120	h
14	0/-0.030	0.20	+/-0.020	14	26	36	13.70	83	4	HF444140	h
16	0/-0.030	0.30	+/-0.020	16	32	42	15.70	92	4	HF444160	h
20	0/-0.030	0.40	+/-0.020	20	38	50	19.70	104	4	HF444200	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF444

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	D X D			D x D			0.5D x D			0.5D x D		
Vc (m/min)	110-130			70-90			50-70			30-50		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.026	670	4250	0.024	400	3180	0.020	250	2120	0.018	160
8	4780	0.034	650	3180	0.031	390	2390	0.026	240	1590	0.024	150
10	3820	0.041	620	2550	0.037	370	1910	0.031	230	1270	0.029	150
12	3180	0.047	590	2120	0.042	360	1590	0.035	220	1060	0.033	140
14	2730	0.052	570	1820	0.047	340	1360	0.039	210	910	0.037	130
16	2390	0.058	560	1590	0.052	330	1190	0.044	210	800	0.041	130
20	1910	0.071	540	1270	0.064	320	960	0.053	200	640	0.050	130

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3								
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2								
ap x ae	1.5D x D			1.5D x D								
Vc (m/min)	85-105			55-75								
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)						
6	5040	0.021	420	3450	0.019	260						
8	3780	0.027	410	2590	0.024	250						
10	3030	0.033	400	2070	0.029	240						
12	2520	0.037	380	1730	0.034	230						
14	2160	0.042	360	1480	0.038	220						
16	1890	0.047	350	1290	0.042	220						
20	1510	0.057	340	1040	0.051	210						

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.2D x 0.3D			1.2D x 0.3D		
Vc (m/min)	130-150			90-110			60-80			40-60		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	7430	0.031	940	5310	0.028	600	3720	0.025	370	2650	0.035	370
8	5570	0.041	910	3980	0.037	580	2790	0.033	360	1990	0.045	360
10	4460	0.049	870	3180	0.044	560	2230	0.039	350	1590	0.054	340
12	3720	0.056	830	2650	0.050	530	1860	0.045	330	1330	0.062	330
14	3180	0.063	800	2270	0.057	510	1590	0.050	320	1140	0.069	320
16	2790	0.070	780	1990	0.063	500	1390	0.056	310	1000	0.077	310
20	2230	0.085	760	1590	0.077	490	1110	0.068	300	800	0.094	300

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF444

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	7° x 0.4D			5° x 0.4D			3° x 0.4D			3° x 0.4D		
Vc (m/min)	110-130			70-90			50-70			30-50		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.018	470	4250	0.017	290	3180	0.016	200	2120	0.015	125
8	4780	0.024	455	3180	0.022	285	2390	0.020	195	1590	0.019	121
10	3820	0.029	435	2550	0.027	275	1910	0.025	187	1270	0.023	116
12	3180	0.033	415	2120	0.031	260	1590	0.028	178	1060	0.026	111
14	2730	0.037	400	1820	0.034	250	1360	0.032	171	910	0.029	107
16	2390	0.041	390	1590	0.038	245	1190	0.035	167	800	0.033	105
20	1910	0.050	380	1270	0.046	235	960	0.043	164	640	0.040	102

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	15° x D			10° x D			5° x D			5° x D		
Vc (m/min)	100-120			60-80			45-65			30-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.021	490	3720	0.019	285	2920	0.018	214	1860	0.025	188
8	4380	0.027	475	2790	0.025	280	2190	0.024	208	1390	0.033	182
10	3500	0.033	455	2230	0.030	265	1750	0.029	200	1110	0.039	174
12	2920	0.037	435	1860	0.034	255	1460	0.033	190	930	0.045	167
14	2500	0.042	420	1590	0.039	245	1250	0.037	183	800	0.050	161
16	2190	0.047	410	1390	0.043	240	1090	0.041	178	700	0.056	157
20	1750	0.057	395	1110	0.052	230	880	0.050	175	560	0.068	153

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3								
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²								
α° x ae	30° x D			15° x D								
Vc (m/min)	85-105			45-65								
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)						
10	2870	0.027	305	1750	0.024	170						
12	2390	0.030	290	1460	0.028	165						
14	2050	0.034	280	1250	0.031	155						
16	1790	0.038	270	1090	0.035	150						
20	1430	0.046	265	880	0.042	150						

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF444

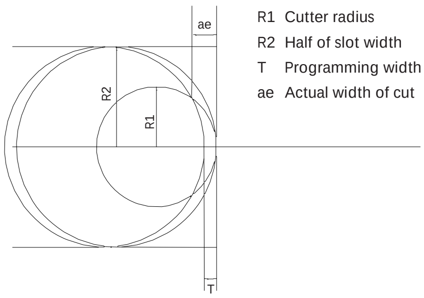
VERTICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	100-120			60-80			45-65			30-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.026	610	3720	0.024	350	2920	0.020	230	1860	0.018	140
8	4380	0.034	600	2790	0.031	340	2190	0.026	220	1390	0.024	130
10	3500	0.041	570	2230	0.037	330	1750	0.031	210	1110	0.029	130
12	2920	0.047	540	1860	0.042	310	1460	0.035	200	930	0.033	120
14	2500	0.052	520	1590	0.047	300	1250	0.039	200	800	0.037	120
16	2190	0.058	510	1390	0.052	290	1090	0.044	190	700	0.041	110
20	1750	0.071	500	1110	0.064	280	880	0.053	190	560	0.050	110

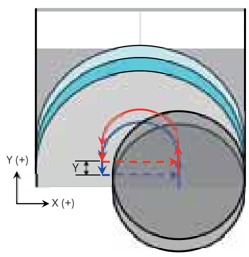
TROCHOIDAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	2D x 0.2D			2D x 0.1D			1.5D x 0.1D			1.5D x 0.1D		
Vc (m/min)	160-200			110-130			80-100			50-70		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5040	0.066	1320	3450	0.059	810	2650	0.052	560	1590	0.072	460
8	3780	0.085	1290	2590	0.077	790	1990	0.068	540	1190	0.094	450
10	3030	0.102	1240	2070	0.092	760	1590	0.082	520	960	0.112	430
12	2520	0.117	1180	1730	0.105	730	1330	0.093	500	800	0.128	410
14	2160	0.131	1130	1480	0.118	700	1140	0.105	480	680	0.144	390
16	1890	0.146	1100	1290	0.131	680	1000	0.117	470	600	0.160	380
20	1510	0.177	1070	1040	0.160	660	800	0.142	450	480	0.195	370

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut

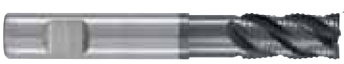


PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF445

weldon shank and reduced neck, 45° chamfer, roughing HR

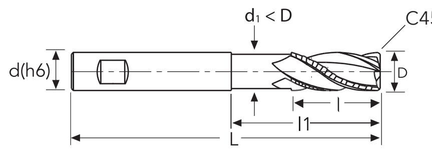
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | HR FINE | Z4 UP



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SLOTTING (1.5D) | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
6	0/-0.030	0.10	+/-0.020	6	13	20	5.80	57	4	HF445060	h
8	0/-0.030	0.20	+/-0.020	8	20	26	7.80	64	4	HF445080	h
10	0/-0.030	0.20	+/-0.020	10	22	30	9.80	72	4	HF445100	h
12	0/-0.030	0.20	+/-0.020	12	26	36	11.80	83	4	HF445120	h
14	0/-0.030	0.20	+/-0.020	14	26	36	13.70	83	4	HF445140	h
16	0/-0.030	0.30	+/-0.020	16	32	42	15.70	92	4	HF445160	h
20	0/-0.030	0.40	+/-0.020	20	38	50	19.70	104	4	HF445200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF445

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D X D			D x D			0.5D x D			0.5D x D		
Vc (m/min)	110-130			70-90			50-70			30-50		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.026	670	4250	0.024	400	3180	0.020	250	2120	0.018	160
8	4780	0.034	650	3180	0.031	390	2390	0.026	240	1590	0.024	150
10	3820	0.041	620	2550	0.037	370	1910	0.031	230	1270	0.029	150
12	3180	0.047	590	2120	0.042	360	1590	0.035	220	1060	0.033	140
14	2730	0.052	570	1820	0.047	340	1360	0.039	210	910	0.037	130
16	2390	0.058	560	1590	0.052	330	1190	0.044	210	800	0.041	130
20	1910	0.071	540	1270	0.064	320	960	0.053	200	640	0.050	130

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²		
ap x ae	1.5D x D			1.5D x D		
Vc (m/min)	85-105			55-75		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	3780	0.027	410	2590	0.024	250
10	3030	0.033	400	2070	0.029	240
12	2520	0.037	380	1730	0.034	230
14	2160	0.042	360	1480	0.038	220
16	1890	0.047	350	1290	0.042	220
20	1510	0.057	340	1040	0.051	210

SLOTTING

Material Group ISO 513	P1 P2 M1 K1		
Hardness/Rm	≤ 700 N/mm²		
ap x ae	2D x D		
Vc (m/min)	60-80		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	3720	0.016	230
8	2790	0.020	230
10	2230	0.024	220
12	1860	0.028	210
14	1590	0.031	200
16	1390	0.035	190
20	1110	0.043	190

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

HF445

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
Vc (m/min)	**130-150**			**90-110**			**60-80**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	7430	0.031	940	5310	0.028	600	3720	0.025	370	2650	0.035	370
8	5570	0.041	910	3980	0.037	580	2790	0.033	360	1990	0.045	360
10	4460	0.049	870	3180	0.044	560	2230	0.039	350	1590	0.054	340
12	3720	0.056	830	2650	0.050	530	1860	0.045	330	1330	0.062	330
14	3180	0.063	800	2270	0.057	510	1590	0.050	320	1140	0.069	320
16	2790	0.070	780	1990	0.063	500	1390	0.056	310	1000	0.077	310
20	2230	0.085	760	1590	0.077	490	1110	0.068	300	800	0.094	300

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	**7° x 0.4D**			**5° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.018	470	4250	0.017	290	3180	0.016	200	2120	0.015	125
8	4780	0.024	455	3180	0.022	285	2390	0.020	195	1590	0.019	121
10	3820	0.029	435	2550	0.027	275	1910	0.025	187	1270	0.023	116
12	3180	0.033	415	2120	0.031	260	1590	0.028	178	1060	0.026	111
14	2730	0.037	400	1820	0.034	250	1360	0.032	171	910	0.029	107
16	2390	0.041	390	1590	0.038	245	1190	0.035	167	800	0.033	105
20	1910	0.050	380	1270	0.046	235	960	0.043	164	640	0.040	102

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
Vc (m/min)	**100-120**			**60-80**			**45-65**			**30-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	4380	0.027	475	2790	0.025	280	2190	0.024	208	1390	0.033	182
10	3500	0.033	455	2230	0.030	265	1750	0.029	200	1110	0.039	174
12	2920	0.037	435	1860	0.034	255	1460	0.033	190	930	0.045	167
14	2500	0.042	420	1590	0.039	245	1250	0.037	183	800	0.050	161
16	2190	0.047	410	1390	0.043	240	1090	0.041	178	700	0.056	157
20	1750	0.057	395	1110	0.052	230	880	0.050	175	560	0.068	153

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

CUTTING PARAMETERS

HF445

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**30° x D**			**15° x D**								
	Vc (m/min)	**85-105**			**45-65**								
RAMPING	**D (mm)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**						
	10	2870	0.027	305	1750	0.024	170						
	12	2390	0.030	290	1460	0.028	165						
	14	2050	0.034	280	1250	0.031	155						
	16	1790	0.038	270	1090	0.035	150						
	20	1430	0.046	265	880	0.042	150						

	Material Group ISO 513	P1 P2 M1 K1											
	Hardness/Rm	≤ 700 N/mm²											
	α° x ae	**45° x D**											
	Vc (m/min)	**55-75**											
RAMPING	**D (mm)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**									
	10	2070	0.026	220									
	12	1730	0.030	210									
	14	1480	0.034	200									
	16	1290	0.038	195									
	20	1040	0.046	190									

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
	Vc (m/min)	**100-120**			**60-80**			**45-65**			**30-40**		
VERTICAL	**D (mm)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**
	6	5840	0.026	610	3720	0.024	350	2920	0.020	230	1860	0.018	140
	8	4380	0.034	600	2790	0.031	340	2190	0.026	220	1390	0.024	130
	10	3500	0.041	570	2230	0.037	330	1750	0.031	210	1110	0.029	130
	12	2920	0.047	540	1860	0.042	310	1460	0.035	200	930	0.033	120
	14	2500	0.052	520	1590	0.047	300	1250	0.039	200	800	0.037	120
	16	2190	0.058	510	1390	0.052	290	1090	0.044	190	700	0.041	110
	20	1750	0.071	500	1110	0.064	280	880	0.053	190	560	0.050	110

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

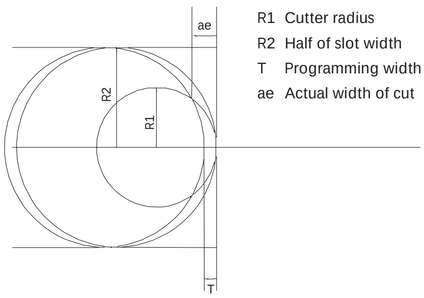
CUTTING PARAMETERS

HF445

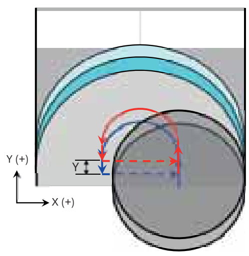
TROCHOIDAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5040	0.066	1320	3450	0.059	810	2650	0.052	560	1590	0.072	460
8	3780	0.085	1290	2590	0.077	790	1990	0.068	540	1190	0.094	450
10	3030	0.102	1240	2070	0.092	760	1590	0.082	520	960	0.112	430
12	2520	0.117	1180	1730	0.105	730	1330	0.093	500	800	0.128	410
14	2160	0.131	1130	1480	0.118	700	1140	0.105	480	680	0.144	390
16	1890	0.146	1100	1290	0.131	680	1000	0.117	470	600	0.160	380
20	1510	0.177	1070	1040	0.160	660	800	0.142	450	480	0.195	370

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



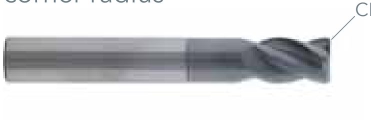
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

HF342

cylindrical shank and reduced neck, extra short, corner radius

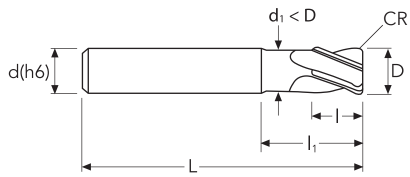
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.20	+/-0.010	6	5	9	2.80	50	4	HF34202030	h
4	0/-0.030	0.20	+/-0.010	6	6	12	3.80	50	4	HF34202040	h
5	0/-0.030	0.20	+/-0.010	6	8	14	4.80	50	4	HF34202050	h
6	0/-0.030	0.30	+/-0.010	6	9	18	5.80	55	4	HF34203060	h
8	0/-0.030	0.50	+/-0.010	8	12	24	7.80	60	4	HF34205080	h
10	0/-0.030	1.00	+/-0.010	10	15	30	9.80	70	4	HF34210100	h
12	0/-0.030	1.00	+/-0.010	12	18	35	11.80	80	4	HF34210120	h

h stock standard   f non-standard stock   m stock exhaustion

HF342

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	14860	0.014	830	9550	0.013	480	7430	0.011	310	4250	0.010	170
4	11150	0.019	830	7170	0.017	480	5570	0.014	310	3180	0.013	160
5	8920	0.023	820	5730	0.021	470	4460	0.017	310	2550	0.016	160
6	7430	0.027	800	4780	0.024	460	3720	0.020	300	2120	0.019	160
8	5570	0.035	780	3580	0.032	450	2790	0.026	290	1590	0.025	160
10	4460	0.042	750	2870	0.038	430	2230	0.032	280	1270	0.029	150
12	3720	0.048	710	2390	0.043	410	1860	0.036	270	1060	0.034	140

ap x ae	≤ D5	0.5D x D	0.5D x D	0.25D x D	0.25D x D

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.2D x 0.5D**			**1.2D x 0.5D**			**D x 0.3D**			**D x 0.3D**		
Vc (m/min)	**160-180**			**100-120**			**70-90**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	18050	0.017	1210	11680	0.015	710	8490	0.013	460	5310	0.018	390
4	13540	0.022	1200	8760	0.020	700	6370	0.018	450	3980	0.024	390
5	10830	0.028	1200	7010	0.025	700	5100	0.022	450	3180	0.030	390
6	9020	0.032	1170	5840	0.029	680	4250	0.026	440	2650	0.036	380
8	6770	0.042	1140	4380	0.038	660	3180	0.034	430	1990	0.046	370
10	5410	0.050	1090	3500	0.045	640	2550	0.040	410	1590	0.055	350
12	4510	0.058	1040	2920	0.052	610	2120	0.046	390	1330	0.063	340

ap x ae	≤ D5	1.2D x 0.3D	1.2D x 0.3D	D x 0.2D	D x 0.2D

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	14860	0.010	605	9550	0.010	365	7430	0.008	250	4250	0.008	133
4	11150	0.013	600	7170	0.013	360	5570	0.011	247	3180	0.010	132
5	8920	0.017	600	5730	0.016	360	4460	0.014	246	2550	0.013	131
6	7430	0.020	585	4780	0.018	350	3720	0.016	241	2120	0.015	128
8	5570	0.025	570	3580	0.024	340	2790	0.021	235	1590	0.020	125
10	4460	0.031	545	2870	0.029	325	2230	0.025	225	1270	0.024	120
12	3720	0.035	520	2390	0.033	310	1860	0.029	214	1060	0.027	114

α°	≤ D5	2°	2°	1°	1°

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF342

RAMPING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	α° x ae	15° x 0.4D			10° x 0.4D			5° x 0.4D			5° x 0.4D		
	Vc (m/min)	120-140			70-90			55-75			25-45		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	6900	0.022	595	4250	0.020	335	3450	0.019	260	1860	0.026	193
	8	5180	0.028	580	3180	0.026	325	2590	0.024	253	1390	0.034	187
	10	4140	0.034	555	2550	0.031	315	2070	0.029	243	1110	0.040	179
	12	3450	0.038	530	2120	0.035	300	1730	0.034	232	930	0.046	172

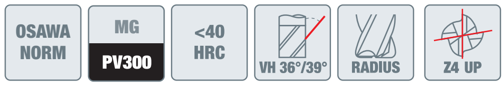
VERTICAL	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
	Vc (m/min)	120-140			70-90			55-75			25-45		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	6900	0.027	750	4250	0.024	410	3450	0.020	280	1860	0.019	140
	8	5180	0.035	730	3180	0.032	400	2590	0.026	270	1390	0.025	140
	10	4140	0.042	700	2550	0.038	390	2070	0.032	260	1110	0.029	130
	12	3450	0.048	660	2120	0.043	370	1730	0.036	250	930	0.034	120

DRILLING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
	ap x ae	D x D			D x D			0.5D x D			0.5D x D		
	Vc (m/min)	100-120			60-80			45-65			590-690		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	11680	0.007	330	7430	0.006	190	5840	0.006	130	3180	0.008	100
	4	8760	0.009	320	5570	0.008	190	4380	0.007	130	2390	0.010	100
	5	7010	0.012	320	4460	0.010	180	3500	0.009	130	1910	0.013	100
	6	5840	0.014	320	3720	0.012	180	2920	0.011	130	1590	0.015	90
	8	4380	0.018	310	2790	0.016	180	2190	0.014	120	1190	0.019	90
	10	3500	0.021	290	2230	0.019	170	1750	0.017	120	960	0.023	90
	12	2920	0.024	280	1860	0.022	160	1460	0.019	110	800	0.026	80
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

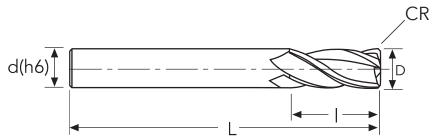
HF842

cylindrical shank, corner radius



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.025	0.30	+/-0.010	6	11		57	4	HF84203040	h
4	0/-0.025	0.50	+/-0.010	6	11		57	4	HF84205040	h
5	0/-0.025	0.30	+/-0.010	6	13		57	4	HF84203050	h
5	0/-0.025	0.50	+/-0.010	6	13		57	4	HF84205050	h
6	0/-0.025	0.30	+/-0.010	6	13		57	4	HF84203060	h
6	0/-0.025	0.50	+/-0.010	6	13		57	4	HF84205060	h
6	0/-0.025	1.00	+/-0.010	6	13		57	4	HF84210060	h
8	0/-0.030	0.50	+/-0.010	8	20		64	4	HF84205080	h
8	0/-0.030	1.00	+/-0.010	8	20		64	4	HF84210080	h
10	0/-0.030	0.50	+/-0.010	10	22		72	4	HF84205100	h
10	0/-0.030	1.00	+/-0.010	10	22		72	4	HF84210100	h
12	0/-0.030	0.50	+/-0.010	12	26		83	4	HF84205120	h
12	0/-0.030	1.00	+/-0.010	12	26		83	4	HF84210120	h
12	0/-0.030	2.00	+/-0.010	12	26		83	4	HF84220120	h
12	0/-0.030	3.00	+/-0.010	12	26		83	4	HF84230120	h
14	0/-0.030	1.00	+/-0.010	14	26		83	4	HF84210140	h
16	0/-0.030	1.00	+/-0.010	16	32		92	4	HF84210160	h
16	0/-0.030	2.00	+/-0.010	16	32		92	4	HF84220160	h
16	0/-0.030	3.00	+/-0.010	16	32		92	4	HF84230160	h
18	0/-0.030	1.00	+/-0.010	18	32		92	4	HF84210180	h
20	0/-0.030	1.00	+/-0.010	20	38		104	4	HF84210200	h
20	0/-0.030	2.00	+/-0.010	20	38		104	4	HF84220200	h
20	0/-0.030	3.00	+/-0.010	20	38		104	4	HF84230200	h

h stock standard   f non-standard stock   m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF842

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D X D			D x D			0.5D x D			0.5D x D		
Vc (m/min)	130-150			80-100			60-80			30-50		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	11150	0.019	830	7170	0.017	480	5570	0.014	310	3180	0.013	160
5	8920	0.023	820	5730	0.021	470	4460	0.017	310	2550	0.016	160
6	7430	0.027	800	4780	0.024	460	3720	0.020	300	2120	0.019	160
8	5570	0.035	780	3580	0.032	450	2790	0.026	290	1590	0.025	160
10	4460	0.042	750	2870	0.038	430	2230	0.032	280	1270	0.029	150
12	3720	0.048	710	2390	0.043	410	1860	0.036	270	1060	0.034	140
14	3180	0.054	690	2050	0.049	400	1590	0.041	260	910	0.038	140
16	2790	0.060	670	1790	0.054	390	1390	0.045	250	800	0.042	130
18	2480	0.066	650	1590	0.059	380	1240	0.050	250	710	0.046	130
20	2230	0.073	650	1430	0.066	380	1110	0.055	240	640	0.051	130
ap x ae ≤ D5	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.2D x 0.3D			1.2D x 0.3D		
Vc (m/min)	160-180			100-120			70-90			40-60		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	13540	0.022	1200	8760	0.020	700	6370	0.018	450	3980	0.024	390
5	10830	0.028	1200	7010	0.025	700	5100	0.022	450	3180	0.030	390
6	9020	0.032	1170	5840	0.029	680	4250	0.026	440	2650	0.036	380
8	6770	0.042	1140	4380	0.038	660	3180	0.034	430	1990	0.046	370
10	5410	0.050	1090	3500	0.045	640	2550	0.040	410	1590	0.055	350
12	4510	0.058	1040	2920	0.052	610	2120	0.046	390	1330	0.063	340
14	3870	0.065	1000	2500	0.058	580	1820	0.052	380	1140	0.071	330
16	3380	0.072	970	2190	0.065	570	1590	0.058	370	1000	0.079	320
18	3010	0.079	950	1950	0.071	560	1420	0.063	360	880	0.087	310
20	2710	0.088	950	1750	0.079	550	1270	0.070	360	800	0.096	310
ap x ae ≤ D5	1.5D x 0.25D			1.5D x 0.25D			1.2D x 0.1D			1.2D x 0.1D		

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	5° x 0.4D			4° x 0.4D			3° x 0.4D			3° x 0.4D		
Vc (m/min)	130-150			80-100			60-80			30-50		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	11150	0.013	600	7170	0.013	360	5570	0.011	247	3180	0.010	132
5	8920	0.017	600	5730	0.016	360	4460	0.014	246	2550	0.013	131
6	7430	0.020	585	4780	0.018	350	3720	0.016	241	2120	0.015	128
8	5570	0.025	570	3580	0.024	340	2790	0.021	235	1590	0.020	125
10	4460	0.031	545	2870	0.029	325	2230	0.025	225	1270	0.024	120
12	3720	0.035	520	2390	0.033	310	1860	0.029	214	1060	0.027	114
14	3180	0.039	500	2050	0.037	300	1590	0.032	206	910	0.030	110
16	2790	0.044	490	1790	0.041	290	1390	0.036	200	800	0.034	108
18	2480	0.048	475	1590	0.045	285	1240	0.040	197	710	0.037	105
20	2230	0.053	475	1430	0.050	285	1110	0.044	195	640	0.041	105
α° max ≤ D5	2°			2°			1°			1°		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF842

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**15° x 0.4D**			**10° x 0.4D**			**5° x 0.4D**			**5° x 0.4D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
RAMPING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	7430	0.022	640	4780	0.020	380	3720	0.019	281	2120	0.026	220
	8	5570	0.028	620	3580	0.026	370	2790	0.024	273	1590	0.034	214
	10	4460	0.034	600	2870	0.031	355	2230	0.029	262	1270	0.040	205
	12	3720	0.038	570	2390	0.035	335	1860	0.034	250	1060	0.046	196
	14	3180	0.043	550	2050	0.040	325	1590	0.038	240	910	0.052	189
	16	2790	0.048	535	1790	0.044	315	1390	0.042	233	800	0.058	185
	18	2480	0.053	520	1590	0.048	310	1240	0.046	229	710	0.063	180
	20	2230	0.058	520	1430	0.054	305	1110	0.051	227	640	0.070	180

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
VERTICAL	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	7430	0.027	800	4780	0.024	460	3720	0.020	300	2120	0.019	160
	8	5570	0.035	780	3580	0.032	450	2790	0.026	290	1590	0.025	160
	10	4460	0.042	750	2870	0.038	430	2230	0.032	280	1270	0.029	150
	12	3720	0.048	710	2390	0.043	410	1860	0.036	270	1060	0.034	140
	14	3180	0.054	690	2050	0.049	400	1590	0.041	260	910	0.038	140
	16	2790	0.060	670	1790	0.054	390	1390	0.045	250	800	0.042	130
	18	2480	0.066	650	1590	0.059	380	1240	0.050	250	710	0.046	130
	20	2230	0.073	650	1430	0.066	380	1110	0.055	240	640	0.051	130

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**100-120**			**60-80**			**45-65**			**590-690**		
DRILLING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	8760	0.009	320	5570	0.008	190	4380	0.007	130	2390	0.010	100
	5	7010	0.012	320	4460	0.010	180	3500	0.009	130	1910	0.013	100
	6	5840	0.014	320	3720	0.012	180	2920	0.011	130	1590	0.015	90
	8	4380	0.018	310	2790	0.016	180	2190	0.014	120	1190	0.019	90
	10	3500	0.021	290	2230	0.019	170	1750	0.017	120	960	0.023	90
	12	2920	0.024	280	1860	0.022	160	1460	0.019	110	800	0.026	80
	14	2500	0.027	270	1590	0.024	150	1250	0.022	110	680	0.030	80
	16	2190	0.030	260	1390	0.027	150	1090	0.024	100	600	0.033	80
	18	1950	0.033	260	1240	0.030	150	970	0.026	100	530	0.036	80
	20	1750	0.037	260	1110	0.033	150	880	0.029	100	480	0.040	80
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

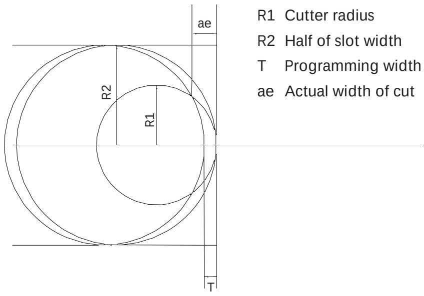
HF842

TROCHOIDAL

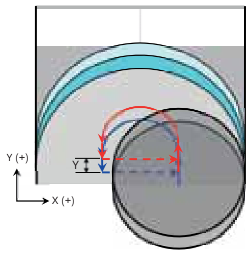
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**190-230**			**130-150**			**100-120**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	8760	0.046	1620	5570	0.042	930	4380	0.037	650	2390	0.051	490
5	7010	0.058	1610	4460	0.052	920	3500	0.046	640	1910	0.063	480
6	5840	0.068	1580	3720	0.061	900	2920	0.054	630	1590	0.074	470
8	4380	0.088	1530	2790	0.079	880	2190	0.070	610	1190	0.096	460
10	3500	0.105	1470	2230	0.095	840	1750	0.084	590	960	0.116	440
12	2920	0.120	1400	1860	0.108	800	1460	0.096	560	800	0.132	420
14	2500	0.135	1350	1590	0.122	770	1250	0.108	540	680	0.149	400
16	2190	0.150	1310	1390	0.135	750	1090	0.120	520	600	0.165	400
18	1950	0.165	1290	1240	0.149	740	970	0.132	510	530	0.182	380
20	1750	0.183	1280	1110	0.164	730	880	0.146	510	480	0.201	390

ap x ae	≤ D5				
		1.5D x 0.1D	1.5D x 0.1D		

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut

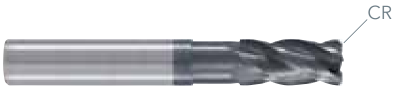


PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF442

cylindrical shank and reduced neck, corner radius

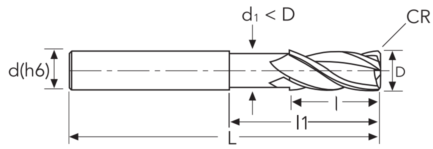
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.30	+/-0.020	6	9	15	2.80	57	4	HF44203030	h
3	0/-0.030	0.50	+/-0.020	6	9	15	2.80	57	4	HF44205030	h
4	0/-0.030	0.30	+/-0.020	6	11	18	3.80	57	4	HF44203040	h
4	0/-0.030	0.50	+/-0.020	6	11	18	3.80	57	4	HF44205040	h
5	0/-0.030	0.30	+/-0.020	6	13	19	4.80	57	4	HF44203050	h
5	0/-0.030	0.50	+/-0.020	6	13	19	4.80	57	4	HF44205050	h
6	0/-0.030	0.30	+/-0.020	6	13	20	5.80	57	4	HF44203060	h
6	0/-0.030	0.50	+/-0.020	6	13	20	5.80	57	4	HF44205060	h
6	0/-0.030	1.00	+/-0.020	6	13	20	5.80	57	4	HF44210060	h
8	0/-0.030	0.50	+/-0.020	8	20	26	7.80	64	4	HF44205080	h
8	0/-0.030	1.00	+/-0.020	8	20	26	7.80	64	4	HF44210080	h
10	0/-0.030	0.50	+/-0.020	10	22	30	9.80	72	4	HF44205100	h
10	0/-0.030	1.00	+/-0.020	10	22	30	9.80	72	4	HF44210100	h
12	0/-0.030	0.50	+/-0.020	12	26	36	11.80	83	4	HF44205120	h
12	0/-0.030	1.00	+/-0.020	12	26	36	11.80	83	4	HF44210120	h
14	0/-0.030	1.00	+/-0.020	14	26	36	13.70	83	4	HF44210140	h
16	0/-0.030	1.00	+/-0.020	16	32	42	15.70	92	4	HF44210160	h
16	0/-0.030	2.00	+/-0.020	16	32	42	15.70	92	4	HF44220160	h
20	0/-0.030	1.00	+/-0.020	20	38	50	19.70	104	4	HF44210200	h
20	0/-0.030	2.00	+/-0.020	20	38	50	19.70	104	4	HF44220200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF442

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	12740	0.013	640	8490	0.011	390	6370	0.009	240	4250	0.009	150
4	9550	0.017	640	6370	0.015	380	4780	0.012	240	3180	0.012	150
5	7640	0.021	630	5100	0.019	380	3820	0.016	240	2550	0.014	150
6	6370	0.024	620	4250	0.022	370	3180	0.018	230	2120	0.017	140
8	4780	0.032	600	3180	0.028	360	2390	0.024	230	1590	0.022	140
10	3820	0.038	580	2550	0.034	350	1910	0.028	220	1270	0.026	130
12	3180	0.043	550	2120	0.039	330	1590	0.032	210	1060	0.030	130
14	2730	0.049	530	1820	0.044	320	1360	0.036	200	910	0.034	120
16	2390	0.054	520	1590	0.049	310	1190	0.041	190	800	0.038	120
20	1910	0.066	500	1270	0.059	300	960	0.049	190	640	0.046	120

ap x ae	**≤ D5**		
0.5D x D	0.5D x D	0.25D x D	0.25D x D

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²		
ap x ae	**1.5D x D**			**1.5D x D**		
Vc (m/min)	**85-105**			**55-75**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	3780	0.025	380	2590	0.023	230
10	3030	0.030	370	2070	0.027	230
12	2520	0.035	350	1730	0.031	220
14	2160	0.039	340	1480	0.035	210
16	1890	0.043	330	1290	0.039	200
20	1510	0.053	320	1040	0.047	200

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
Vc (m/min)	**130-150**			**90-110**			**60-80**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	14860	0.015	900	10620	0.014	580	7430	0.012	360	5310	0.017	350
4	11150	0.020	890	7960	0.018	570	5570	0.016	360	3980	0.022	350
5	8920	0.025	890	6370	0.022	570	4460	0.020	350	3180	0.027	350
6	7430	0.029	870	5310	0.026	560	3720	0.023	350	2650	0.032	340
8	5570	0.038	840	3980	0.034	540	2790	0.030	340	1990	0.042	330
10	4460	0.045	810	3180	0.041	520	2230	0.036	320	1590	0.050	320
12	3720	0.052	770	2650	0.047	490	1860	0.041	310	1330	0.057	300
14	3180	0.058	740	2270	0.052	480	1590	0.047	300	1140	0.064	290
16	2790	0.065	720	1990	0.058	460	1390	0.052	290	1000	0.071	290
20	2230	0.079	700	1590	0.071	450	1110	0.063	280	800	0.087	280

ap x ae	**≤ D5**		
1.5D x 0.25D	1.5D x 0.25D	1.2D x 0.1D	1.2D x 0.1D

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF442

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	12740	0.009	470	8490	0.009	290	6370	0.008	193	4250	0.007	120
4	9550	0.012	465	6370	0.011	290	4780	0.010	191	3180	0.009	119
5	7640	0.015	460	5100	0.014	285	3820	0.012	190	2550	0.012	118
6	6370	0.018	450	4250	0.016	280	3180	0.015	186	2120	0.014	115
8	4780	0.023	440	3180	0.021	270	2390	0.019	181	1590	0.018	112
10	3820	0.028	420	2550	0.026	260	1910	0.023	173	1270	0.021	108
12	3180	0.031	400	2120	0.029	250	1590	0.026	165	1060	0.024	103
14	2730	0.035	385	1820	0.033	240	1360	0.029	159	910	0.027	99
16	2390	0.039	375	1590	0.037	235	1190	0.032	154	800	0.030	97
20	1910	0.048	365	1270	0.045	225	960	0.039	151	640	0.037	94

α° max	≤ D5	2°	2°	1°	1°

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
Vc (m/min)	**100-120**			**60-80**			**45-65**			**30-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.019	455	3720	0.018	265	2920	0.017	198	1860	0.023	174
8	4380	0.025	440	2790	0.023	260	2190	0.022	193	1390	0.030	168
10	3500	0.030	420	2230	0.028	250	1750	0.026	185	1110	0.036	161
12	2920	0.034	405	1860	0.032	235	1460	0.030	176	930	0.042	154
14	2500	0.039	390	1590	0.036	225	1250	0.034	170	800	0.047	149
16	2190	0.043	375	1390	0.040	220	1090	0.038	165	700	0.052	145
20	1750	0.052	365	1110	0.048	215	880	0.046	162	560	0.063	141

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2		
α° x ae	**30° x D**			**15° x D**		
Vc (m/min)	**80-100**			**45-65**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
10	2870	0.025	280	1750	0.023	160
12	2390	0.028	270	1460	0.026	150
14	2050	0.032	260	1250	0.029	145
16	1790	0.035	250	1090	0.032	140
20	1430	0.043	245	880	0.039	140

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF442

VERTICAL	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
	Vc (m/min)	100-120			60-80			45-65			30-40		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	5840	0.024	570	3720	0.022	330	2920	0.018	210	1860	0.017	130
	8	4380	0.032	550	2790	0.028	320	2190	0.024	210	1390	0.022	120
	10	3500	0.038	530	2230	0.034	300	1750	0.028	200	1110	0.026	120
	12	2920	0.043	500	1860	0.039	290	1460	0.032	190	930	0.030	110
	14	2500	0.049	490	1590	0.044	280	1250	0.036	180	800	0.034	110
	16	2190	0.054	470	1390	0.049	270	1090	0.041	180	700	0.038	110
	20	1750	0.066	460	1110	0.059	260	880	0.049	170	560	0.046	100

DRILLING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	D x D			D x D			0.5D x D			0.5D x D		
	Vc (m/min)	85-105			55-75			40-60			20-40		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	10080	0.006	250	6900	0.006	160	5310	0.005	110	3180	0.007	90
	4	7560	0.008	250	5180	0.007	160	3980	0.007	110	2390	0.009	90
	5	6050	0.010	250	4140	0.009	150	3180	0.008	110	1910	0.011	90
	6	5040	0.012	240	3450	0.011	150	2650	0.010	100	1590	0.013	90
	8	3780	0.016	240	2590	0.014	150	1990	0.013	100	1190	0.017	80
	10	3030	0.019	230	2070	0.017	140	1590	0.015	100	960	0.021	80
	12	2520	0.022	220	1730	0.019	130	1330	0.017	90	800	0.024	80
	14	2160	0.024	210	1480	0.022	130	1140	0.019	90	680	0.027	70
	16	1890	0.027	200	1290	0.024	130	1000	0.022	90	600	0.030	70
	20	1510	0.033	200	1040	0.030	120	800	0.026	80	480	0.036	70
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

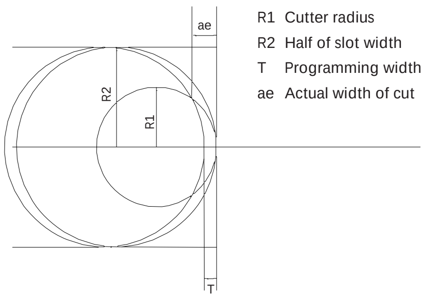
HF442

TROCHOIDAL

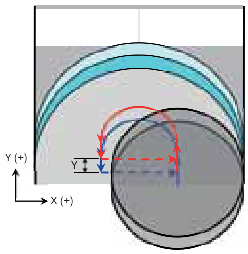
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10080	0.032	1270	6900	0.028	780	5310	0.025	540	3180	0.035	440
4	7560	0.042	1260	5180	0.037	780	3980	0.033	530	2390	0.046	440
5	6050	0.052	1250	4140	0.047	770	3180	0.041	530	1910	0.057	430
6	5040	0.061	1220	3450	0.055	750	2650	0.049	520	1590	0.067	430
8	3780	0.079	1190	2590	0.071	730	1990	0.063	500	1190	0.087	410
10	3030	0.095	1150	2070	0.085	700	1590	0.076	480	960	0.104	400
12	2520	0.108	1090	1730	0.097	670	1330	0.086	460	800	0.119	380
14	2160	0.122	1050	1480	0.109	650	1140	0.097	440	680	0.134	360
16	1890	0.135	1020	1290	0.122	630	1000	0.108	430	600	0.149	360
20	1510	0.164	990	1040	0.148	610	800	0.131	420	480	0.181	350

ap x ae	≤ D5	1.5D x 0.1D	1.5D x 0.1D		

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



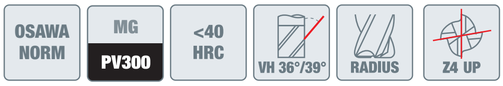
R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



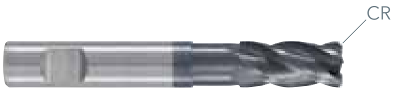
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

HF443

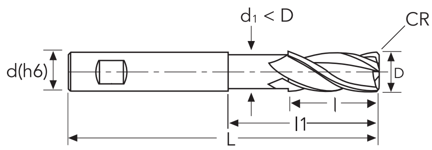


weldon shank and reduced neck, corner radius



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.30	+/-0.020	6	9	15	2.80	57	4	HF44303030	h
3	0/-0.030	0.50	+/-0.020	6	9	15	2.80	57	4	HF44305030	h
4	0/-0.030	0.30	+/-0.020	6	11	18	3.80	57	4	HF44303040	h
4	0/-0.030	0.50	+/-0.020	6	11	18	3.80	57	4	HF44305040	h
5	0/-0.030	0.50	+/-0.020	6	13	19	4.80	57	4	HF44305050	h
6	0/-0.030	0.50	+/-0.020	6	13	20	5.80	57	4	HF44305060	h
6	0/-0.030	1.00	+/-0.020	6	13	20	5.80	57	4	HF44310060	h
8	0/-0.030	0.50	+/-0.020	8	20	26	7.80	64	4	HF44305080	h
8	0/-0.030	1.00	+/-0.020	8	20	26	7.80	64	4	HF44310080	h
10	0/-0.030	0.50	+/-0.020	10	22	30	9.80	72	4	HF44305100	h
10	0/-0.030	1.00	+/-0.020	10	22	30	9.80	72	4	HF44310100	h
12	0/-0.030	0.50	+/-0.020	12	26	36	11.80	83	4	HF44305120	h
12	0/-0.030	1.00	+/-0.020	12	26	36	11.80	83	4	HF44310120	h
14	0/-0.030	1.00	+/-0.020	14	26	36	13.70	83	4	HF44310140	h
16	0/-0.030	1.00	+/-0.020	16	32	42	15.70	92	4	HF44310160	h
20	0/-0.030	1.00	+/-0.020	20	38	50	19.70	104	4	HF44310200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF443

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
SLOTTING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	12740	0.013	640	8490	0.011	390	6370	0.009	240	4250	0.009	150
	4	9550	0.017	640	6370	0.015	380	4780	0.012	240	3180	0.012	150
	5	7640	0.021	630	5100	0.019	380	3820	0.016	240	2550	0.014	150
	6	6370	0.024	620	4250	0.022	370	3180	0.018	230	2120	0.017	140
	8	4780	0.032	600	3180	0.028	360	2390	0.024	230	1590	0.022	140
	10	3820	0.038	580	2550	0.034	350	1910	0.028	220	1270	0.026	130
	12	3180	0.043	550	2120	0.039	330	1590	0.032	210	1060	0.030	130
	14	2730	0.049	530	1820	0.044	320	1360	0.036	200	910	0.034	120
	16	2390	0.054	520	1590	0.049	310	1190	0.041	190	800	0.038	120
	20	1910	0.066	500	1270	0.059	300	960	0.049	190	640	0.046	120
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3								
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²								
	ap x ae	**1.5D x D**			**1.5D x D**								
	Vc (m/min)	**85-105**			**55-75**								
SLOTTING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)						
	8	3780	0.025	380	2590	0.023	230						
	10	3030	0.030	370	2070	0.027	230						
	12	2520	0.035	350	1730	0.031	220						
	14	2160	0.039	340	1480	0.035	210						
	16	1890	0.043	330	1290	0.039	200						
	20	1510	0.053	320	1040	0.047	200						

	Material Group ISO 513	P1 P2 M1 K1											
	Hardness/Rm	≤ 700 N/mm²											
	ap x ae	**2D x D**											
	Vc (m/min)	**60-80**											
SLOTTING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)									
	10	2230	0.023	200									
	12	1860	0.026	190									
	14	1590	0.029	190									
	16	1390	0.032	180									
	20	1110	0.039	180									

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

CUTTING PARAMETERS

HF443

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
Vc (m/min)	**130-150**			**90-110**			**60-80**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	14860	0.015	900	10620	0.014	580	7430	0.012	360	5310	0.017	350
4	11150	0.020	890	7960	0.018	570	5570	0.016	360	3980	0.022	350
5	8920	0.025	890	6370	0.022	570	4460	0.020	350	3180	0.027	350
6	7430	0.029	870	5310	0.026	560	3720	0.023	350	2650	0.032	340
8	5570	0.038	840	3980	0.034	540	2790	0.030	340	1990	0.042	330
10	4460	0.045	810	3180	0.041	520	2230	0.036	320	1590	0.050	320
12	3720	0.052	770	2650	0.047	490	1860	0.041	310	1330	0.057	300
14	3180	0.058	740	2270	0.052	480	1590	0.047	300	1140	0.064	290
16	2790	0.065	720	1990	0.058	460	1390	0.052	290	1000	0.071	290
20	2230	0.079	700	1590	0.071	450	1110	0.063	280	800	0.087	280

ap x ae	≤ D5	1.5D x 0.25D	1.5D x 0.25D	1.2D x 0.1D	1.2D x 0.1D

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	12740	0.009	470	8490	0.009	290	6370	0.008	193	4250	0.007	120
4	9550	0.012	465	6370	0.011	290	4780	0.010	191	3180	0.009	119
5	7640	0.015	460	5100	0.014	285	3820	0.012	190	2550	0.012	118
6	6370	0.018	450	4250	0.016	280	3180	0.015	186	2120	0.014	115
8	4780	0.023	440	3180	0.021	270	2390	0.019	181	1590	0.018	112
10	3820	0.028	420	2550	0.026	260	1910	0.023	173	1270	0.021	108
12	3180	0.031	400	2120	0.029	250	1590	0.026	165	1060	0.024	103
14	2730	0.035	385	1820	0.033	240	1360	0.029	159	910	0.027	99
16	2390	0.039	375	1590	0.037	235	1190	0.032	154	800	0.030	97
20	1910	0.048	365	1270	0.045	225	960	0.039	151	640	0.037	94

α° max	≤ D5	2°	2°	1°	1°

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
Vc (m/min)	**100-120**			**60-80**			**45-65**			**30-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.019	455	3720	0.018	265	2920	0.017	198	1860	0.023	174
8	4380	0.025	440	2790	0.023	260	2190	0.022	193	1390	0.030	168
10	3500	0.030	420	2230	0.028	250	1750	0.026	185	1110	0.036	161
12	2920	0.034	405	1860	0.032	235	1460	0.030	176	930	0.042	154
14	2500	0.039	390	1590	0.036	225	1250	0.034	170	800	0.047	149
16	2190	0.043	375	1390	0.040	220	1090	0.038	165	700	0.052	145
20	1750	0.052	365	1110	0.048	215	880	0.046	162	560	0.063	141

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

CUTTING PARAMETERS

HF443

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	30° x D			15° x D								
Vc (m/min)	85-105			55-75								
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)						
10	2870	0.025	280	1750	0.023	160						
12	2390	0.028	270	1460	0.026	150						
14	2050	0.032	260	1250	0.029	145						
16	1790	0.035	250	1090	0.032	140						
20	1430	0.043	245	880	0.039	140						

RAMPING

Material Group ISO 513	P1 P2 M1 K1		
Hardness/Rm	≤ 700 N/mm²		
α° x ae	45° x D		
Vc (m/min)	60-80		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)
10	2070	0.024	200
12	1730	0.028	195
14	1480	0.031	185
16	1290	0.035	180
20	1040	0.042	175

VERTICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	100-120			60-80			45-65			30-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.024	570	3720	0.022	330	2920	0.018	210	1860	0.017	130
8	4380	0.032	550	2790	0.028	320	2190	0.024	210	1390	0.022	120
10	3500	0.038	530	2230	0.034	300	1750	0.028	200	1110	0.026	120
12	2920	0.043	500	1860	0.039	290	1460	0.032	190	930	0.030	110
14	2500	0.049	490	1590	0.044	280	1250	0.036	180	800	0.034	110
16	2190	0.054	470	1390	0.049	270	1090	0.041	180	700	0.038	110
20	1750	0.066	460	1110	0.059	260	880	0.049	170	560	0.046	100

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

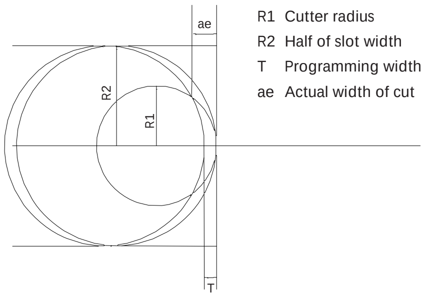
CUTTING PARAMETERS

HF443

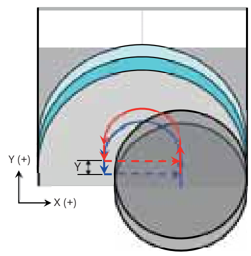
	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**85-105**			**55-75**			**40-60**			**20-40**		
DRILLING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	10080	0.006	250	6900	0.006	160	5310	0.005	110	3180	0.007	90
	4	7560	0.008	250	5180	0.007	160	3980	0.007	110	2390	0.009	90
	5	6050	0.010	250	4140	0.009	150	3180	0.008	110	1910	0.011	90
	6	5040	0.012	240	3450	0.011	150	2650	0.010	100	1590	0.013	90
	8	3780	0.016	240	2590	0.014	150	1990	0.013	100	1190	0.017	80
	10	3030	0.019	230	2070	0.017	140	1590	0.015	100	960	0.021	80
	12	2520	0.022	220	1730	0.019	130	1330	0.017	90	800	0.024	80
	14	2160	0.024	210	1480	0.022	130	1140	0.019	90	680	0.027	70
	16	1890	0.027	200	1290	0.024	130	1000	0.022	90	600	0.030	70
	20	1510	0.033	200	1040	0.030	120	800	0.026	80	480	0.036	70
ap x ae	**≤ D5**	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
	Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
TROCHOIDAL	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	10080	0.032	1270	6900	0.028	780	5310	0.025	540	3180	0.035	440
	4	7560	0.042	1260	5180	0.037	780	3980	0.033	530	2390	0.046	440
	5	6050	0.052	1250	4140	0.047	770	3180	0.041	530	1910	0.057	430
	6	5040	0.061	1220	3450	0.055	750	2650	0.049	520	1590	0.067	430
	8	3780	0.079	1190	2590	0.071	730	1990	0.063	500	1190	0.087	410
	10	3030	0.095	1150	2070	0.085	700	1590	0.076	480	960	0.104	400
	12	2520	0.108	1090	1730	0.097	670	1330	0.086	460	800	0.119	380
	14	2160	0.122	1050	1480	0.109	650	1140	0.097	440	680	0.134	360
	16	1890	0.135	1020	1290	0.122	630	1000	0.108	430	600	0.149	360
	20	1510	0.164	990	1040	0.148	610	800	0.131	420	480	0.181	350
ap x ae	**≤ D5**	1.5D x 0.1D			1.5D x 0.1D								

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut

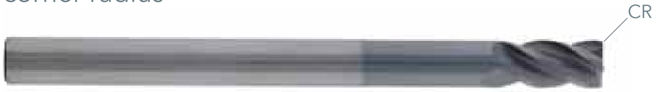


PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

HF542

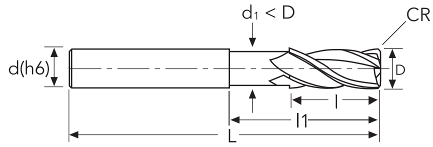
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP

cylindrical shank and reduced neck, long reach, corner radius



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
6	0/-0.030	0.30	+/-0.010	6	12	30	5.80	75	4	HF5420306075	h
6	0/-0.030	0.50	+/-0.010	6	12	30	5.80	75	4	HF5420506075	h
6	0/-0.030	1.00	+/-0.010	6	12	30	5.80	75	4	HF5421006075	h
6	0/-0.030	0.30	+/-0.010	6	12	30	5.80	100	4	HF54203060100	h
6	0/-0.030	0.50	+/-0.010	6	12	30	5.80	100	4	HF54205060100	h
6	0/-0.030	1.00	+/-0.010	6	12	30	5.80	100	4	HF54210060100	h
8	0/-0.030	0.50	+/-0.010	8	16	40	7.80	100	4	HF54205080100	h
8	0/-0.030	1.00	+/-0.010	8	16	40	7.80	100	4	HF54210080100	h
8	0/-0.030	2.00	+/-0.010	8	16	40	7.80	100	4	HF54220080100	h
10	0/-0.030	0.50	+/-0.010	10	20	50	9.80	125	4	HF54205100125	h
10	0/-0.030	1.00	+/-0.010	10	20	50	9.80	125	4	HF54210100125	h
10	0/-0.030	2.00	+/-0.010	10	20	50	9.80	125	4	HF54220100125	h
12	0/-0.030	0.50	+/-0.010	12	24	60	11.80	125	4	HF54205120125	h
12	0/-0.030	1.00	+/-0.010	12	24	60	11.80	125	4	HF54210120125	h
12	0/-0.030	2.00	+/-0.010	12	24	60	11.80	125	4	HF54220120125	h
12	0/-0.030	3.00	+/-0.010	12	24	60	11.80	125	4	HF54230120125	h
12	0/-0.030	0.50	+/-0.010	12	24	60	11.80	150	4	HF54205120150	h
12	0/-0.030	1.00	+/-0.010	12	24	60	11.80	150	4	HF54210120150	h
12	0/-0.030	2.00	+/-0.010	12	24	60	11.80	150	4	HF54220120150	h
12	0/-0.030	3.00	+/-0.010	12	24	60	11.80	150	4	HF54230120150	h
16	0/-0.030	0.50	+/-0.010	16	32	80	15.70	150	4	HF54205160150	h
16	0/-0.030	1.00	+/-0.010	16	32	80	15.70	150	4	HF54210160150	h
16	0/-0.030	2.00	+/-0.010	16	32	80	15.70	150	4	HF54220160150	h
16	0/-0.030	3.00	+/-0.010	16	32	80	15.70	150	4	HF54230160150	h
16	0/-0.030	4.00	+/-0.010	16	32	80	15.70	150	4	HF54240160150	h
20	0/-0.030	0.50	+/-0.010	20	40	100	19.70	150	4	HF54205200150	h
20	0/-0.030	1.00	+/-0.010	20	40	100	19.70	150	4	HF54210200150	h
20	0/-0.030	2.00	+/-0.010	20	40	100	19.70	150	4	HF54220200150	h
20	0/-0.030	3.00	+/-0.010	20	40	100	19.70	150	4	HF54230200150	h
20	0/-0.030	4.00	+/-0.010	20	40	100	19.70	150	4	HF54240200150	h

h stock standard f non-standard stock m stock exhaustion

HF542

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**0.5D x D**			**0.3D x D**			**0.2D x D**			**0.2D x D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5310	0.019	410	3720	0.017	260	2650	0.015	150	1590	0.014	90
8	3980	0.025	400	2790	0.023	250	1990	0.019	150	1190	0.018	80
10	3180	0.030	380	2230	0.027	240	1590	0.023	140	960	0.021	80
12	2650	0.035	370	1860	0.031	230	1330	0.026	140	800	0.024	80
16	1990	0.043	340	1390	0.039	220	1000	0.032	130	600	0.030	70
20	1590	0.053	330	1110	0.047	210	800	0.039	130	480	0.037	70

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.2D x 0.2D**			**1.2D x 0.2D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.023	590	4250	0.021	360	3180	0.019	240	2120	0.026	220
8	4780	0.030	580	3180	0.027	350	2390	0.024	230	1590	0.033	210
10	3820	0.036	550	2550	0.033	330	1910	0.029	220	1270	0.040	200
12	3180	0.041	530	2120	0.037	320	1590	0.033	210	1060	0.046	190
16	2390	0.052	500	1590	0.047	300	1190	0.041	200	800	0.057	180
20	1910	0.063	480	1270	0.057	290	960	0.050	190	640	0.069	180

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5310	0.015	310	3720	0.014	210	2650	0.012	124	1590	0.012	78
8	3980	0.019	305	2790	0.018	205	1990	0.015	120	1190	0.016	76
10	3180	0.023	290	2230	0.022	195	1590	0.018	115	960	0.019	73
12	2650	0.026	275	1860	0.025	185	1330	0.021	110	800	0.022	70
16	1990	0.033	260	1390	0.031	175	1000	0.026	104	600	0.027	66
20	1590	0.040	250	1110	0.038	170	800	0.032	101	480	0.033	64

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**7° x 0.4D**			**5° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**80-100**			**50-70**			**35-55**			**20-30**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.016	310	3180	0.015	195	2390	0.015	143	1330	0.021	109
8	3580	0.021	305	2390	0.020	190	1790	0.019	139	1000	0.027	107
10	2870	0.025	290	1910	0.024	180	1430	0.023	133	800	0.032	102
12	2390	0.029	275	1590	0.027	175	1190	0.027	126	660	0.037	96
16	1790	0.036	260	1190	0.034	160	900	0.033	120	500	0.046	91
20	1430	0.044	250	960	0.041	160	720	0.040	116	400	0.056	89

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

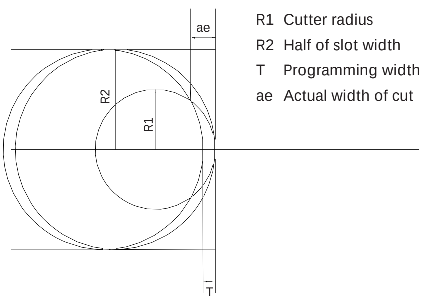
HF542

VERTICAL												
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
Vc (m/min)	**80-100**			**50-70**			**35-55**			**20-30**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.019	370	3180	0.017	220	2390	0.015	140	1330	0.014	70
8	3580	0.025	360	2390	0.023	220	1790	0.019	140	1000	0.018	70
10	2870	0.030	350	1910	0.027	210	1430	0.023	130	800	0.021	70
12	2390	0.035	330	1590	0.031	200	1190	0.026	120	660	0.024	60
16	1790	0.043	310	1190	0.039	190	900	0.032	120	500	0.030	60
20	1430	0.053	300	960	0.047	180	720	0.039	110	400	0.037	60

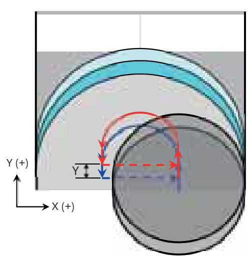
DRILLING												
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D x D**			**D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**85-105**			**55-75**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4250	0.010	170	2920	0.009	100	2120	0.008	70	1330	0.011	60
8	3180	0.013	160	2190	0.011	100	1590	0.010	60	1000	0.014	60
10	2550	0.015	150	1750	0.014	100	1270	0.012	60	800	0.017	50
12	2120	0.017	150	1460	0.016	90	1060	0.014	60	660	0.019	50
16	1590	0.022	140	1090	0.019	80	800	0.017	60	500	0.024	50
20	1270	0.026	130	880	0.024	80	640	0.021	50	400	0.029	50

TROCHOIDAL												
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.1D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4250	0.049	830	2920	0.044	510	2120	0.039	330	1330	0.053	280
8	3180	0.063	800	2190	0.057	500	1590	0.050	320	1000	0.069	280
10	2550	0.076	770	1750	0.068	480	1270	0.060	310	800	0.083	270
12	2120	0.086	730	1460	0.078	450	1060	0.069	290	660	0.095	250
16	1590	0.108	690	1090	0.097	420	800	0.086	280	500	0.119	240
20	1270	0.131	670	880	0.118	420	640	0.105	270	400	0.145	230

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut

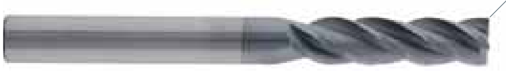


PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF942

OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP

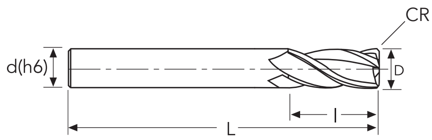
cylindrical shank, long cutting edge ideal for trochoidal milling, corner radius



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.025	0.10	+/-0.010	6	19		75	4	HF9420104075	h
5	0/-0.025	0.10	+/-0.010	6	19		75	4	HF9420105075	h
6	0/-0.025	0.10	+/-0.010	6	25		75	4	HF9420106075	h
8	0/-0.030	0.20	+/-0.010	8	30		75	4	HF9420208075	h
10	0/-0.030	0.20	+/-0.010	10	40		100	4	HF94202100100	h
12	0/-0.030	0.30	+/-0.010	12	45		100	4	HF94203120100	h
16	0/-0.030	0.30	+/-0.010	16	65		125	4	HF94203160125	h
20	0/-0.030	0.30	+/-0.010	20	65		125	4	HF94203200125	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF942

SIDE MILLING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.2D x 0.2D**			**1.2D x 0.2D**		
	Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	9550	0.016	620	6370	0.015	370	4780	0.013	250	3180	0.018	230
	5	7640	0.021	650	5100	0.019	390	3820	0.017	260	2550	0.023	240
	6	6370	0.026	660	4250	0.023	400	3180	0.021	260	2120	0.029	240
	8	4780	0.031	590	3180	0.028	350	2390	0.025	230	1590	0.034	210
	10	3820	0.036	560	2550	0.033	330	1910	0.029	220	1270	0.040	200
	12	3180	0.041	530	2120	0.037	320	1590	0.033	210	1060	0.045	190
	16	2390	0.047	450	1590	0.042	270	1190	0.038	180	800	0.052	170
	20	1910	0.063	480	1270	0.057	290	960	0.051	190	640	0.070	180
ap x ae	≤ D5	1.5D x 0.1D			1.5D x 0.1D			1.2D x 0.1D			1.2D x 0.1D		

HELICAL	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
	Vc (m/min)	**90-110**			**60-80**			**40-60**			**20-40**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	7960	0.010	325	5570	0.010	220	3980	0.008	130	2390	0.009	82
	5	6370	0.013	340	4460	0.013	225	3180	0.011	134	1910	0.011	85
	6	5310	0.016	345	3720	0.016	230	2650	0.013	137	1590	0.014	87
	8	3980	0.019	305	2790	0.018	205	1990	0.015	122	1190	0.016	77
	10	3180	0.023	290	2230	0.022	195	1590	0.018	116	960	0.019	74
	12	2650	0.026	275	1860	0.025	185	1330	0.021	110	800	0.022	70
	16	1990	0.030	235	1390	0.028	155	1000	0.024	94	600	0.025	59
	20	1590	0.040	255	1110	0.038	170	800	0.032	101	480	0.033	64
α° max	≤ D5	2°			2°			1°			1°		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF942

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	5° x 0.4D			5° x 0.4D			3° x 0.4D			3° x 0.4D		
Vc (m/min)	80-100			50-70			35-55			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	7170	0.012	340	4780	0.011	205	3580	0.010	150	1990	0.014	114
5	5730	0.015	350	3820	0.014	210	2870	0.014	155	1590	0.019	118
6	4780	0.019	360	3180	0.017	215	2390	0.017	159	1330	0.023	121
8	3580	0.022	320	2390	0.020	190	1790	0.020	141	1000	0.027	108
10	2870	0.027	305	1910	0.024	185	1430	0.023	134	800	0.032	103
12	2390	0.030	285	1590	0.027	170	1190	0.026	126	660	0.036	96
16	1790	0.034	245	1190	0.031	145	900	0.030	108	500	0.041	83
20	1430	0.046	265	960	0.042	160	720	0.041	117	400	0.056	89

VERTICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	80-100			50-70			35-55			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	7170	0.014	390	4780	0.012	230	3580	0.010	150	1990	0.010	80
5	5730	0.018	400	3820	0.016	240	2870	0.013	150	1590	0.012	80
6	4780	0.022	410	3180	0.019	250	2390	0.016	150	1330	0.015	80
8	3580	0.026	370	2390	0.023	220	1790	0.019	140	1000	0.018	70
10	2870	0.030	350	1910	0.027	210	1430	0.023	130	800	0.021	70
12	2390	0.034	330	1590	0.031	200	1190	0.026	120	660	0.024	60
16	1790	0.039	280	1190	0.035	170	900	0.029	110	500	0.027	50
20	1430	0.053	300	960	0.048	180	720	0.040	110	400	0.037	60

DRILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x D			D x D			0.5D x D			0.5D x D		
Vc (m/min)	85-105			55-75			40-60			20-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	6370	0.007	170	4380	0.006	110	3180	0.005	70	1990	0.007	60
5	5100	0.009	180	3500	0.008	110	2550	0.007	70	1590	0.010	60
6	4250	0.011	180	2920	0.010	110	2120	0.009	70	1330	0.012	60
8	3180	0.013	160	2190	0.012	100	1590	0.010	70	1000	0.014	60
10	2550	0.015	160	1750	0.014	100	1270	0.012	60	800	0.017	50
12	2120	0.017	150	1460	0.015	90	1060	0.014	60	660	0.019	50
16	1590	0.020	120	1090	0.018	80	800	0.016	50	500	0.022	40
20	1270	0.026	130	880	0.024	80	640	0.021	50	400	0.029	50
ap x ae ≤ D5	0.5D x D			0.5D x D			0.25D x D			0.25D x D		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

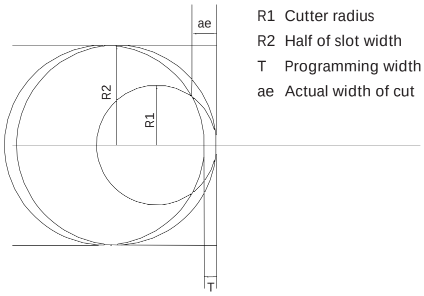
HF942

TROCHOIDAL

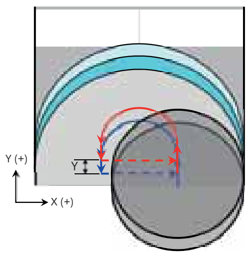
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.1D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	6370	0.034	870	4380	0.031	540	3180	0.027	350	1990	0.037	300
5	5100	0.044	900	3500	0.040	550	2550	0.035	360	1590	0.048	310
6	4250	0.054	920	2920	0.049	570	2120	0.043	370	1330	0.059	320
8	3180	0.064	810	2190	0.058	500	1590	0.051	330	1000	0.070	280
10	2550	0.076	780	1750	0.068	480	1270	0.061	310	800	0.084	270
12	2120	0.086	730	1460	0.077	450	1060	0.069	290	660	0.095	250
16	1590	0.098	620	1090	0.088	380	800	0.078	250	500	0.108	220
20	1270	0.132	670	880	0.119	420	640	0.106	270	400	0.145	230

ap x ae	≤ D5				
		1.5D x 0.1D	1.5D x 0.1D	1.2D x 0.05D	1.2D x 0.05D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



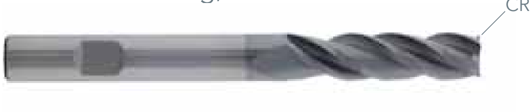
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

HF943

weldon shank, long cutting edge ideal for trochoidal milling, corner radius

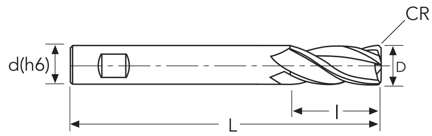
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.025	0.10	+/-0.010	6	19		75	4	HF9430104075	h
5	0/-0.025	0.10	+/-0.010	6	19		75	4	HF9430105075	h
6	0/-0.025	0.10	+/-0.010	6	25		75	4	HF9430106075	h
8	0/-0.030	0.20	+/-0.010	8	30		75	4	HF9430208075	h
10	0/-0.030	0.20	+/-0.010	10	40		100	4	HF94302100100	h
12	0/-0.030	0.30	+/-0.010	12	45		100	4	HF94303120100	h
16	0/-0.030	0.30	+/-0.010	16	65		125	4	HF94303160125	h
20	0/-0.030	0.30	+/-0.010	20	65		125	4	HF94303200125	h

h stock standard   f non-standard stock   m stock exhaustion

CUTTING PARAMETERS

HF943

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.2D x 0.2D**			**1.2D x 0.2D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	9550	0.016	620	6370	0.015	370	4780	0.013	250	3180	0.018	230
5	7640	0.021	650	5100	0.019	390	3820	0.017	260	2550	0.023	240
6	6370	0.026	660	4250	0.023	400	3180	0.021	260	2120	0.029	240
8	4780	0.031	590	3180	0.028	350	2390	0.025	230	1590	0.034	210
10	3820	0.036	560	2550	0.033	330	1910	0.029	220	1270	0.040	200
12	3180	0.041	530	2120	0.037	320	1590	0.033	210	1060	0.045	190
16	2390	0.047	450	1590	0.042	270	1190	0.038	180	800	0.052	170
20	1910	0.063	480	1270	0.057	290	960	0.051	190	640	0.070	180

ap x ae	≤ D5				
		1.5D x 0.1D	1.5D x 0.1D	1.2D x 0.1D	1.2D x 0.1D

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	7960	0.010	325	5570	0.010	220	3980	0.008	130	2390	0.009	82
5	6370	0.013	340	4460	0.013	225	3180	0.011	134	1910	0.011	85
6	5310	0.016	345	3720	0.016	230	2650	0.013	137	1590	0.014	87
8	3980	0.019	305	2790	0.018	205	1990	0.015	122	1190	0.016	77
10	3180	0.023	290	2230	0.022	195	1590	0.018	116	960	0.019	74
12	2650	0.026	275	1860	0.025	185	1330	0.021	110	800	0.022	70
16	1990	0.030	235	1390	0.028	155	1000	0.024	94	600	0.025	59
20	1590	0.040	255	1110	0.038	170	800	0.032	101	480	0.033	64

α° max	≤ D5				
		2°	2°	1°	1°

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF942 PARAMETERS.

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF943

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	5° x 0.4D			5° x 0.4D			3° x 0.4D			3° x 0.4D		
Vc (m/min)	80-100			50-70			35-55			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	7170	0.012	340	4780	0.011	205	3580	0.010	150	1990	0.014	114
5	5730	0.015	350	3820	0.014	210	2870	0.014	155	1590	0.019	118
6	4780	0.019	360	3180	0.017	215	2390	0.017	159	1330	0.023	121
8	3580	0.022	320	2390	0.020	190	1790	0.020	141	1000	0.027	108
10	2870	0.027	305	1910	0.024	185	1430	0.023	134	800	0.032	103
12	2390	0.030	285	1590	0.027	170	1190	0.026	126	660	0.036	96
16	1790	0.034	245	1190	0.031	145	900	0.030	108	500	0.041	83
20	1430	0.046	265	960	0.042	160	720	0.041	117	400	0.056	89

VERTICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	80-100			50-70			35-55			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	7170	0.014	390	4780	0.012	230	3580	0.010	150	1990	0.010	80
5	5730	0.018	400	3820	0.016	240	2870	0.013	150	1590	0.012	80
6	4780	0.022	410	3180	0.019	250	2390	0.016	150	1330	0.015	80
8	3580	0.026	370	2390	0.023	220	1790	0.019	140	1000	0.018	70
10	2870	0.030	350	1910	0.027	210	1430	0.023	130	800	0.021	70
12	2390	0.034	330	1590	0.031	200	1190	0.026	120	660	0.024	60
16	1790	0.039	280	1190	0.035	170	900	0.029	110	500	0.027	50
20	1430	0.053	300	960	0.048	180	720	0.040	110	400	0.037	60

DRILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x D			D x D			0.5D x D			0.5D x D		
Vc (m/min)	85-105			55-75			40-60			20-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	6370	0.007	170	4380	0.006	110	3180	0.005	70	1990	0.007	60
5	5100	0.009	180	3500	0.008	110	2550	0.007	70	1590	0.010	60
6	4250	0.011	180	2920	0.010	110	2120	0.009	70	1330	0.012	60
8	3180	0.013	160	2190	0.012	100	1590	0.010	70	1000	0.014	60
10	2550	0.015	160	1750	0.014	100	1270	0.012	60	800	0.017	50
12	2120	0.017	150	1460	0.015	90	1060	0.014	60	660	0.019	50
16	1590	0.020	120	1090	0.018	80	800	0.016	50	500	0.022	40
20	1270	0.026	130	880	0.024	80	640	0.021	50	400	0.029	50

ap x ae	≤ D5	0.5D x D	0.5D x D	0.25D x D	0.25D x D

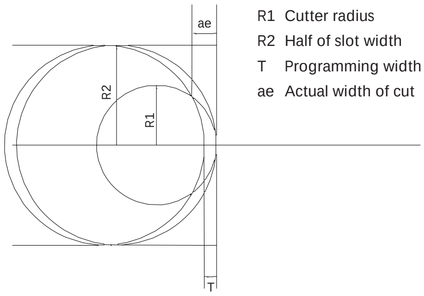
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF942 PARAMETERS.

CUTTING PARAMETERS

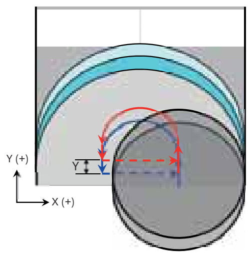
HF943

	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**2D x 0.1D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
	Vc (m/min)	**160-200**			**110-130**			**80-100**			**50-70**		
TROCHOIDAL	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	6370	0.034	870	4380	0.031	540	3180	0.027	350	1990	0.037	300
	5	5100	0.044	900	3500	0.040	550	2550	0.035	360	1590	0.048	310
	6	4250	0.054	920	2920	0.049	570	2120	0.043	370	1330	0.059	320
	8	3180	0.064	810	2190	0.058	500	1590	0.051	330	1000	0.070	280
	10	2550	0.076	780	1750	0.068	480	1270	0.061	310	800	0.084	270
	12	2120	0.086	730	1460	0.077	450	1060	0.069	290	660	0.095	250
	16	1590	0.098	620	1090	0.088	380	800	0.078	250	500	0.108	220
	20	1270	0.132	670	880	0.119	420	640	0.106	270	400	0.145	230
ap x ae	**≤ D5**	1.5D x 0.1D			1.5D x 0.1D			1.2D x 0.05D			1.2D x 0.05D		

NOTES:
Down milling CNC programming is required.
“ae” value max 0.2xD - “T” value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the “T” value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut

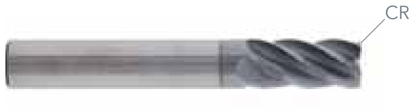


PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF942 PARAMETERS.

HF642

OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5

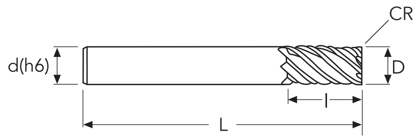
cylindrical shank, 5F ideal for trochoidal milling, corner radius



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.025	0.10	+/-0.010	6	12		57	5	HF64201040	h
5	0/-0.025	0.10	+/-0.010	6	13		57	5	HF64201050	h
6	0/-0.025	0.10	+/-0.010	6	13		57	5	HF64201060	h
8	0/-0.030	0.20	+/-0.010	8	20		64	5	HF64202080	h
10	0/-0.030	0.20	+/-0.010	10	22		72	5	HF64202100	h
12	0/-0.030	0.30	+/-0.010	12	26		83	5	HF64203120	h
16	0/-0.030	0.30	+/-0.010	16	32		92	5	HF64203160	h
20	0/-0.030	0.30	+/-0.010	20	38		104	5	HF64203200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF642

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
Vc (m/min)	**160-180**			**100-120**			**70-90**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	13540	0.019	1280	8760	0.017	740	6370	0.015	480	3980	0.021	410
5	10830	0.023	1270	7010	0.021	740	5100	0.019	480	3180	0.026	410
6	9020	0.028	1240	5840	0.025	720	4250	0.022	470	2650	0.030	400
8	6770	0.036	1210	4380	0.032	700	3180	0.029	450	1990	0.039	390
10	5410	0.043	1160	3500	0.039	670	2550	0.034	440	1590	0.047	370
12	4510	0.049	1100	2920	0.044	640	2120	0.039	420	1330	0.054	360
16	3380	0.061	1030	2190	0.055	600	1590	0.049	390	1000	0.067	340
20	2710	0.074	1010	1750	0.067	590	1270	0.060	380	800	0.082	330

ap x ae	≤ D5	1.5D x 0.3D	1.5D x 0.3D	1.2D x 0.2D	1.2D x 0.2D

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	11150	0.011	640	7170	0.011	385	5570	0.009	263	3180	0.009	140
5	8920	0.014	635	5730	0.013	380	4460	0.012	262	2550	0.011	140
6	7430	0.017	620	4780	0.016	370	3720	0.014	256	2120	0.013	136
8	5570	0.022	605	3580	0.020	360	2790	0.018	249	1590	0.017	133
10	4460	0.026	580	2870	0.024	350	2230	0.021	239	1270	0.020	127
12	3720	0.030	555	2390	0.028	330	1860	0.024	228	1060	0.023	121
16	2790	0.037	520	1790	0.035	310	1390	0.031	213	800	0.029	114
20	2230	0.045	505	1430	0.042	300	1110	0.037	207	640	0.035	111

α° max	≤ D5	2°	2°	1°	1°

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF642

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	7430	0.018	680	4780	0.017	405	3720	0.016	298	2120	0.022	234
8	5570	0.024	660	3580	0.022	390	2790	0.021	290	1590	0.029	227
10	4460	0.028	635	2870	0.026	375	2230	0.025	278	1270	0.034	218
12	3720	0.033	605	2390	0.030	360	1860	0.029	265	1060	0.039	208
16	2790	0.041	570	1790	0.037	335	1390	0.036	248	800	0.049	196
20	2230	0.050	550	1430	0.046	325	1110	0.043	241	640	0.060	191

VERTICAL

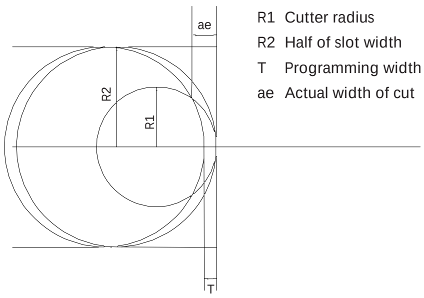
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	7430	0.023	850	4780	0.021	490	3720	0.017	320	2120	0.016	170
8	5570	0.030	830	3580	0.027	480	2790	0.022	310	1590	0.021	170
10	4460	0.036	800	2870	0.032	460	2230	0.027	300	1270	0.025	160
12	3720	0.041	760	2390	0.037	440	1860	0.031	280	1060	0.029	150
16	2790	0.051	710	1790	0.046	410	1390	0.038	270	800	0.036	140
20	2230	0.062	690	1430	0.056	400	1110	0.047	260	640	0.043	140

TROCHOIDAL

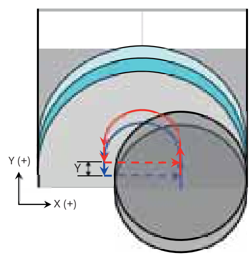
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**190-230**			**130-150**			**100-120**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.057	1680	3720	0.052	960	2920	0.046	670	1590	0.063	500
8	4380	0.074	1630	2790	0.067	930	2190	0.060	650	1190	0.082	490
10	3500	0.089	1560	2230	0.080	900	1750	0.071	620	960	0.098	470
12	2920	0.102	1490	1860	0.092	850	1460	0.082	600	800	0.112	450
16	2190	0.128	1400	1390	0.115	800	1090	0.102	560	600	0.140	420
20	1750	0.155	1360	1110	0.140	770	880	0.124	550	480	0.171	410

ap x ae				
≤ D5	1.5D x 0.1D	1.5D x 0.1D	D x 0.1D	D x 0.1D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut

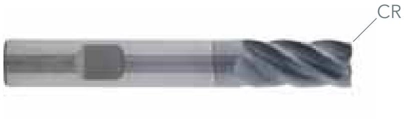


PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF643

weldon shank, 5 flutes ideal for trochoidal milling, corner radius

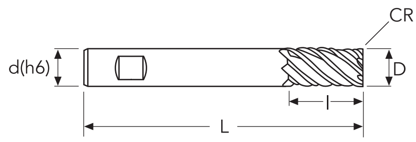
OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5



P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.025	0.10	+/-0.010	6	12		57	5	HF64301040	h
5	0/-0.025	0.10	+/-0.010	6	13		57	5	HF64301050	h
6	0/-0.025	0.10	+/-0.010	6	13		57	5	HF64301060	h
8	0/-0.030	0.20	+/-0.010	8	20		64	5	HF64302080	h
10	0/-0.030	0.20	+/-0.010	10	22		72	5	HF64302100	h
12	0/-0.030	0.30	+/-0.010	12	26		83	5	HF64303120	h
16	0/-0.030	0.30	+/-0.010	16	32		92	5	HF64303160	h
20	0/-0.030	0.30	+/-0.010	20	38		104	5	HF64303200	h

h stock standard f non-standard stock m stock exhaustion

OSAWA

CUTTING PARAMETERS

HF643

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
Vc (m/min)	**160-180**			**100-120**			**70-90**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	13540	0.019	1280	8760	0.017	740	6370	0.015	480	3980	0.021	410
5	10830	0.023	1270	7010	0.021	740	5100	0.019	480	3180	0.026	410
6	9020	0.028	1240	5840	0.025	720	4250	0.022	470	2650	0.030	400
8	6770	0.036	1210	4380	0.032	700	3180	0.029	450	1990	0.039	390
10	5410	0.043	1160	3500	0.039	670	2550	0.034	440	1590	0.047	370
12	4510	0.049	1100	2920	0.044	640	2120	0.039	420	1330	0.054	360
16	3380	0.061	1030	2190	0.055	600	1590	0.049	390	1000	0.067	340
20	2710	0.074	1010	1750	0.067	590	1270	0.060	380	800	0.082	330
ap x ae ≤ D5	1.5D x 0.3D			1.5D x 0.3D			1.2D x 0.2D			1.2D x 0.2D		

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	11150	0.011	640	7170	0.011	385	5570	0.009	263	3180	0.009	140
5	8920	0.014	635	5730	0.013	380	4460	0.012	262	2550	0.011	140
6	7430	0.017	620	4780	0.016	370	3720	0.014	256	2120	0.013	136
8	5570	0.022	605	3580	0.020	360	2790	0.018	249	1590	0.017	133
10	4460	0.026	580	2870	0.024	350	2230	0.021	239	1270	0.020	127
12	3720	0.030	555	2390	0.028	330	1860	0.024	228	1060	0.023	121
16	2790	0.037	520	1790	0.035	310	1390	0.031	213	800	0.029	114
20	2230	0.045	505	1430	0.042	300	1110	0.037	207	640	0.035	111
α° max ≤ D5	2°			2°			1°			1°		

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	11150	0.013	700	7170	0.012	415	5570	0.011	306	3180	0.015	240
5	8920	0.016	695	5730	0.014	410	4460	0.014	305	2550	0.019	240
6	7430	0.018	680	4780	0.017	405	3720	0.016	298	2120	0.022	234
8	5570	0.024	660	3580	0.022	390	2790	0.021	290	1590	0.029	227
10	4460	0.028	635	2870	0.026	375	2230	0.025	278	1270	0.034	218
12	3720	0.033	605	2390	0.030	360	1860	0.029	265	1060	0.039	208
16	2790	0.041	570	1790	0.037	335	1390	0.036	248	800	0.049	196
20	2230	0.050	550	1430	0.046	325	1110	0.043	241	640	0.060	191

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF642 PARAMETERS.

CUTTING PARAMETERS

HF643

VERTICAL

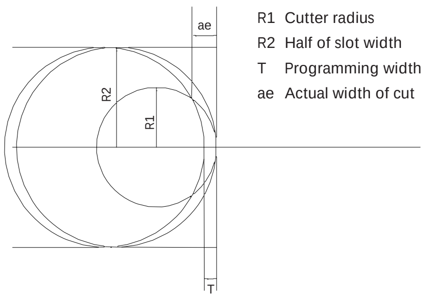
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	11150	0.016	880	7170	0.014	510	5570	0.012	330	3180	0.011	180
5	8920	0.020	870	5730	0.018	500	4460	0.015	330	2550	0.014	170
6	7430	0.023	850	4780	0.021	490	3720	0.017	320	2120	0.016	170
8	5570	0.030	830	3580	0.027	480	2790	0.022	310	1590	0.021	170
10	4460	0.036	800	2870	0.032	460	2230	0.027	300	1270	0.025	160
12	3720	0.041	760	2390	0.037	440	1860	0.031	280	1060	0.029	150
16	2790	0.051	710	1790	0.046	410	1390	0.038	270	800	0.036	140
20	2230	0.062	690	1430	0.056	400	1110	0.047	260	640	0.043	140

TROCHOIDAL

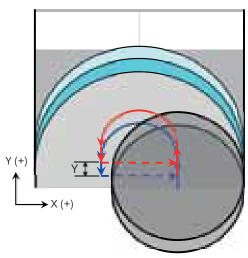
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**190-230**			**130-150**			**100-120**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	8760	0.039	1720	5570	0.035	990	4380	0.031	690	2390	0.043	520
5	7010	0.049	1710	4460	0.044	980	3500	0.039	680	1910	0.054	510
6	5840	0.057	1680	3720	0.052	960	2920	0.046	670	1590	0.063	500
8	4380	0.074	1630	2790	0.067	930	2190	0.060	650	1190	0.082	490
10	3500	0.089	1560	2230	0.080	900	1750	0.071	620	960	0.098	470
12	2920	0.102	1490	1860	0.092	850	1460	0.082	600	800	0.112	450
16	2190	0.128	1400	1390	0.115	800	1090	0.102	560	600	0.140	420
20	1750	0.155	1360	1110	0.140	770	880	0.124	550	480	0.171	410

ap x ae	≤ D5				
		1.5D x 0.1D	1.5D x 0.1D	D x 0.1D	D x 0.1D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF642 PARAMETERS.

HF742

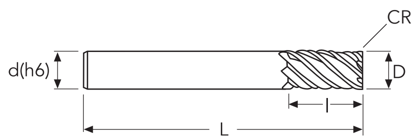
cylindrical shank, long 5 flutes ideal for trochoidal milling, corner radius

OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5

P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.025	0.10	+/-0.010	6	25		75	5	HF7420106075	h
8	0/-0.030	0.20	+/-0.010	8	25		75	5	HF7420208075	h
10	0/-0.030	0.20	+/-0.010	10	38		100	5	HF74202100100	h
12	0/-0.030	0.30	+/-0.010	12	45		100	5	HF74203120100	h
16	0/-0.030	0.30	+/-0.010	16	55		125	5	HF74203160125	h
20	0/-0.030	0.30	+/-0.010	20	65		125	5	HF74203200125	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF742

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 03D**			**1.5D x 0.3D**			**1.2D x 0.2D**			**1.2D x 0.2D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.023	740	4250	0.021	450	3180	0.019	300	2120	0.026	270
8	4780	0.028	660	3180	0.025	400	2390	0.022	260	1590	0.030	240
10	3820	0.033	630	2550	0.030	380	1910	0.026	250	1270	0.036	230
12	3180	0.037	590	2120	0.033	350	1590	0.030	240	1060	0.041	220
16	2390	0.042	510	1590	0.038	300	1190	0.034	200	800	0.047	190
20	1910	0.057	540	1270	0.051	330	960	0.046	220	640	0.063	200

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5310	0.016	435	3720	0.016	290	2650	0.013	172	1590	0.014	109
8	3980	0.019	385	2790	0.018	255	1990	0.015	153	1190	0.016	96
10	3180	0.023	365	2230	0.022	245	1590	0.018	145	960	0.019	92
12	2650	0.026	345	1860	0.025	230	1330	0.021	137	800	0.022	87
16	1990	0.030	295	1390	0.028	195	1000	0.024	118	600	0.025	74
20	1590	0.040	315	1110	0.038	210	800	0.032	127	480	0.033	80

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x D**			**4° x D**			**3° x D**			**3° x D**		
Vc (m/min)	**80-100**			**50-70**			**35-55**			**20-30**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.017	405	3180	0.016	250	2390	0.015	179	1330	0.021	137
8	3580	0.020	360	2390	0.019	225	1790	0.018	158	1000	0.024	122
10	2870	0.024	345	1910	0.022	215	1430	0.021	150	800	0.029	116
12	2390	0.027	325	1590	0.025	200	1190	0.024	142	660	0.033	108
16	1790	0.031	275	1190	0.029	170	900	0.027	122	500	0.037	93
20	1430	0.042	295	960	0.039	185	720	0.037	131	400	0.050	100

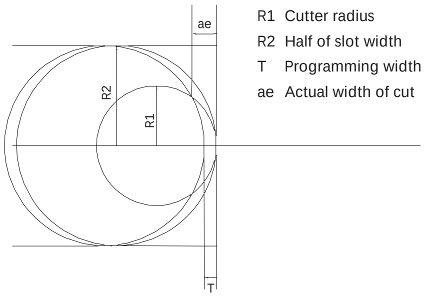
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF742

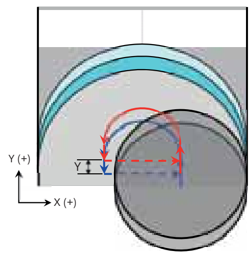
VERTICAL	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
	Vc (m/min)	**80-100**			**50-70**			**35-55**			**20-30**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	4780	0.022	520	3180	0.019	310	2390	0.016	190	1330	0.015	100
	8	3580	0.026	460	2390	0.023	280	1790	0.019	170	1000	0.018	90
	10	2870	0.030	440	1910	0.027	260	1430	0.023	160	800	0.021	90
	12	2390	0.034	410	1590	0.031	250	1190	0.026	150	660	0.024	80
	16	1790	0.039	350	1190	0.035	210	900	0.029	130	500	0.027	70
	20	1430	0.053	380	960	0.048	230	720	0.040	140	400	0.037	70

TROCHOIDAL	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**3D x 0.1D**			**3D x 0.1D**			**2D x 0.1D**			**2D x 0.1D**		
	Vc (m/min)	**130-170**			**100-130**			**70-90**			**40-60**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	4250	0.054	1150	2920	0.049	710	2120	0.043	460	1330	0.059	400
	8	3180	0.064	1020	2190	0.058	630	1590	0.051	410	1000	0.070	350
	10	2550	0.076	970	1750	0.068	600	1270	0.061	390	800	0.084	330
	12	2120	0.086	910	1460	0.077	570	1060	0.069	360	660	0.095	310
	16	1590	0.098	780	1090	0.088	480	800	0.078	310	500	0.108	270
	20	1270	0.132	840	880	0.119	520	640	0.106	340	400	0.145	290

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



OSAWA

HF743

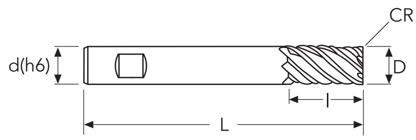
OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5

weldon shank, long 5 flutes ideal for trochoidal milling, corner radius

P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.025	0.10	+/-0.010	6	25		75	5	HF7430106075	h
8	0/-0.030	0.20	+/-0.010	8	25		75	5	HF7430208075	h
10	0/-0.030	0.20	+/-0.010	10	38		100	5	HF74302100100	h
12	0/-0.030	0.30	+/-0.010	12	45		100	5	HF74303120100	h
16	0/-0.030	0.30	+/-0.010	16	55		125	5	HF74303160125	h
20	0/-0.030	0.30	+/-0.010	20	65		125	5	HF74303200125	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF743

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 03D**			**1.5D x 0.3D**			**1.2D x 0.2D**			**1.2D x 0.2D**		
Vc (m/min)	**110-130**			**70-90**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.023	740	4250	0.021	450	3180	0.019	300	2120	0.026	270
8	4780	0.028	660	3180	0.025	400	2390	0.022	260	1590	0.030	240
10	3820	0.033	630	2550	0.030	380	1910	0.026	250	1270	0.036	230
12	3180	0.037	590	2120	0.033	350	1590	0.030	240	1060	0.041	220
16	2390	0.042	510	1590	0.038	300	1190	0.034	200	800	0.047	190
20	1910	0.057	540	1270	0.051	330	960	0.046	220	640	0.063	200

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5310	0.016	435	3720	0.016	290	2650	0.013	172	1590	0.014	109
8	3980	0.019	385	2790	0.018	255	1990	0.015	153	1190	0.016	96
10	3180	0.023	365	2230	0.022	245	1590	0.018	145	960	0.019	92
12	2650	0.026	345	1860	0.025	230	1330	0.021	137	800	0.022	87
16	1990	0.030	295	1390	0.028	195	1000	0.024	118	600	0.025	74
20	1590	0.040	315	1110	0.038	210	800	0.032	127	480	0.033	80

RAMPING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x D**			**4° x D**			**3° x D**			**3° x D**		
Vc (m/min)	**80-100**			**50-70**			**35-55**			**20-30**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.017	405	3180	0.016	250	2390	0.015	179	1330	0.021	137
8	3580	0.020	360	2390	0.019	225	1790	0.018	158	1000	0.024	122
10	2870	0.024	345	1910	0.022	215	1430	0.021	150	800	0.029	116
12	2390	0.027	325	1590	0.025	200	1190	0.024	142	660	0.033	108
16	1790	0.031	275	1190	0.029	170	900	0.027	122	500	0.037	93
20	1430	0.042	295	960	0.039	185	720	0.037	131	400	0.050	100

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF742 PARAMETERS.

CUTTING PARAMETERS

HF743

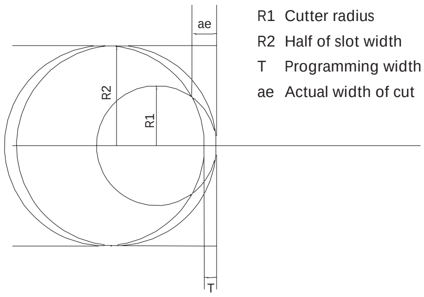
VERTICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	80-100			50-70			35-55			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.022	520	3180	0.019	310	2390	0.016	190	1330	0.015	100
8	3580	0.026	460	2390	0.023	280	1790	0.019	170	1000	0.018	90
10	2870	0.030	440	1910	0.027	260	1430	0.023	160	800	0.021	90
12	2390	0.034	410	1590	0.031	250	1190	0.026	150	660	0.024	80
16	1790	0.039	350	1190	0.035	210	900	0.029	130	500	0.027	70
20	1430	0.053	380	960	0.048	230	720	0.040	140	400	0.037	70

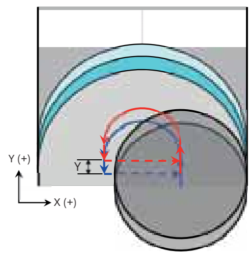
TROCHOIDAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	3D x 0.1D			3D x 0.1D			2D x 0.1D			2D x 0.1D		
Vc (m/min)	130-170			100-130			70-90			40-60		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4250	0.054	1150	2920	0.049	710	2120	0.043	460	1330	0.059	400
8	3180	0.064	1020	2190	0.058	630	1590	0.051	410	1000	0.070	350
10	2550	0.076	970	1750	0.068	600	1270	0.061	390	800	0.084	330
12	2120	0.086	910	1460	0.077	570	1060	0.069	360	660	0.095	310
16	1590	0.098	780	1090	0.088	480	800	0.078	310	500	0.108	270
20	1270	0.132	840	880	0.119	520	640	0.106	340	400	0.145	290

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF742 PARAMETERS.

HF861

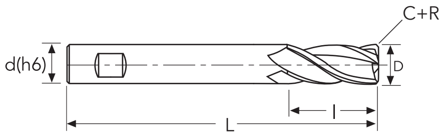
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C+R | Z4 UP

weldon shank, SC smooth cut for low cutting force, chamfer + radius

P	M	K	N	S	H
★	★	★		★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL



D	D Tol.	C+R	C+R Tol	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020		+/-0.020	4	3		50	4	HF861010	h
1.5	0/-0.020		+/-0.020	4	4.5		50	4	HF861015	h
2	0/-0.020		+/-0.020	4	6.5		50	4	HF861020	h
2.5	0/-0.020		+/-0.020	4	6.5		50	4	HF861025	h
3	0/-0.025	0.1	+/-0.020	6	9		50	4	HF861030	h
3.5	0/-0.025	0.1	+/-0.020	6	12		50	4	HF861035	h
4	0/-0.025	0.1	+/-0.020	6	12		50	4	HF861040	h
4.5	0/-0.025	0.1	+/-0.020	6	15		50	4	HF861045	h
5	0/-0.025	0.1	+/-0.020	6	15		50	4	HF861050	h
6	0/-0.025	0.1	+/-0.020	6	20		60	4	HF861060	h
7	0/-0.030	0.2	+/-0.020	8	22		64	4	HF861070	h
8	0/-0.030	0.2	+/-0.020	8	22		64	4	HF861080	h
9	0/-0.030	0.2	+/-0.020	10	27		70	4	HF861090	h
10	0/-0.030	0.2	+/-0.020	10	27		70	4	HF861100	h
11	0/-0.030	0.2	+/-0.020	12	32		75	4	HF861110	h
12	0/-0.030	0.2	+/-0.020	12	32		75	4	HF861120	h
13	0/-0.030	0.2	+/-0.020	14	32		90	4	HF861130	h
14	0/-0.030	0.2	+/-0.020	14	32		90	4	HF861140	h
15	0/-0.030	0.2	+/-0.020	16	32		90	4	HF861150	h
16	0/-0.030	0.2	+/-0.020	16	32		90	4	HF861160	h
18	0/-0.030	0.2	+/-0.020	18	38		100	4	HF861180	h
20	0/-0.030	0.2	+/-0.020	20	38		100	4	HF861200	h

h stock standard f non-standard stock m stock exhaustion

HF861

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2			≤ 35 HRC			≤ 40 HRC		
ap x ae	**D X D**			**D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	30000	0.005	600	28660	0.005	520	22290	0.004	330	12740	0.004	180
1.5	29720	0.008	890	19110	0.007	520	14860	0.006	330	8490	0.005	180
2	22290	0.010	890	14330	0.009	520	11150	0.008	330	6370	0.007	180
3	14860	0.014	830	9550	0.013	480	7430	0.011	310	4250	0.010	170
4	11150	0.019	830	7170	0.017	480	5570	0.014	310	3180	0.013	160
5	8920	0.023	820	5730	0.021	470	4460	0.017	310	2550	0.016	160
6	7430	0.027	800	4780	0.024	460	3720	0.020	300	2120	0.019	160
8	5570	0.035	780	3580	0.032	450	2790	0.026	290	1590	0.025	160
10	4460	0.042	750	2870	0.038	430	2230	0.032	280	1270	0.029	150
12	3720	0.048	710	2390	0.043	410	1860	0.036	270	1060	0.034	140
14	3180	0.054	690	2050	0.049	400	1590	0.041	260	910	0.038	140
16	2790	0.060	670	1790	0.054	390	1390	0.045	250	800	0.042	130
18	2480	0.066	650	1590	0.059	380	1240	0.050	250	710	0.046	130
20	2230	0.073	650	1430	0.066	380	1110	0.055	240	640	0.051	130

ap x ae		
ap x ae	**D1**	0.25D x D
ap x ae	**≤ D3**	0.5D x D

SLOTTING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3		
Hardness/Rm	≤ 700 N/mm^2			700-1000 N/mm^2		
ap x ae	**1.5D x D**			**1.5D x D**		
Vc (m/min)	**100-120**			**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	4380	0.028	490	2790	0.025	280
10	3500	0.034	470	2230	0.030	270
12	2920	0.038	450	1860	0.035	260
14	2500	0.043	430	1590	0.039	250
16	2190	0.048	420	1390	0.043	240
18	1950	0.053	410	1240	0.048	240
20	1750	0.058	410	1110	0.053	230

SLOTTING

Material Group ISO 513	P1 P2 M1 K1		
Hardness/Rm	≤ 700 N/mm^2		
ap x ae	**2D x D**		
Vc (m/min)	**75-95**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)
10	2710	0.025	270
12	2260	0.029	260
14	1930	0.032	250
16	1690	0.036	240
18	1500	0.040	240
20	1350	0.044	240

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

CUTTING PARAMETERS

HF861

SIDE MILLING

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.2D x 0.3D**			**1.2D x 0.3D**		
Vc (m/min)	**160-180**			**100-120**			**70-90**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	30000	0.006	720	30000	0.005	650	25480	0.005	490	15920	0.007	420
1.5	36090	0.009	1300	23350	0.008	760	16990	0.007	490	10620	0.010	420
2	27070	0.012	1300	17520	0.011	760	12740	0.010	490	7960	0.013	420
3	18050	0.017	1210	11680	0.015	710	8490	0.013	460	5310	0.018	390
4	13540	0.022	1200	8760	0.020	700	6370	0.018	450	3980	0.024	390
5	10830	0.028	1200	7010	0.025	700	5100	0.022	450	3180	0.030	390
6	9020	0.032	1170	5840	0.029	680	4250	0.026	440	2650	0.036	380
8	6770	0.042	1140	4380	0.038	660	3180	0.034	430	1990	0.046	370
10	5410	0.050	1090	3500	0.045	640	2550	0.040	410	1590	0.055	350
12	4510	0.058	1040	2920	0.052	610	2120	0.046	390	1330	0.063	340
14	3870	0.065	1000	2500	0.058	580	1820	0.052	380	1140	0.071	330
16	3380	0.072	970	2190	0.065	570	1590	0.058	370	1000	0.079	320
18	3010	0.079	950	1950	0.071	560	1420	0.063	360	880	0.087	310
20	2710	0.088	950	1750	0.079	550	1270	0.070	360	800	0.096	310

ap x ae	≤ D3	1.5D x 0.1D

HELICAL

Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**3° x 0.4D**		
Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	30000	0.004	435	28660	0.003	390	22290	0.003	268	12740	0.003	143
1.5	29720	0.005	650	19110	0.005	390	14860	0.005	268	8490	0.004	143
2	22290	0.007	650	14330	0.007	390	11150	0.006	268	6370	0.006	143
3	14860	0.010	605	9550	0.010	365	7430	0.008	250	4250	0.008	133
4	11150	0.013	600	7170	0.013	360	5570	0.011	247	3180	0.010	132
5	8920	0.017	600	5730	0.016	360	4460	0.014	246	2550	0.013	131
6	7430	0.020	585	4780	0.018	350	3720	0.016	241	2120	0.015	128
8	5570	0.025	570	3580	0.024	340	2790	0.021	235	1590	0.020	125
10	4460	0.031	545	2870	0.029	325	2230	0.025	225	1270	0.024	120
12	3720	0.035	520	2390	0.033	310	1860	0.029	214	1060	0.027	114
14	3180	0.039	500	2050	0.037	300	1590	0.032	206	910	0.030	110
16	2790	0.044	490	1790	0.041	290	1390	0.036	200	800	0.034	108
18	2480	0.048	475	1590	0.045	285	1240	0.040	197	710	0.037	105
20	2230	0.053	475	1430	0.050	285	1110	0.044	195	640	0.041	105

α° max	≤ D3	1°

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

HF861

RAMPING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	α° x ae	**15° x D**			**10° x D**			**5° x D**			**5° x D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	7430	0.022	640	4780	0.020	380	3720	0.019	281	2120	0.026	220
	8	5570	0.028	620	3580	0.026	370	2790	0.024	273	1590	0.034	214
	10	4460	0.034	600	2870	0.031	355	2230	0.029	262	1270	0.040	205
	12	3720	0.038	570	2390	0.035	335	1860	0.034	250	1060	0.046	196
	14	3180	0.043	550	2050	0.040	325	1590	0.038	240	910	0.052	189
	16	2790	0.048	535	1790	0.044	315	1390	0.042	233	800	0.058	185
	18	2480	0.053	520	1590	0.048	310	1240	0.046	229	710	0.063	180
	20	2230	0.058	520	1430	0.054	305	1110	0.051	227	640	0.070	180

VERTICAL	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
	Vc (m/min)	**130-150**			**80-100**			**60-80**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	7430	0.027	800	4780	0.024	460	3720	0.020	300	2120	0.019	160
	8	5570	0.035	780	3580	0.032	450	2790	0.026	290	1590	0.025	160
	10	4460	0.042	750	2870	0.038	430	2230	0.032	280	1270	0.029	150
	12	3720	0.048	710	2390	0.043	410	1860	0.036	270	1060	0.034	140
	14	3180	0.054	690	2050	0.049	400	1590	0.041	260	910	0.038	140
	16	2790	0.060	670	1790	0.054	390	1390	0.045	250	800	0.042	130
	18	2480	0.066	650	1590	0.059	380	1240	0.050	250	710	0.046	130
	20	2230	0.073	650	1430	0.066	380	1110	0.055	240	640	0.051	130

DRILLING	Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
	Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
	ap x ae	**D x D**			**D x D**			**0.5D x D**			**0.5D x D**		
	Vc (m/min)	**100-120**			**60-80**			**45-55**			**20-40**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	1	30000	0.003	300	22290	0.002	200	17520	0.002	140	9550	0.003	110
	1.5	23350	0.004	350	14860	0.003	200	11680	0.003	140	6370	0.004	110
	2	17520	0.005	350	11150	0.005	200	8760	0.004	140	4780	0.006	110
	3	11680	0.007	330	7430	0.006	190	5840	0.006	130	3180	0.008	100
	4	8760	0.009	320	5570	0.008	190	4380	0.007	130	2390	0.010	100
	5	7010	0.012	320	4460	0.010	180	3500	0.009	130	1910	0.013	100
	6	5840	0.014	320	3720	0.012	180	2920	0.011	130	1590	0.015	90
	8	4380	0.018	310	2790	0.016	180	2190	0.014	120	1190	0.019	90
	10	3500	0.021	290	2230	0.019	170	1750	0.017	120	960	0.023	90
	12	2920	0.024	280	1860	0.022	160	1460	0.019	110	800	0.026	80
	14	2500	0.027	270	1590	0.024	150	1250	0.022	110	680	0.030	80
	16	2190	0.030	260	1390	0.027	150	1090	0.024	100	600	0.033	80
	18	1950	0.033	260	1240	0.030	150	970	0.026	100	530	0.036	80
	20	1750	0.037	260	1110	0.033	150	880	0.029	100	480	0.040	80
ap x ae	**≤ D3**	0.5D x D											

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

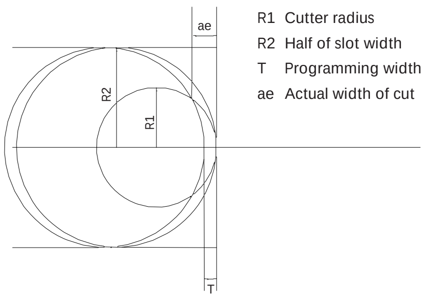
HF861

TROCHOIDAL

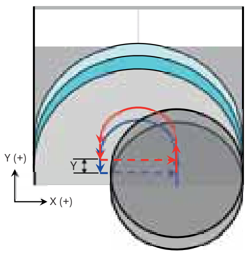
Material Group ISO 513	P1 P2 M1 K1			P3 P4 M2 K2 K3			P5 M3 M4 K4 S1 S4			S2 S3 S5		
Hardness/Rm	≤ 700 N/mm²			700-1000 N/mm²			≤ 35 HRC			≤ 40 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**190-230**			**130-150**			**100-120**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	30000	0.013	1500	22290	0.011	1000	17520	0.010	700	9550	0.014	530
1.5	23350	0.019	1750	14860	0.017	1000	11680	0.015	700	6370	0.021	530
2	17520	0.025	1750	11150	0.023	1000	8760	0.020	700	4780	0.028	530
3	11680	0.035	1640	7430	0.032	940	5840	0.028	650	3180	0.039	490
4	8760	0.046	1620	5570	0.042	930	4380	0.037	650	2390	0.051	490
5	7010	0.058	1610	4460	0.052	920	3500	0.046	640	1910	0.063	480
6	5840	0.068	1580	3720	0.061	900	2920	0.054	630	1590	0.074	470
8	4380	0.088	1530	2790	0.079	880	2190	0.070	610	1190	0.096	460
10	3500	0.105	1470	2230	0.095	840	1750	0.084	590	960	0.116	440
12	2920	0.120	1400	1860	0.108	800	1460	0.096	560	800	0.132	420
14	2500	0.135	1350	1590	0.122	770	1250	0.108	540	680	0.149	400
16	2190	0.150	1310	1390	0.135	750	1090	0.120	520	600	0.165	400
18	1950	0.165	1290	1240	0.149	740	970	0.132	510	530	0.182	380
20	1750	0.183	1280	1110	0.164	730	880	0.146	510	480	0.201	390

ap x ae	**D1**	D x 0.1D	D x 0.1D	D x 0.1D	D x 0.1D
ap x ae	**≤ D3**	1.5D x 0.1D	1.5D x 0.1D	D x 0.1D	D x 0.1D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

HF850

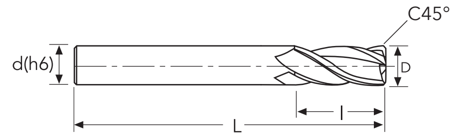
cylindrical shank, 45° chamfer

OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | C45° | Z4 UP

P	M	K	N	S	H
★	★	★		★	★

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.030	0.10	+/-0.020	6	9		57	4	HF850030	h
4	0/-0.030	0.10	+/-0.020	6	11		57	4	HF850040	h
5	0/-0.030	0.10	+/-0.020	6	13		57	4	HF850050	h
6	0/-0.030	0.10	+/-0.020	6	13		57	4	HF850060	h
8	0/-0.030	0.20	+/-0.020	8	20		64	4	HF850080	h
10	0/-0.030	0.20	+/-0.020	10	22		72	4	HF850100	h
12	0/-0.030	0.20	+/-0.020	12	26		83	4	HF850120	h
14	0/-0.030	0.30	+/-0.020	14	32		90	4	HF850140	h
16	0/-0.030	0.30	+/-0.020	16	32		92	4	HF850160	h
20	0/-0.030	0.40	+/-0.020	20	38		104	4	HF850200	h

h stock standard   f non-standard stock   m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF850

SLOTTING	**Material Group ISO 513**	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
	ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.3D x D**		
	Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
	D (mm)	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**
	3	9550	0.012	450	7430	0.011	320	5310	0.009	190	4250	0.008	140
	4	7170	0.016	450	5570	0.014	320	3980	0.012	190	3180	0.011	140
	5	5730	0.020	450	4460	0.018	310	3180	0.015	190	2550	0.014	140
	6	4780	0.023	440	3720	0.021	310	2650	0.017	180	2120	0.016	140
	8	3580	0.030	430	2790	0.027	300	1990	0.022	180	1590	0.021	130
	10	2870	0.036	410	2230	0.032	290	1590	0.027	170	1270	0.025	130
	12	2390	0.041	390	1860	0.037	270	1330	0.031	160	1060	0.029	120
	14	2050	0.046	380	1590	0.041	260	1140	0.034	160	910	0.032	120
	16	1790	0.051	370	1390	0.046	260	1000	0.038	150	800	0.036	110
	20	1430	0.062	350	1110	0.056	250	800	0.047	150	640	0.043	110
ap x ae	**≤ D5**	0.3D x D			0.3D x D			0.2D x D			0.1D x D		

SIDE MILLING	**Material Group ISO 513**	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
	ap x ae	**1.5D x 0.3D**			**1.5D x 0.2D**			**1.2D x 0.2D**			**1.2D x 0.1D**		
	Vc (m/min)	**100-120**			**70-90**			**50-70**			**40-60**		
	D (mm)	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**
	3	11680	0.014	670	8490	0.013	440	6370	0.011	290	5310	0.016	330
	4	8760	0.019	660	6370	0.017	430	4780	0.015	290	3980	0.021	330
	5	7010	0.023	660	5100	0.021	430	3820	0.019	290	3180	0.026	330
	6	5840	0.028	640	4250	0.025	420	3180	0.022	280	2650	0.030	320
	8	4380	0.036	630	3180	0.032	410	2390	0.029	270	1990	0.039	310
	10	3500	0.043	600	2550	0.039	390	1910	0.034	260	1590	0.047	300
	12	2920	0.049	570	2120	0.044	370	1590	0.039	250	1330	0.054	290
	14	2500	0.055	550	1820	0.050	360	1360	0.044	240	1140	0.061	280
	16	2190	0.061	540	1590	0.055	350	1190	0.049	230	1000	0.067	270
	20	1750	0.074	520	1270	0.067	340	960	0.060	230	800	0.082	260
ap x ae	**≤ D5**	1.2D x 0.2D			1.2D x 0.1D			D x 0.2D			D x 0.1D		

HELICAL	**Material Group ISO 513**	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
	α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
	Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
	D (mm)	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**
	3	9550	0.009	330	7430	0.008	240	5310	0.007	152	4250	0.008	128
	4	7170	0.011	330	5570	0.011	240	3980	0.009	150	3180	0.010	126
	5	5730	0.014	325	4460	0.013	235	3180	0.012	149	2550	0.012	126
	6	4780	0.017	320	3720	0.016	230	2650	0.014	146	2120	0.015	123
	8	3580	0.022	310	2790	0.020	225	1990	0.018	142	1590	0.019	120
	10	2870	0.026	300	2230	0.024	215	1590	0.021	136	1270	0.023	115
	12	2390	0.030	285	1860	0.028	205	1330	0.024	130	1060	0.026	109
	14	2050	0.033	275	1590	0.031	200	1140	0.028	126	910	0.029	106
	16	1790	0.037	265	1390	0.035	190	1000	0.031	122	800	0.032	103
	20	1430	0.045	260	1110	0.042	185	800	0.037	119	640	0.039	100
α°	**≤ D5**	2°			2°			1°			1°		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF850

RAMPING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
α° x ae	**5° x D**			**4° x D**			**3° x D**			**2° x D**		
Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.020	385	3720	0.019	280	2650	0.018	187	2120	0.027	232
8	3580	0.026	370	2790	0.024	270	1990	0.023	182	1590	0.035	226
10	2870	0.031	360	2230	0.029	260	1590	0.027	175	1270	0.043	216
12	2390	0.036	340	1860	0.033	245	1330	0.031	167	1060	0.049	206
14	2050	0.040	330	1590	0.037	240	1140	0.035	161	910	0.055	199
16	1790	0.045	320	1390	0.042	230	1000	0.039	157	800	0.061	195
20	1430	0.054	310	1110	0.051	225	800	0.048	153	640	0.074	189

VERTICAL

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.023	440	3720	0.021	310	2650	0.017	180	2120	0.016	140
8	3580	0.030	430	2790	0.027	300	1990	0.022	180	1590	0.021	130
10	2870	0.036	410	2230	0.032	290	1590	0.027	170	1270	0.025	130
12	2390	0.041	390	1860	0.037	270	1330	0.031	160	1060	0.029	120
14	2050	0.046	380	1590	0.041	260	1140	0.034	160	910	0.032	120
16	1790	0.051	370	1390	0.046	260	1000	0.038	150	800	0.036	110
20	1430	0.062	350	1110	0.056	250	800	0.047	150	640	0.043	110

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

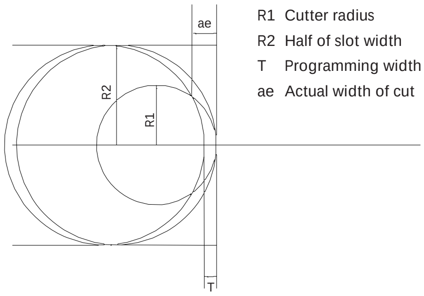
HF850

TROCHOIDAL

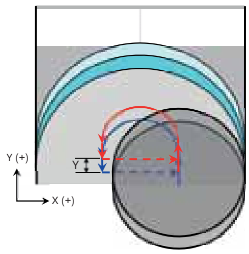
Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**130-150**			**100-120**			**70-90**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	7430	0.030	880	5840	0.027	630	4250	0.024	400	3180	0.033	420
4	5570	0.039	880	4380	0.035	620	3180	0.031	400	2390	0.043	410
5	4460	0.049	870	3500	0.044	620	2550	0.039	400	1910	0.054	410
6	3720	0.057	850	2920	0.052	600	2120	0.046	390	1590	0.063	400
8	2790	0.074	830	2190	0.067	590	1590	0.060	380	1190	0.082	390
10	2230	0.089	800	1750	0.080	560	1270	0.071	360	960	0.098	380
12	1860	0.102	760	1460	0.092	540	1060	0.082	350	800	0.112	360
14	1590	0.115	730	1250	0.103	520	910	0.092	330	680	0.126	340
16	1390	0.128	710	1090	0.115	500	800	0.102	330	600	0.140	340
20	1110	0.155	690	880	0.140	490	640	0.124	320	480	0.171	330

ap x ae	**≤ D5**				
		1.5D x 0.1D	1.5D x 0.1D	D x 0.1D	D x 0.05D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF450

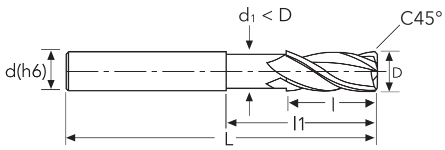
OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | C45° | Z4 UP

cylindrical shank and reduced neck, 45° chamfer

P	M	K	N	S	H
★	★	★		★	★

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.10	+/-0.020	6	9	15	2.80	57	4	HF450030	h
4	0/-0.030	0.10	+/-0.020	6	11	18	3.80	57	4	HF450040	h
5	0/-0.030	0.10	+/-0.020	6	13	19	4.80	57	4	HF450050	h
6	0/-0.030	0.10	+/-0.020	6	13	20	5.80	57	4	HF450060	h
8	0/-0.030	0.20	+/-0.020	8	20	26	7.80	64	4	HF450080	h
10	0/-0.030	0.20	+/-0.020	10	22	30	9.80	72	4	HF450100	h
12	0/-0.030	0.20	+/-0.020	12	26	36	11.80	83	4	HF450120	h
14	0/-0.030	0.20	+/-0.020	14	26	36	13.70	83	4	HF450140	h
16	0/-0.030	0.30	+/-0.020	16	32	42	15.70	92	4	HF450160	h
20	0/-0.030	0.40	+/-0.020	20	38	50	19.70	104	4	HF450200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF450

SLOTTING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.2D x D**		
Vc (m/min)	**70-90**			**50-70**			**30-50**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	8490	0.011	360	6370	0.010	250	4250	0.008	140	3180	0.007	100
4	6370	0.014	360	4780	0.013	240	3180	0.011	140	2390	0.010	90
5	5100	0.018	360	3820	0.016	240	2550	0.013	130	1910	0.012	90
6	4250	0.021	350	3180	0.019	240	2120	0.015	130	1590	0.014	90
8	3180	0.027	340	2390	0.024	230	1590	0.020	130	1190	0.019	90
10	2550	0.032	330	1910	0.029	220	1270	0.024	120	960	0.022	90
12	2120	0.037	310	1590	0.033	210	1060	0.028	120	800	0.026	80
14	1820	0.041	300	1360	0.037	200	910	0.031	110	680	0.029	80
16	1590	0.046	290	1190	0.041	200	800	0.034	110	600	0.032	80
20	1270	0.056	280	960	0.050	190	640	0.042	110	480	0.039	80

ap x ae	≤ D5	0.3D x D	0.3D x D	0.2D x D	0.1D x D

SIDE MILLING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.2D**			**1.2D x 0.2D**			**D x 0.1D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10620	0.013	550	7430	0.012	340	5310	0.010	220	4250	0.014	240
4	7960	0.017	540	5570	0.015	340	3980	0.014	220	3180	0.019	240
5	6370	0.021	540	4460	0.019	340	3180	0.017	210	2550	0.023	240
6	5310	0.025	530	3720	0.022	330	2650	0.020	210	2120	0.027	230
8	3980	0.032	510	2790	0.029	320	1990	0.026	200	1590	0.035	220
10	3180	0.039	490	2230	0.035	310	1590	0.031	200	1270	0.042	220
12	2650	0.044	470	1860	0.040	300	1330	0.035	190	1060	0.048	210
14	2270	0.050	450	1590	0.045	280	1140	0.040	180	910	0.055	200
16	1990	0.055	440	1390	0.050	280	1000	0.044	180	800	0.061	190
20	1590	0.067	430	1110	0.060	270	800	0.054	170	640	0.074	190

ap x ae	≤ D5	1.2D x 0.2D	1.2D x 0.1D	D x 0.1D	D x 0.05D

HELICAL

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
Vc (m/min)	**70-90**			**50-70**			**30-50**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	8490	0.008	265	6370	0.007	185	4250	0.006	109	3180	0.007	86
4	6370	0.010	265	4780	0.010	185	3180	0.008	108	2390	0.009	86
5	5100	0.013	260	3820	0.012	185	2550	0.011	108	1910	0.011	85
6	4250	0.015	255	3180	0.014	180	2120	0.012	105	1590	0.013	83
8	3180	0.019	250	2390	0.018	175	1590	0.016	102	1190	0.017	81
10	2550	0.023	240	1910	0.022	165	1270	0.019	98	960	0.020	78
12	2120	0.027	225	1590	0.025	160	1060	0.022	93	800	0.023	74
14	1820	0.030	220	1360	0.028	155	910	0.025	90	680	0.026	71
16	1590	0.033	215	1190	0.031	150	800	0.028	88	600	0.029	70
20	1270	0.041	205	960	0.038	145	640	0.034	86	480	0.035	68

α°	≤ D5	2°	2°	1°	1°

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF450

RAMPING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
α° x ae	5° x D			4° x D			3° x D			2° x D		
Vc (m/min)	60-80			50-60			30-40			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	3720	0.018	270	2920	0.017	195	1860	0.016	118	1330	0.025	131
8	2790	0.023	260	2190	0.022	190	1390	0.021	114	1000	0.032	128
10	2230	0.028	250	1750	0.026	185	1110	0.025	110	800	0.038	123
12	1860	0.032	240	1460	0.030	175	930	0.028	105	660	0.044	116
14	1590	0.036	230	1250	0.034	170	800	0.032	102	570	0.049	112
16	1390	0.040	225	1090	0.037	165	700	0.035	99	500	0.055	109
20	1110	0.049	215	880	0.045	160	560	0.043	96	400	0.067	107

VERTICAL

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	60-80			50-60			30-40			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	3720	0.021	310	2920	0.019	220	1860	0.015	120	1330	0.014	80
8	2790	0.027	300	2190	0.024	210	1390	0.020	110	1000	0.019	70
10	2230	0.032	290	1750	0.029	200	1110	0.024	110	800	0.022	70
12	1860	0.037	270	1460	0.033	190	930	0.028	100	660	0.026	70
14	1590	0.041	260	1250	0.037	190	800	0.031	100	570	0.029	70
16	1390	0.046	260	1090	0.041	180	700	0.034	100	500	0.032	60
20	1110	0.056	250	880	0.050	180	560	0.042	90	400	0.039	60

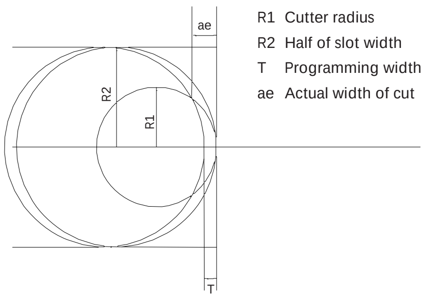
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

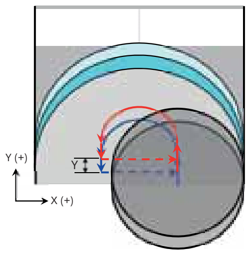
HF450

TROCHOIDAL	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
	ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**D x 0.1D**			**D x 0.1D**		
	Vc (m/min)	**110-130**			**80-100**			**50-70**			**40-60**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	6900	0.027	740	5310	0.024	510	3180	0.021	270	2650	0.029	310
	4	5180	0.035	730	3980	0.032	510	2390	0.028	270	1990	0.039	310
	5	4140	0.044	730	3180	0.040	500	1910	0.035	270	1590	0.048	310
	6	3450	0.052	710	2650	0.046	490	1590	0.041	260	1330	0.057	300
	8	2590	0.067	690	1990	0.060	480	1190	0.054	250	1000	0.074	290
	10	2070	0.080	670	1590	0.072	460	960	0.064	250	800	0.088	280
	12	1730	0.092	640	1330	0.083	440	800	0.073	240	660	0.101	270
	14	1480	0.103	610	1140	0.093	420	680	0.083	220	570	0.114	260
	16	1290	0.115	590	1000	0.103	410	600	0.092	220	500	0.126	250
	20	1040	0.140	580	800	0.126	400	480	0.112	210	400	0.154	250
ap x ae	**≤ D5**	1.5D x 0.1D			1.5D x 0.1D			D x 0.1D			D x 0.05D		

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut

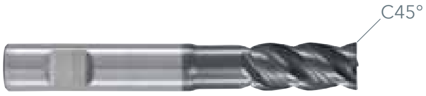


PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF451

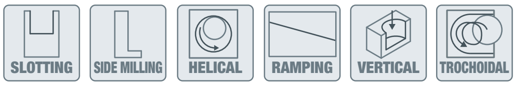
weldon shank and reduced neck, 45° chamfer

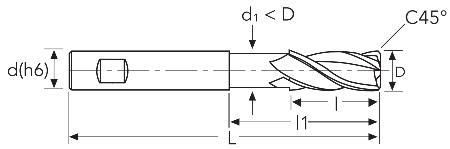
OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | C45° | Z4 UP



P	M	K	N	S	H
★	★	★		★	★

★ 1st choice ☆ suitable





D	D Tol.	C45°	C45° Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.10	+/-0.020	6	9	15	2.80	57	4	HF451030	h
4	0/-0.030	0.10	+/-0.020	6	11	18	3.80	57	4	HF451040	h
5	0/-0.030	0.10	+/-0.020	6	13	19	4.80	57	4	HF451050	h
6	0/-0.030	0.10	+/-0.020	6	13	20	5.80	57	4	HF451060	h
8	0/-0.030	0.20	+/-0.020	8	20	26	7.80	64	4	HF451080	h
10	0/-0.030	0.20	+/-0.020	10	22	30	9.80	72	4	HF451100	h
12	0/-0.030	0.20	+/-0.020	12	26	36	11.80	83	4	HF451120	h
14	0/-0.030	0.20	+/-0.020	14	26	36	13.70	83	4	HF451140	h
16	0/-0.030	0.30	+/-0.020	16	32	42	15.70	92	4	HF451160	h
20	0/-0.030	0.40	+/-0.020	20	38	50	19.70	104	4	HF451200	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

HF451

SLOTTING	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
	ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.2D x D**		
	Vc (m/min)	**70-90**			**50-70**			**30-50**			**20-40**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	8490	0.011	360	6370	0.010	250	4250	0.008	140	3180	0.007	100
	4	6370	0.014	360	4780	0.013	240	3180	0.011	140	2390	0.010	90
	5	5100	0.018	360	3820	0.016	240	2550	0.013	130	1910	0.012	90
	6	4250	0.021	350	3180	0.019	240	2120	0.015	130	1590	0.014	90
	8	3180	0.027	340	2390	0.024	230	1590	0.020	130	1190	0.019	90
	10	2550	0.032	330	1910	0.029	220	1270	0.024	120	960	0.022	90
	12	2120	0.037	310	1590	0.033	210	1060	0.028	120	800	0.026	80
	14	1820	0.041	300	1360	0.037	200	910	0.031	110	680	0.029	80
	16	1590	0.046	290	1190	0.041	200	800	0.034	110	600	0.032	80
	20	1270	0.056	280	960	0.050	190	640	0.042	110	480	0.039	80
ap x ae	**≤ D5**	0.3D x D			0.3D x D			0.2D x D			0.1D x D		

SIDE MILLING	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
	ap x ae	**1.5D x 0.3D**			**1.5D x 0.2D**			**1.2D x 0.2D**			**D x 0.1D**		
	Vc (m/min)	**90-110**			**60-80**			**40-60**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	10620	0.013	550	7430	0.012	340	5310	0.010	220	4250	0.014	240
	4	7960	0.017	540	5570	0.015	340	3980	0.014	220	3180	0.019	240
	5	6370	0.021	540	4460	0.019	340	3180	0.017	210	2550	0.023	240
	6	5310	0.025	530	3720	0.022	330	2650	0.020	210	2120	0.027	230
	8	3980	0.032	510	2790	0.029	320	1990	0.026	200	1590	0.035	220
	10	3180	0.039	490	2230	0.035	310	1590	0.031	200	1270	0.042	220
	12	2650	0.044	470	1860	0.040	300	1330	0.035	190	1060	0.048	210
	14	2270	0.050	450	1590	0.045	280	1140	0.040	180	910	0.055	200
	16	1990	0.055	440	1390	0.050	280	1000	0.044	180	800	0.061	190
	20	1590	0.067	430	1110	0.060	270	800	0.054	170	640	0.074	190
ap x ae	**≤ D5**	1.2D x 0.2D			1.2D x 0.1D			D x 0.1D			D x 0.05D		

HELICAL	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
	α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
	Vc (m/min)	**70-90**			**50-70**			**30-50**			**20-40**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	8490	0.008	265	6370	0.007	185	4250	0.006	109	3180	0.007	86
	4	6370	0.010	265	4780	0.010	185	3180	0.008	108	2390	0.009	86
	5	5100	0.013	260	3820	0.012	185	2550	0.011	108	1910	0.011	85
	6	4250	0.015	255	3180	0.014	180	2120	0.012	105	1590	0.013	83
	8	3180	0.019	250	2390	0.018	175	1590	0.016	102	1190	0.017	81
	10	2550	0.023	240	1910	0.022	165	1270	0.019	98	960	0.020	78
	12	2120	0.027	225	1590	0.025	160	1060	0.022	93	800	0.023	74
	14	1820	0.030	220	1360	0.028	155	910	0.025	90	680	0.026	71
	16	1590	0.033	215	1190	0.031	150	800	0.028	88	600	0.029	70
	20	1270	0.041	205	960	0.038	145	640	0.034	86	480	0.035	68
α°	**≤ D5**	2°			2°			1°			1°		

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF450 PARAMETERS.

CUTTING PARAMETERS

HF451

	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
	α° x ae	**5° x D**			**4° x D**			**3° x D**			**2° x D**		
	Vc (m/min)	**60-80**			**50-60**			**30-40**			**20-30**		
RAMPING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	3720	0.018	270	2920	0.017	195	1860	0.016	118	1330	0.025	131
	8	2790	0.023	260	2190	0.022	190	1390	0.021	114	1000	0.032	128
	10	2230	0.028	250	1750	0.026	185	1110	0.025	110	800	0.038	123
	12	1860	0.032	240	1460	0.030	175	930	0.028	105	660	0.044	116
	14	1590	0.036	230	1250	0.034	170	800	0.032	102	570	0.049	112
	16	1390	0.040	225	1090	0.037	165	700	0.035	99	500	0.055	109
	20	1110	0.049	215	880	0.045	160	560	0.043	96	400	0.067	107

	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
	ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
	Vc (m/min)	**60-80**			**50-60**			**30-40**			**20-30**		
VERTICAL	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	3720	0.021	310	2920	0.019	220	1860	0.015	120	1330	0.014	80
	8	2790	0.027	300	2190	0.024	210	1390	0.020	110	1000	0.019	70
	10	2230	0.032	290	1750	0.029	200	1110	0.024	110	800	0.022	70
	12	1860	0.037	270	1460	0.033	190	930	0.028	100	660	0.026	70
	14	1590	0.041	260	1250	0.037	190	800	0.031	100	570	0.029	70
	16	1390	0.046	260	1090	0.041	180	700	0.034	100	500	0.032	60
	20	1110	0.056	250	880	0.050	180	560	0.042	90	400	0.039	60

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF450 PARAMETERS.

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

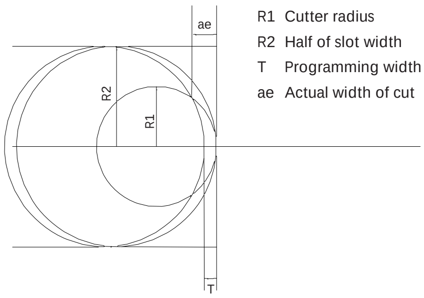
CUTTING PARAMETERS

HF451

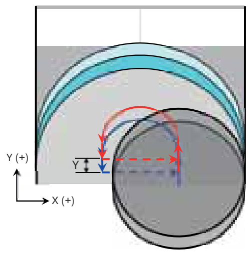
TROCHOIDAL													
Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5			
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC			
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**D x 0.1D**			**D x 0.1D**			
Vc (m/min)	**110-130**			**80-100**			**50-70**			**40-60**			
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
3	6900	0.027	740	5310	0.024	510	3180	0.021	270	2650	0.029	310	
4	5180	0.035	730	3980	0.032	510	2390	0.028	270	1990	0.039	310	
5	4140	0.044	730	3180	0.040	500	1910	0.035	270	1590	0.048	310	
6	3450	0.052	710	2650	0.046	490	1590	0.041	260	1330	0.057	300	
8	2590	0.067	690	1990	0.060	480	1190	0.054	250	1000	0.074	290	
10	2070	0.080	670	1590	0.072	460	960	0.064	250	800	0.088	280	
12	1730	0.092	640	1330	0.083	440	800	0.073	240	660	0.101	270	
14	1480	0.103	610	1140	0.093	420	680	0.083	220	570	0.114	260	
16	1290	0.115	590	1000	0.103	410	600	0.092	220	500	0.126	250	
20	1040	0.140	580	800	0.126	400	480	0.112	210	400	0.154	250	

ap x ae	≤ D5				
		1.5D x 0.1D	1.5D x 0.1D	D x 0.1D	D x 0.05D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF450 PARAMETERS.

HF852

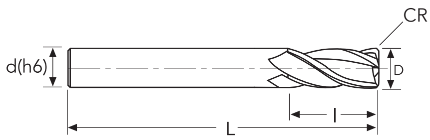
cylindrical shank, corner radius

OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | RADIUS | Z4 UP

P	M	K	N	S	H
★	★	★		★	★

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.025	0.30	+/-0.010	6	11		57	4	HF85203040	h
4	0/-0.025	0.50	+/-0.010	6	11		57	4	HF85205040	h
5	0/-0.025	0.30	+/-0.010	6	15		57	4	HF85203050	h
5	0/-0.025	0.50	+/-0.010	6	15		57	4	HF85205050	h
6	0/-0.025	0.30	+/-0.010	6	13		57	4	HF85203060	h
6	0/-0.025	0.50	+/-0.010	6	13		57	4	HF85205060	h
6	0/-0.025	1.00	+/-0.010	6	13		57	4	HF85210060	h
8	0/-0.030	0.50	+/-0.010	8	20		64	4	HF85205080	h
8	0/-0.030	1.00	+/-0.010	8	20		64	4	HF85210080	h
10	0/-0.030	0.50	+/-0.010	10	22		72	4	HF85205100	h
10	0/-0.030	1.00	+/-0.010	10	22		72	4	HF85210100	h
12	0/-0.030	0.50	+/-0.010	12	26		83	4	HF85205120	h
12	0/-0.030	1.00	+/-0.010	12	26		83	4	HF85210120	h
12	0/-0.030	2.00	+/-0.010	12	26		83	4	HF85220120	h
12	0/-0.030	3.00	+/-0.010	12	26		83	4	HF85230120	h
14	0/-0.030	1.00	+/-0.010	14	26		83	4	HF85210140	h
16	0/-0.030	1.00	+/-0.010	16	32		92	4	HF85210160	h
16	0/-0.030	2.00	+/-0.010	16	32		92	4	HF85220160	h
20	0/-0.030	1.00	+/-0.010	20	38		104	4	HF85210200	h
20	0/-0.030	2.00	+/-0.010	20	38		104	4	HF85220200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF852

SLOTTING	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
	ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.2D x D**		
	Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	7170	0.016	450	5570	0.014	320	3980	0.012	190	3180	0.011	140
	5	5730	0.020	450	4460	0.018	310	3180	0.015	190	2550	0.014	140
	6	4780	0.023	440	3720	0.021	310	2650	0.017	180	2120	0.016	140
	8	3580	0.030	430	2790	0.027	300	1990	0.022	180	1590	0.021	130
	10	2870	0.036	410	2230	0.032	290	1590	0.027	170	1270	0.025	130
	12	2390	0.041	390	1860	0.037	270	1330	0.031	160	1060	0.029	120
	14	2050	0.046	380	1590	0.041	260	1140	0.034	160	910	0.032	120
	16	1790	0.051	370	1390	0.046	260	1000	0.038	150	800	0.036	110
	20	1430	0.062	350	1110	0.056	250	800	0.047	150	640	0.043	110
ap x ae	**≤ D5**	0.3D x D			0.3D x D			0.2D x D			0.1D x D		

SIDE MILLING	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
	ap x ae	**1.5D x 0.3D**			**1.5D x 0.2D**			**1.2D x 0.2D**			**1.2D x 0.1D**		
	Vc (m/min)	**100-120**			**70-90**			**50-70**			**40-60**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	8760	0.019	660	6370	0.017	430	4780	0.015	290	3980	0.021	330
	5	7010	0.023	660	5100	0.021	430	3820	0.019	290	3180	0.026	330
	6	5840	0.028	640	4250	0.025	420	3180	0.022	280	2650	0.030	320
	8	4380	0.036	630	3180	0.032	410	2390	0.029	270	1990	0.039	310
	10	3500	0.043	600	2550	0.039	390	1910	0.034	260	1590	0.047	300
	12	2920	0.049	570	2120	0.044	370	1590	0.039	250	1330	0.054	290
	14	2500	0.055	550	1820	0.050	360	1360	0.044	240	1140	0.061	280
	16	2190	0.061	540	1590	0.055	350	1190	0.049	230	1000	0.067	270
	20	1750	0.074	520	1270	0.067	340	960	0.060	230	800	0.082	260
ap x ae	**≤ D5**	1.2D x 0.2D			1.2D x 0.1D			D x 0.2D			D x 0.1D		

HELICAL	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm^2			900-1200 N/mm^2			35-45 HRC			≤ 55 HRC		
	α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
	Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	7170	0.011	330	5570	0.011	240	3980	0.009	150	3180	0.010	126
	5	5730	0.014	325	4460	0.013	235	3180	0.012	149	2550	0.012	126
	6	4780	0.017	320	3720	0.016	230	2650	0.014	146	2120	0.015	123
	8	3580	0.022	310	2790	0.020	225	1990	0.018	142	1590	0.019	120
	10	2870	0.026	300	2230	0.024	215	1590	0.021	136	1270	0.023	115
	12	2390	0.030	285	1860	0.028	205	1330	0.024	130	1060	0.026	109
	14	2050	0.033	275	1590	0.031	200	1140	0.028	126	910	0.029	106
	16	1790	0.037	265	1390	0.035	190	1000	0.031	122	800	0.032	103
	20	1430	0.045	260	1110	0.042	185	800	0.037	119	640	0.039	100
α°	**≤ D5**	2°			2°			1°			1°		

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HF852

RAMPING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
α° x ae	**5° x D**			**4° x D**			**3° x D**			**2° x D**		
Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.020	385	3720	0.019	280	2650	0.018	187	2120	0.027	232
8	3580	0.026	370	2790	0.024	270	1990	0.023	182	1590	0.035	226
10	2870	0.031	360	2230	0.029	260	1590	0.027	175	1270	0.043	216
12	2390	0.036	340	1860	0.033	245	1330	0.031	167	1060	0.049	206
14	2050	0.040	330	1590	0.037	240	1140	0.035	161	910	0.055	199
16	1790	0.045	320	1390	0.042	230	1000	0.039	157	800	0.061	195
20	1430	0.054	310	1110	0.051	225	800	0.048	153	640	0.074	189

VERTICAL

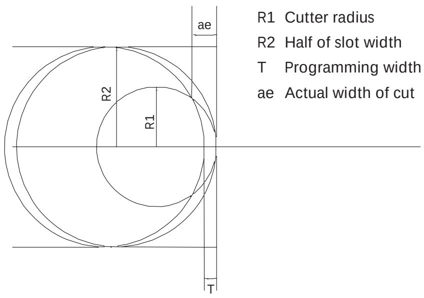
Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	**D x 0.4D**			**D x 0.4D**			**D x 0.25D**			**D x 0.25D**		
Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.023	440	3720	0.021	310	2650	0.017	180	2120	0.016	140
8	3580	0.030	430	2790	0.027	300	1990	0.022	180	1590	0.021	130
10	2870	0.036	410	2230	0.032	290	1590	0.027	170	1270	0.025	130
12	2390	0.041	390	1860	0.037	270	1330	0.031	160	1060	0.029	120
14	2050	0.046	380	1590	0.041	260	1140	0.034	160	910	0.032	120
16	1790	0.051	370	1390	0.046	260	1000	0.038	150	800	0.036	110
20	1430	0.062	350	1110	0.056	250	800	0.047	150	640	0.043	110

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

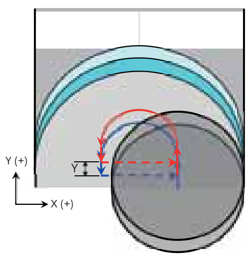
HF852

	Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
	Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
	ap x ae	**2D x 0.2D**			**2D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
	Vc (m/min)	**130-150**			**100-120**			**70-90**			**50-70**		
TROCHOIDAL	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	4	5570	0.039	880	4380	0.035	620	3180	0.031	400	2390	0.043	410
	5	4460	0.049	870	3500	0.044	620	2550	0.039	400	1910	0.054	410
	6	3720	0.057	850	2920	0.052	600	2120	0.046	390	1590	0.063	400
	8	2790	0.074	830	2190	0.067	590	1590	0.060	380	1190	0.082	390
	10	2230	0.089	800	1750	0.080	560	1270	0.071	360	960	0.098	380
	12	1860	0.102	760	1460	0.092	540	1060	0.082	350	800	0.112	360
	14	1590	0.115	730	1250	0.103	520	910	0.092	330	680	0.126	340
	16	1390	0.128	710	1090	0.115	500	800	0.102	330	600	0.140	340
	20	1110	0.155	690	880	0.140	490	640	0.124	320	480	0.171	330
ap x ae	**≤ D5**	1.5D x 0.1D			1.5D x 0.1D			D x 0.1D			D x 0.05D		

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



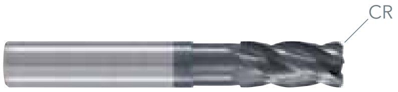
R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

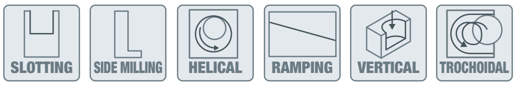
HF452

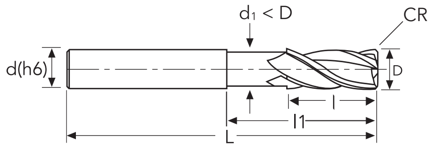
cylindrical shank and reduced neck, corner radius



P	M	K	N	S	H
★	★	★		★	★

★ 1st choice ☆ suitable





D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.30	+/-0.020	6	9	15	2.80	57	4	HF45203030	h
3	0/-0.030	0.50	+/-0.020	6	9	15	2.80	57	4	HF45205030	h
4	0/-0.030	0.30	+/-0.020	6	11	18	3.80	57	4	HF45203040	h
4	0/-0.030	0.50	+/-0.020	6	11	18	3.80	57	4	HF45205040	h
5	0/-0.030	0.50	+/-0.020	6	13	19	4.80	57	4	HF45205050	h
6	0/-0.030	0.50	+/-0.020	6	13	20	5.80	57	4	HF45205060	h
6	0/-0.030	1.00	+/-0.020	6	13	20	5.80	57	4	HF45210060	h
8	0/-0.030	0.50	+/-0.020	8	20	26	7.80	64	4	HF45205080	h
8	0/-0.030	1.00	+/-0.020	8	20	26	7.80	64	4	HF45210080	h
10	0/-0.030	0.50	+/-0.020	10	22	30	9.80	72	4	HF45205100	h
10	0/-0.030	1.00	+/-0.020	10	22	30	9.80	72	4	HF45210100	h
12	0/-0.030	0.50	+/-0.020	12	26	36	11.80	83	4	HF45205120	h
12	0/-0.030	1.00	+/-0.020	12	26	36	11.80	83	4	HF45210120	h
16	0/-0.030	1.00	+/-0.020	16	32	42	15.70	92	4	HF45210160	h
16	0/-0.030	2.00	+/-0.020	16	32	42	15.70	92	4	HF45220160	h
20	0/-0.030	1.00	+/-0.020	20	38	50	19.70	104	4	HF45210200	h
20	0/-0.030	2.00	+/-0.020	20	38	50	19.70	104	4	HF45220200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HF452

SLOTTING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.2D x D**		
Vc (m/min)	**70-90**			**50-70**			**30-50**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	8490	0.011	360	6370	0.010	250	4250	0.008	140	3180	0.007	100
4	6370	0.014	360	4780	0.013	240	3180	0.011	140	2390	0.010	90
5	5100	0.018	360	3820	0.016	240	2550	0.013	130	1910	0.012	90
6	4250	0.021	350	3180	0.019	240	2120	0.015	130	1590	0.014	90
8	3180	0.027	340	2390	0.024	230	1590	0.020	130	1190	0.019	90
10	2550	0.032	330	1910	0.029	220	1270	0.024	120	960	0.022	90
12	2120	0.037	310	1590	0.033	210	1060	0.028	120	800	0.026	80
14	1820	0.041	300	1360	0.037	200	910	0.031	110	680	0.029	80
16	1590	0.046	290	1190	0.041	200	800	0.034	110	600	0.032	80
20	1270	0.056	280	960	0.050	190	640	0.042	110	480	0.039	80

ap x ae	≤ D5	0.3D x D	0.3D x D	0.2D x D	0.1D x D

SIDE MILLING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.2D**			**1.2D x 0.2D**			**D x 0.1D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10620	0.013	550	7430	0.012	340	5310	0.010	220	4250	0.014	240
4	7960	0.017	540	5570	0.015	340	3980	0.014	220	3180	0.019	240
5	6370	0.021	540	4460	0.019	340	3180	0.017	210	2550	0.023	240
6	5310	0.025	530	3720	0.022	330	2650	0.020	210	2120	0.027	230
8	3980	0.032	510	2790	0.029	320	1990	0.026	200	1590	0.035	220
10	3180	0.039	490	2230	0.035	310	1590	0.031	200	1270	0.042	220
12	2650	0.044	470	1860	0.040	300	1330	0.035	190	1060	0.048	210
14	2270	0.050	450	1590	0.045	280	1140	0.040	180	910	0.055	200
16	1990	0.055	440	1390	0.050	280	1000	0.044	180	800	0.061	190
20	1590	0.067	430	1110	0.060	270	800	0.054	170	640	0.074	190

ap x ae	≤ D5	1.2D x 0.2D	1.2D x 0.1D	D x 0.1D	D x 0.05D

HELICAL

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
α° x ae	**5° x 0.4D**			**4° x 0.4D**			**3° x 0.4D**			**2° x 0.4D**		
Vc (m/min)	**70-90**			**50-70**			**30-50**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	8490	0.008	265	6370	0.007	185	4250	0.006	109	3180	0.007	86
4	6370	0.010	265	4780	0.010	185	3180	0.008	108	2390	0.009	86
5	5100	0.013	260	3820	0.012	185	2550	0.011	108	1910	0.011	85
6	4250	0.015	255	3180	0.014	180	2120	0.012	105	1590	0.013	83
8	3180	0.019	250	2390	0.018	175	1590	0.016	102	1190	0.017	81
10	2550	0.023	240	1910	0.022	165	1270	0.019	98	960	0.020	78
12	2120	0.027	225	1590	0.025	160	1060	0.022	93	800	0.023	74
14	1820	0.030	220	1360	0.028	155	910	0.025	90	680	0.026	71
16	1590	0.033	215	1190	0.031	150	800	0.028	88	600	0.029	70
20	1270	0.041	205	960	0.038	145	640	0.034	86	480	0.035	68

α°	≤ D5	2°	2°	1°	1°

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HF452

RAMPING

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
α° x ae	5° x D			4° x D			3° x D			2° x D		
Vc (m/min)	60-80			50-60			30-40			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	3720	0.018	270	2920	0.017	195	1860	0.016	118	1330	0.025	131
8	2790	0.023	260	2190	0.022	190	1390	0.021	114	1000	0.032	128
10	2230	0.028	250	1750	0.026	185	1110	0.025	110	800	0.038	123
12	1860	0.032	240	1460	0.030	175	930	0.028	105	660	0.044	116
14	1590	0.036	230	1250	0.034	170	800	0.032	102	570	0.049	112
16	1390	0.040	225	1090	0.037	165	700	0.035	99	500	0.055	109
20	1110	0.049	215	880	0.045	160	560	0.043	96	400	0.067	107

VERTICAL

Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	D x 0.4D			D x 0.4D			D x 0.25D			D x 0.25D		
Vc (m/min)	60-80			50-60			30-40			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	3720	0.021	310	2920	0.019	220	1860	0.015	120	1330	0.014	80
8	2790	0.027	300	2190	0.024	210	1390	0.020	110	1000	0.019	70
10	2230	0.032	290	1750	0.029	200	1110	0.024	110	800	0.022	70
12	1860	0.037	270	1460	0.033	190	930	0.028	100	660	0.026	70
14	1590	0.041	260	1250	0.037	190	800	0.031	100	570	0.029	70
16	1390	0.046	260	1090	0.041	180	700	0.034	100	500	0.032	60
20	1110	0.056	250	880	0.050	180	560	0.042	90	400	0.039	60

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

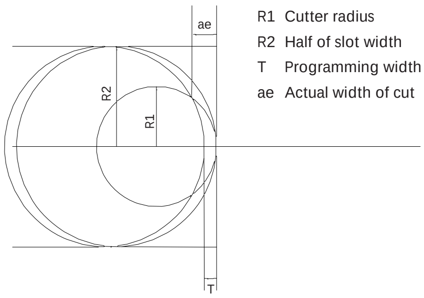
HF452

TROCHOIDAL

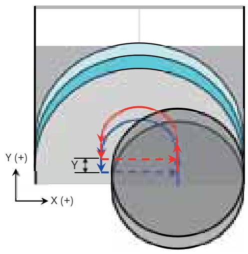
Material Group ISO 513	P4 M4 K4			P4 P5 M4 M5 K4 S1			P5 P6 M5 K4 S2 S3			H1 H4 H5		
Hardness/Rm	800-1000 N/mm²			900-1200 N/mm²			35-45 HRC			≤ 55 HRC		
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**D x 0.1D**			**D x 0.1D**		
Vc (m/min)	**110-130**			**80-100**			**50-70**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	6900	0.027	740	5310	0.024	510	3180	0.021	270	2650	0.029	310
4	5180	0.035	730	3980	0.032	510	2390	0.028	270	1990	0.039	310
5	4140	0.044	730	3180	0.040	500	1910	0.035	270	1590	0.048	310
6	3450	0.052	710	2650	0.046	490	1590	0.041	260	1330	0.057	300
8	2590	0.067	690	1990	0.060	480	1190	0.054	250	1000	0.074	290
10	2070	0.080	670	1590	0.072	460	960	0.064	250	800	0.088	280
12	1730	0.092	640	1330	0.083	440	800	0.073	240	660	0.101	270
14	1480	0.103	610	1140	0.093	420	680	0.083	220	570	0.114	260
16	1290	0.115	590	1000	0.103	410	600	0.092	220	500	0.126	250
20	1040	0.140	580	800	0.126	400	480	0.112	210	400	0.154	250

ap x ae	**≤ D5**				
		1.5D x 0.1D	1.5D x 0.1D	D x 0.1D	D x 0.05D

NOTES:
Down milling CNC programming is required.
"ae" value max 0.2xD - "T" value max 0.1xD.
The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.
The cutting conditions are based on CNC programming with medium dynamic speed.
With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.
With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.



R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

MEF

STAINLESS STEEL AND SUPER ALLOYS

Ultra-fine micrograin and Endless Black coating for high performance machining on stainless steel, HRSA and titanium alloy, carbon and low alloy steel. The unique design of the cutting geometry and the Endless Black coating are specifically developed to control the cutting friction delivering longer tool life through the reduction of the heat generation.

Micrograna ultrafine e rivestimento Endless Black per la lavorazione ad alto rendimento di acciai al carbonio, acciai inossidabili, HRSA e leghe di titanio. La geometria e il rivestimento specifici consentono di generare bassi sforzi di taglio e l'abbassamento del coefficiente di attrito, garantendo una riduzione dello sviluppo del calore con conseguente rallentamento del processo di usura del tagliente.

Besonders feine Mikrokörnung und Beschichtung Endless Black für Hochleistungsbearbeitungen von Kohlenstoffstahl, Edelstahl, HRSA und Titanlegierungen. Dank der speziellen Geometrie und der spezifischen Beschichtung werden ein niedriger Schneiddruck erzeugt und der Reibungsfaktor gesenkt, wodurch die Hitzeentwicklung reduziert und in Folge die Abnutzung der Schneidkante verzögert werden.

Ultra Micrograin et revêtement Endless Black pour l'usinage à haute performance pour les aciers au carbone, aciers inoxydables, HRSA et alliages de titane. La géométrie et le revêtement spécifiques permettent de générer peu d'efforts de coupe et de réduire le coefficient de frottement, en garantissant une diminution du développement de la chaleur et le ralentissement consécutif du processus d'usure de l'arête.

Micrograno ultrafino y revestimiento Endless Black para el mecanizado a alto rendimiento de aceros al carbono, aceros inoxidables, HRSA y aleaciones de titanio. La geometría y revestimiento específicos permiten generar bajos esfuerzos de corte y reducción del coeficiente de rozamiento, garantizando una reducción del desarrollo de calor con la consiguiente ralentización del proceso de desgaste del filo.

Микрозернистая супермелкая структура твердого сплава и покрытие Endless Black служат для высокоэффективной обработки нержавеющей стали, жаропрочных и титановых сплавов, низко- и высокоуглеродистых сталей. Специальные геометрия и покрытие позволяют снизить трение и тепловыделение при резании и, тем самым, увеличить стойкость инструмента.

MEFCS2

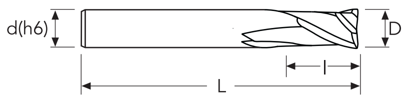
cylindrical shank, 2 flutes

OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 35° | SQUARE | Z2

P	M	K	N	S	H
★	★			★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.030			4	2.5		40	2	MEFCS2010	h
1.5	0/-0.030			4	4		40	2	MEFCS2015	h
2	0/-0.030			4	6		40	2	MEFCS2020	h
2.5	0/-0.030			4	8		40	2	MEFCS2025	h
3	0/-0.030			6	8		45	2	MEFCS2030	h
4	0/-0.030			6	11		45	2	MEFCS2040	h
5	0/-0.030			6	13		50	2	MEFCS2050	h
6	0/-0.030			6	13		50	2	MEFCS2060	h
8	0/-0.030			8	19		60	2	MEFCS2080	h
10	0/-0.030			10	22		70	2	MEFCS2100	h
12	0/-0.030			12	26		75	2	MEFCS2120	h
14	0/-0.030			14	26		85	2	MEFCS2140	h
16	0/-0.030			16	32		100	2	MEFCS2160	h

h stock standard   f non-stock standard   m stock exhaustion

MEFCS2

Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	0.5D x D			0.5D x D			0.3D x D			0.2D x D		
Vc (m/min)	90-110			50-70			30-50			20-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	31850	0.005	290	19110	0.004	150	12740	0.004	90	9550	0.004	70
2	15920	0.009	290	9550	0.008	150	6370	0.007	90	4780	0.007	70
3	10620	0.012	240	6370	0.010	120	4250	0.009	80	3180	0.009	60
4	7960	0.017	270	4780	0.015	140	3180	0.014	90	2390	0.014	70
5	6370	0.023	290	3820	0.020	150	2550	0.018	90	1910	0.018	70
6	5310	0.029	310	3180	0.024	160	2120	0.023	100	1590	0.023	70
8	3980	0.035	270	2390	0.029	140	1590	0.028	90	1190	0.028	70
10	3180	0.040	260	1910	0.034	130	1270	0.032	80	960	0.032	60
12	2650	0.046	240	1590	0.039	120	1060	0.037	80	800	0.037	60
14	2270	0.052	230	1360	0.044	120	910	0.041	80	680	0.041	60
16	1990	0.058	230	1190	0.049	120	800	0.046	70	600	0.046	60

< D3 mm: ap = 0.1D - 0.2D

Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	1.5D x 0.5D			1.5D x 0.5D			D x 0.3D			D x 0.1D		
Vc (m/min)	90-110			60-80			40-60			30-50		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	31850	0.006	350	22290	0.005	210	15920	0.004	140	12740	0.004	110
2	15920	0.011	350	11150	0.009	210	7960	0.009	140	6370	0.009	110
3	10620	0.014	290	7430	0.012	170	5310	0.011	120	4250	0.011	90
4	7960	0.021	330	5570	0.018	200	3980	0.017	130	3180	0.017	110
5	6370	0.028	350	4460	0.023	210	3180	0.022	140	2550	0.022	110
6	5310	0.035	370	3720	0.029	220	2650	0.028	150	2120	0.028	120
8	3980	0.041	330	2790	0.035	200	1990	0.033	130	1590	0.033	110
10	3180	0.048	310	2230	0.041	180	1590	0.039	120	1270	0.039	100
12	2650	0.055	290	1860	0.047	170	1330	0.044	120	1060	0.044	90
14	2270	0.062	280	1590	0.053	170	1140	0.050	110	910	0.050	90
16	1990	0.069	270	1390	0.059	160	1000	0.055	110	800	0.055	90

< D3 mm: ae = 0.05D - 0.2D

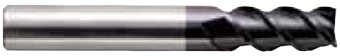
Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	D x D			D x D			0.5D x D			0.2D x D		
Vc (m/min)	90-110			50-70			30-50			20-40		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	31850	0.003	180	19110	0.002	90	12740	0.002	60	9550	0.022	420
2	15920	0.006	180	9550	0.005	90	6370	0.004	60	4780	0.044	420
3	10620	0.007	150	6370	0.006	70	4250	0.006	50	3180	0.055	350
4	7960	0.010	160	4780	0.009	80	3180	0.008	50	2390	0.083	400
5	6370	0.014	180	3820	0.012	90	2550	0.011	60	1910	0.110	420
6	5310	0.017	180	3180	0.015	90	2120	0.014	60	1590	0.138	440
8	3980	0.021	160	2390	0.018	80	1590	0.017	50	1190	0.166	390
10	3180	0.024	150	1910	0.021	80	1270	0.019	50	960	0.193	370
12	2650	0.028	150	1590	0.023	70	1060	0.022	50	800	0.221	350
14	2270	0.031	140	1360	0.026	70	910	0.025	50	680	0.248	340
16	1990	0.035	140	1190	0.029	70	800	0.028	40	600	0.276	330

< D3 mm: ap = 0.1D - 0.2D

MEFCSH3

cylindrical shank, 3 flutes

OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 50° | SQUARE | Z3 ≤ Ø18 | Z4 > Ø18



P	M	K	N	S	H
★	★			★	

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.030			6	13		50	3	MEFCSH3060	h
8	0/-0.030			8	19		60	3	MEFCSH3080	h
10	0/-0.030			10	22		70	3	MEFCSH3100	h
12	0/-0.030			12	26		75	3	MEFCSH3120	h
16	0/-0.030			16	32		100	3	MEFCSH3160	h
18	0/-0.030			18	32		90	3	MEFCSH3180	h
20	0/-0.030			20	38		105	4	MEFCSH4200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEFCSH3

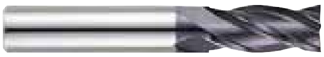
Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.2D x D**		
Vc (m/min)	**80-100**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.022	220	3720	0.013	140	2650	0.012	100	2120	0.012	80
8	3580	0.029	210	2790	0.017	140	1990	0.015	90	1590	0.016	80
10	2870	0.036	220	2230	0.021	140	1590	0.019	90	1270	0.020	80
12	2390	0.046	230	1860	0.027	150	1330	0.024	100	1060	0.026	80
14	2050	0.053	230	1590	0.031	150	1140	0.028	90	910	0.030	80
16	1790	0.065	240	1390	0.038	160	1000	0.034	100	800	0.036	90
18	1590	0.075	250	1240	0.044	160	880	0.039	100	710	0.042	90
20	1430	0.086	260	1110	0.051	170	800	0.045	110	640	0.048	90

Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.2D**			**1.5D x 0.1D**		
Vc (m/min)	**80-120**			**60-80**			**40-60**			**100-140**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.026	260	3720	0.015	170	2650	0.014	110	2120	0.014	90
8	3580	0.035	260	2790	0.020	170	1990	0.019	110	1590	0.019	90
10	2870	0.043	260	2230	0.026	170	1590	0.024	110	1270	0.024	90
12	2390	0.055	280	1860	0.033	180	1330	0.031	120	1060	0.031	100
14	2050	0.064	270	1590	0.038	180	1140	0.036	120	910	0.036	100
16	1790	0.078	290	1390	0.046	190	1000	0.043	130	800	0.043	100
18	1590	0.090	300	1240	0.053	200	880	0.050	130	710	0.050	110
20	1430	0.104	310	1110	0.061	200	800	0.058	140	640	0.058	110

MEFCS4

cylindrical shank, 4 flutes

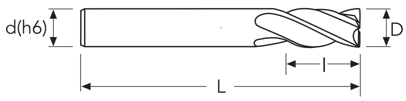
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 35° | SQUARE | Z4



P	M	K	N	S	H
★	★			★	

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.030			4	6		40	4	MEFCS4020	h
2.5	0/-0.030			4	8		40	4	MEFCS4025	h
3	0/-0.030			6	8		45	4	MEFCS4030	h
4	0/-0.030			6	11		45	4	MEFCS4040	h
5	0/-0.030			6	13		50	4	MEFCS4050	h
6	0/-0.030			6	13		50	4	MEFCS4060	h
8	0/-0.030			8	19		60	4	MEFCS4080	h
10	0/-0.030			10	22		70	4	MEFCS4100	h
12	0/-0.030			12	26		75	4	MEFCS4120	h
14	0/-0.030			14	26		85	4	MEFCS4140	h
16	0/-0.030			16	32		100	4	MEFCS4160	h
20	0/-0.030			20	38		105	4	MEFCS4200	h

h stock standard f non-stock standard m stock exhaustion

OSAWA

CUTTING PARAMETERS

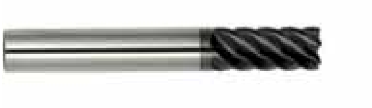
MEFCS4

Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm^2			700-1000 N/mm^2			< 35 HRC			< 45 HRC		
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**		
Vc (m/min)	**90-110**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10620	0.012	510	7430	0.010	300	5310	0.010	200	4250	0.010	160
4	7960	0.015	480	5570	0.013	280	3980	0.012	190	3180	0.012	150
5	6370	0.018	460	4460	0.015	270	3180	0.014	180	2550	0.014	150
6	5310	0.023	490	3720	0.020	290	2650	0.018	200	2120	0.018	160
8	3980	0.030	480	2790	0.026	280	1990	0.024	190	1590	0.024	150
10	3180	0.038	480	2230	0.032	290	1590	0.030	190	1270	0.030	150
12	2650	0.045	480	1860	0.038	280	1330	0.036	190	1060	0.036	150
14	2270	0.052	470	1590	0.044	280	1140	0.042	190	910	0.042	150
16	1990	0.058	460	1390	0.049	270	1000	0.046	190	800	0.046	150
18	1770	0.066	470	1240	0.056	280	880	0.053	190	710	0.053	150
20	1590	0.075	480	1110	0.064	280	800	0.060	190	640	0.060	150

MEF600

cylindrical shank, multi flute

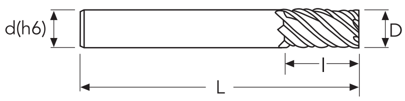
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 50° | SQUARE | Z6~Z8



P	M	K	N	S	H
★	★			★	

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.030			6	13		57	6	MEF600060	h
8	0/-0.030			8	19		63	6	MEF600080	h
10	0/-0.030			10	22		72	6	MEF600100	h
12	0/-0.030			12	26		83	6	MEF600120	h
16	0/-0.030			16	32		92	6	MEF600160	h
20	0/-0.030			20	38		104	8	MEF600200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEF600

SIDE MILLING

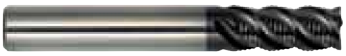
Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.05D**		
Vc (m/min)	**100-140**			**70-110**			**50-90**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.015	570	4780	0.013	370	3720	0.012	270	3180	0.012	230
8	4780	0.020	570	3580	0.017	370	2790	0.016	270	2390	0.016	230
10	3820	0.025	570	2870	0.021	370	2230	0.020	270	1910	0.020	230
12	3180	0.030	570	2390	0.026	370	1860	0.024	270	1590	0.024	230
14	2730	0.035	570	2050	0.030	370	1590	0.028	270	1360	0.028	230
16	2390	0.040	570	1790	0.034	370	1390	0.032	270	1190	0.032	230
20	1910	0.050	760	1430	0.043	490	1110	0.040	360	960	0.040	310

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEF901

cylindrical shank, roughing

OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 45° | SQUARE | HR FINE | Z3~Z6



P	M	K	N	S	H
★	★			★	

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
4	0/-0.048	0.10	+/-0.020	6	11		57	3	MEF901040	h
5	0/-0.048	0.10	+/-0.020	6	13		57	4	MEF901050	h
6	0/-0.048	0.15	+/-0.020	6	16		57	4	MEF901060	h
8	0/-0.058	0.20	+/-0.020	8	16		63	4	MEF901080	h
10	0/-0.058	0.20	+/-0.020	10	22		72	4	MEF901100	h
12	0/-0.070	0.20	+/-0.020	12	26		83	4	MEF901120	h
14	0/-0.070	0.20	+/-0.020	14	26		83	5	MEF901140	h
16	0/-0.070	0.20	+/-0.020	16	32		92	5	MEF901160	h
20	0/-0.084	0.20	+/-0.020	20	38		104	6	MEF901200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEF901

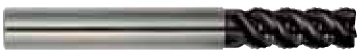
SIDE MILLING

Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.2D**			**D x 0.1D**		
Vc (m/min)	**100-140**			**70-90**			**50-70**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	9550	0.018	520	6370	0.015	290	4780	0.014	210	3980	0.014	170
5	7640	0.022	670	5100	0.019	380	3820	0.018	270	3180	0.018	220
6	6370	0.028	710	4250	0.024	400	3180	0.022	280	2650	0.022	240
8	4780	0.035	670	3180	0.030	380	2390	0.028	270	1990	0.028	220
10	3820	0.040	610	2550	0.034	350	1910	0.032	240	1590	0.032	200
12	3180	0.045	570	2120	0.038	320	1590	0.036	230	1330	0.036	190
14	2730	0.050	680	1820	0.043	390	1360	0.040	270	1140	0.040	230
16	2390	0.057	680	1590	0.048	390	1190	0.046	270	1000	0.046	230
20	1910	0.073	840	1270	0.062	470	960	0.058	340	800	0.058	280

MEF902

cylindrical shank, reduced neck, roughing

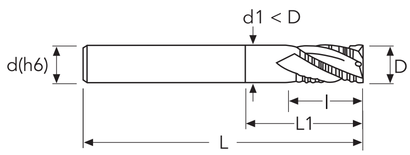
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 45° | SQUARE | HR FINE | Z4~Z6



P	M	K	N	S	H
★	★			★	

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
6	0/-0.048	0.15	+/-0.020	6	16	20	5.50	57	4	MEF902060	h
8	0/-0.058	0.20	+/-0.020	8	16	26	7.50	63	4	MEF902080	h
10	0/-0.058	0.20	+/-0.020	10	22	31	9.50	72	4	MEF902100	h
12	0/-0.070	0.20	+/-0.020	12	26	37	11.50	83	4	MEF902120	h
16	0/-0.070	0.20	+/-0.020	16	32	51	15.50	92	5	MEF902160	h
20	0/-0.084	0.20	+/-0.020	20	38	59	19.20	104	6	MEF902200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEF902

SIDE MILLING

Material Group ISO 513	P1 P2 P3			P4 M1 M2			P5 M3 M4 S1 S2 S4			M5 S3 S5		
Hardness/Rm	< 700 N/mm²			700-1000 N/mm²			< 35 HRC			< 45 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**1.5D x 0.2D**			**D x 0.1D**		
Vc (m/min)	**100-120**			**60-80**			**40-60**			**40-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	5840	0.027	620	3720	0.023	340	2650	0.021	230	2390	0.021	200
8	4380	0.033	580	2790	0.028	320	1990	0.027	210	1790	0.027	190
10	3500	0.038	530	2230	0.032	290	1590	0.030	190	1430	0.030	170
12	2920	0.043	500	1860	0.036	270	1330	0.034	180	1190	0.034	160
14	2500	0.048	590	1590	0.040	320	1140	0.038	220	1020	0.038	190
16	2190	0.054	590	1390	0.046	320	1000	0.043	220	900	0.043	190
20	1750	0.069	730	1110	0.059	390	800	0.055	270	720	0.055	240

ALU

NON-FERROUS MATERIALS

Uncoated polished micrograin with cutting geometry specifically designed for aluminium and non-ferrous materials. The polished edge and the wide chip pockets, deliver low cutting friction, high precision, excellent surface finishing and smooth chip ejection.

Micrograna non rivestita e geometria di taglio sviluppata specificamente per la lavorazione di materiali non-ferrosi. Taglienti lappati e particolare profilo del vano truciolo per bassi sforzi di taglio e un'eccellente finitura superficiale. Disponibile anche la versione HF Alu con passo differenziato (UP) con un particolare design che permette finiture a specchio e lavorazioni DxD, anche nella versione a 4 taglienti.

Unbeschichtete Mikrokörnung und eigens für die Bearbeitung von NE-Metallen entwickelte Schnittgeometrie. Dank der geläppten Schneiden und der besonderen Form der Nuten ist die aufzubringende Schnittkraft gering, bei gleichzeitig ausgezeichnetem Oberflächenfinish. Auch in der Version HF Alu mit ungleicher Teilung (UP) und besonderer Form erhältlich, die auch in der Version mit 4 Schneiden ein spiegelblankes Oberflächenfinish und DxD-Bearbeitungen ermöglicht.

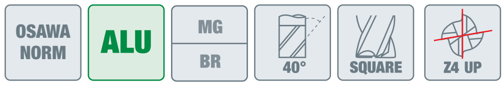
Micrograin non revêtu et poli avec une géométrie de coupe développée spécialement pour l'usinage d'aluminium, d'alliages et de matériaux non ferreux en général. La finition polie des arêtes, associée au profil particulier de la goujure, permet de générer peu d'efforts de coupe et d'obtenir précision et qualité de finition ; une capacité exceptionnelle d'évacuation des copeaux garantit une possibilité de débit copeaux très élevée.

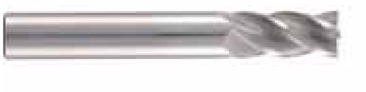
Micrograna no revestida y geometría de corte desarrollada específicamente para la elaboración de materiales no ferrosos. Filos de corte lapeados y perfil especial del compartimento de virutas, para bajos esfuerzos de corte y un excelente acabado de la superfície. También está disponible la versión HF Alu con paso diferenciado (UP) con un diseño especial que permite acabados a espejo y elaboraciones D x D, incluso en la versión de 4 filos.

Микрозернистая структура твердого сплава без покрытия, отполированная поверхность и специальная геометрия предназначены для обработки алюминия и цветных металлов. Отполированные кромки и широкие стружечные канавки обеспечивают снижение трения, увеличение точности, снижение шероховатости и улучшение вывода стружки.

HFAL4

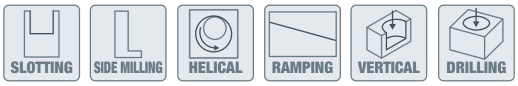
cylindrical shank, 4 flutes

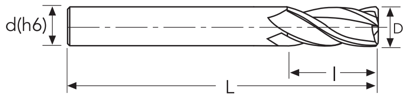




P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable





D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.025			6	9		57	4	HFAL4030	h
4	0/-0.025			6	12		57	4	HFAL4040	h
5	0/-0.025			6	13		57	4	HFAL4050	h
6	0/-0.025			6	13		57	4	HFAL4060	h
8	0/-0.030			8	20		64	4	HFAL4080	h
10	0/-0.030			10	22		72	4	HFAL4100	h
12	0/-0.030			12	26		83	4	HFAL4120	h
14	0/-0.030			14	32		90	4	HFAL4140	h
16	0/-0.030			16	32		92	4	HFAL4160	h
20	0/-0.030			20	38		104	4	HFAL4200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

HFAL4

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	D x D			D x D			D x D			D x D		
Vc (m/min)	300-500			200-400			150-350			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	42460	0.030	5040	31850	0.025	3220	26540	0.021	2210	50000	0.033	6530
4	31850	0.040	5050	23890	0.034	3220	19900	0.028	2210	50000	0.044	8710
5	25480	0.050	5050	19110	0.042	3220	15920	0.035	2210	50000	0.054	10890
6	21230	0.059	4970	15920	0.050	3170	13270	0.041	2170	42460	0.064	10930
8	15920	0.077	4930	11940	0.066	3140	9950	0.054	2160	31850	0.085	10850
10	12740	0.095	4820	9550	0.080	3070	7960	0.066	2110	25480	0.104	10590
12	10620	0.108	4590	7960	0.092	2920	6630	0.076	2000	21230	0.119	10090
14	9100	0.126	4590	6820	0.107	2920	5690	0.088	2010	18200	0.139	10090
16	7960	0.144	4580	5970	0.122	2920	4980	0.101	2010	15920	0.158	10090
18	7080	0.158	4490	5310	0.135	2860	4420	0.111	1960	14150	0.174	9860
20	6370	0.176	4470	4780	0.149	2850	3980	0.123	1960	12740	0.193	9840

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D		
Vc (m/min)	300-600			200-500			200-400			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	47770	0.036	6810	37150	0.032	4770	31850	0.029	3630	50000	0.039	7840
4	35830	0.048	6810	27870	0.043	4770	23890	0.038	3630	50000	0.052	10450
5	28660	0.059	6810	22290	0.053	4770	19110	0.048	3630	50000	0.065	13070
6	23890	0.070	6710	18580	0.063	4700	15920	0.056	3580	42460	0.077	13120
8	17910	0.093	6650	13930	0.084	4660	11940	0.074	3550	31850	0.102	13020
10	14330	0.113	6500	11150	0.102	4550	9550	0.091	3470	25480	0.125	12710
12	11940	0.130	6190	9290	0.117	4330	7960	0.104	3300	21230	0.143	12110
14	10240	0.151	6190	7960	0.136	4330	6820	0.121	3300	18200	0.166	12110
16	8960	0.173	6190	6970	0.156	4340	5970	0.138	3300	15920	0.190	12100
18	7960	0.190	6050	6190	0.171	4240	5310	0.152	3230	14150	0.209	11830
20	7170	0.211	6040	5570	0.190	4220	4780	0.168	3220	12740	0.232	11810

HELICAL

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
α° x ae	8° x 0.5D			5° x 0.5D			5° x 0.5D			8° x 0.5D		
Vc (m/min)	300-600			200-500			200-400			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	47770	0.021	3925	37150	0.018	2730	31850	0.015	1929	50000	0.023	4517
4	35830	0.027	3925	27870	0.025	2730	23890	0.020	1929	50000	0.030	6023
5	28660	0.034	3925	22290	0.031	2730	19110	0.025	1929	50000	0.038	7529
6	23890	0.040	3865	18580	0.036	2690	15920	0.030	1899	42460	0.044	7556
8	17910	0.054	3835	13930	0.048	2670	11940	0.039	1884	31850	0.059	7499
10	14330	0.065	3745	11150	0.058	2610	9550	0.048	1840	25480	0.072	7325
12	11940	0.075	3565	9290	0.067	2485	7960	0.055	1753	21230	0.082	6975
14	10240	0.087	3570	7960	0.078	2485	6820	0.064	1752	18200	0.096	6976
16	8960	0.100	3570	6970	0.089	2485	5970	0.073	1753	15920	0.110	6974
18	7960	0.110	3485	6190	0.098	2425	5310	0.081	1715	14150	0.120	6818
20	7170	0.121	3480	5570	0.109	2420	4780	0.089	1710	12740	0.133	6801

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HFAL4

RAMPING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
α° x ae	15° x 0.5D			10° x 0.5D			7° x 0.5D			15° x 0.5D		
Vc (m/min)	300-500			200-400			200-300			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	42460	0.020	3355	31850	0.017	2185	26540	0.015	1545	50000	0.022	4344
4	31850	0.026	3355	23890	0.023	2185	19900	0.019	1544	50000	0.029	5792
5	25480	0.033	3355	19110	0.029	2185	15920	0.024	1544	50000	0.036	7240
6	21230	0.039	3305	15920	0.034	2150	13270	0.029	1521	42460	0.043	7266
8	15920	0.051	3275	11940	0.045	2135	9950	0.038	1509	31850	0.057	7211
10	12740	0.063	3200	9550	0.055	2085	7960	0.046	1474	25480	0.069	7043
12	10620	0.072	3050	7960	0.062	1985	6630	0.053	1403	21230	0.079	6707
14	9100	0.084	3050	6820	0.073	1985	5690	0.062	1405	18200	0.092	6708
16	7960	0.096	3050	5970	0.083	1985	4980	0.071	1405	15920	0.105	6706
18	7080	0.105	2980	5310	0.092	1945	4420	0.078	1372	14150	0.116	6556
20	6370	0.117	2975	4780	0.101	1940	3980	0.086	1369	12740	0.128	6540

VERTICAL

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	D x 0.4D			D x 0.4D			D x 0.4D			D x 0.4D		
Vc (m/min)	300-500			200-400			150-350			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	42460	0.030	5040	31850	0.027	3410	26540	0.024	2520	50000	0.033	6530
4	31850	0.040	5050	23890	0.036	3410	19900	0.032	2520	50000	0.044	8710
5	25480	0.050	5050	19110	0.045	3410	15920	0.040	2520	50000	0.054	10890
6	21230	0.059	4970	15920	0.053	3350	13270	0.047	2480	42460	0.064	10930
8	15920	0.077	4930	11940	0.070	3330	9950	0.062	2460	31850	0.085	10850
10	12740	0.095	4820	9550	0.085	3250	7960	0.076	2410	25480	0.104	10590
12	10620	0.108	4590	7960	0.097	3090	6630	0.086	2290	21230	0.119	10090
14	9100	0.126	4590	6820	0.113	3090	5690	0.101	2290	18200	0.139	10090
16	7960	0.144	4580	5970	0.130	3090	4980	0.115	2290	15920	0.158	10090
18	7080	0.158	4490	5310	0.143	3030	4420	0.127	2240	14150	0.174	9860
20	6370	0.176	4470	4780	0.158	3020	3980	0.140	2240	12740	0.193	9840

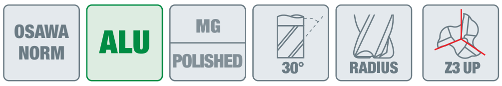
DRILLING

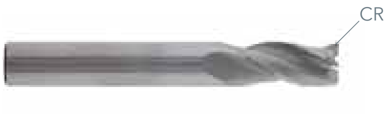
Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	D x D			D x D			0.5D x D			0.5D x D		
Vc (m/min)	270-370			190-290			150-250			590-690		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	33970	0.015	2020	25480	0.013	1360	21230	0.012	1010	50000	0.016	3270
4	25480	0.020	2020	19110	0.018	1360	15920	0.016	1010	50000	0.022	4360
5	20380	0.025	2020	15290	0.022	1360	12740	0.020	1010	40760	0.027	4440
6	16990	0.029	1990	12740	0.026	1340	10620	0.023	990	33970	0.032	4370
8	12740	0.039	1970	9550	0.035	1330	7960	0.031	990	25480	0.043	4340
10	10190	0.047	1930	7640	0.043	1300	6370	0.038	960	20380	0.052	4240
12	8490	0.054	1830	6370	0.049	1240	5310	0.043	920	16990	0.059	4040
14	7280	0.063	1830	5460	0.057	1240	4550	0.050	920	14560	0.069	4040
16	6370	0.072	1830	4780	0.065	1240	3980	0.058	920	12740	0.079	4040
18	5660	0.079	1790	4250	0.071	1210	3540	0.063	900	11320	0.087	3940
20	5100	0.088	1790	3820	0.079	1210	3180	0.070	890	10190	0.097	3930

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HFAL3

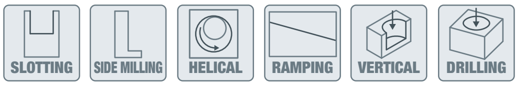
cylindrical shank, 3 flutes, corner radius

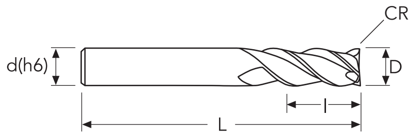




P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable





D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.030	0.10	+/-0.010	6	6.5		50	3	HFAL301020	h
3	0/-0.030	0.10	+/-0.010	6	9		50	3	HFAL301030	h
4	0/-0.030	0.10	+/-0.010	6	12		50	3	HFAL301040	h
5	0/-0.030	0.10	+/-0.010	6	15		50	3	HFAL301050	h
6	0/-0.030	0.10	+/-0.010	6	20		60	3	HFAL301060	h
8	0/-0.030	0.10	+/-0.010	8	20		64	3	HFAL301080	h
10	0/-0.030	0.10	+/-0.010	10	22		75	3	HFAL301100	h
12	0/-0.030	0.10	+/-0.010	12	25		75	3	HFAL301120	h
14	0/-0.030	0.10	+/-0.010	14	32		90	3	HFAL301140	h
16	0/-0.030	0.10	+/-0.010	16	32		90	3	HFAL301160	h
20	0/-0.030	0.10	+/-0.010	20	38		100	3	HFAL301200	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

HFAL3

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	D x D			D x D			D x D			D x D		
Vc (m/min)	300-500			200-400			150-350			600-900		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	50000	0.022	3300	47770	0.019	2680	39810	0.015	1840	50000	0.024	3630
3	42460	0.033	4200	31850	0.028	2680	26540	0.023	1840	50000	0.036	5450
4	31850	0.044	4200	23890	0.037	2680	19900	0.031	1840	50000	0.048	7260
5	25480	0.055	4200	19110	0.047	2680	15920	0.039	1840	47770	0.061	8670
6	21230	0.065	4140	15920	0.055	2640	13270	0.046	1810	39810	0.072	8540
8	15920	0.086	4110	11940	0.073	2620	9950	0.060	1800	29860	0.095	8470
10	12740	0.105	4010	9550	0.089	2560	7960	0.074	1760	23890	0.116	8280
12	10620	0.120	3820	7960	0.102	2440	6630	0.084	1670	19900	0.132	7880
14	9100	0.140	3820	6820	0.119	2430	5690	0.098	1670	17060	0.154	7880
16	7960	0.160	3820	5970	0.136	2440	4980	0.112	1670	14930	0.176	7880
18	7080	0.176	3740	5310	0.150	2380	4420	0.123	1630	13270	0.194	7710
20	6370	0.195	3730	4780	0.166	2380	3980	0.137	1630	11940	0.215	7680

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D		
Vc (m/min)	300-600			200-500			200-400			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	50000	0.026	3960	55730	0.024	3970	47770	0.021	3030	50000	0.029	4360
3	47770	0.040	5680	37150	0.036	3970	31850	0.032	3030	50000	0.044	6530
4	35830	0.053	5680	27870	0.048	3970	23890	0.042	3030	50000	0.058	8710
5	28660	0.066	5670	22290	0.059	3970	19110	0.053	3030	50000	0.073	10890
6	23890	0.078	5590	18580	0.070	3910	15920	0.062	2980	42460	0.086	10930
8	17910	0.103	5540	13930	0.093	3880	11940	0.083	2960	31850	0.114	10850
10	14330	0.126	5420	11150	0.113	3790	9550	0.101	2890	25480	0.139	10590
12	11940	0.144	5160	9290	0.130	3610	7960	0.115	2750	21230	0.158	10090
14	10240	0.168	5160	7960	0.151	3610	6820	0.134	2750	18200	0.185	10090
16	8960	0.192	5160	6970	0.173	3610	5970	0.154	2750	15920	0.211	10090
18	7960	0.211	5040	6190	0.190	3530	5310	0.169	2690	14150	0.232	9860
20	7170	0.234	5030	5570	0.211	3520	4780	0.187	2680	12740	0.257	9840

HELICAL

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
α° x ae	8° x 0.5D			5° x 0.5D			5° x 0.5D			8° x 0.5D		
Vc (m/min)	300-500			200-400			150-350			600-900		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	50000	0.015	2280	47770	0.014	1950	39810	0.011	1339	50000	0.017	2510
3	42460	0.023	2905	31850	0.020	1950	26540	0.017	1339	50000	0.025	3764
4	31850	0.030	2905	23890	0.027	1950	19900	0.022	1339	50000	0.033	5019
5	25480	0.038	2905	19110	0.034	1950	15920	0.028	1339	47770	0.042	5994
6	21230	0.045	2860	15920	0.040	1920	13270	0.033	1319	39810	0.049	5904
8	15920	0.059	2840	11940	0.053	1905	9950	0.044	1308	29860	0.065	5859
10	12740	0.073	2775	9550	0.065	1860	7960	0.054	1278	23890	0.080	5723
12	10620	0.083	2645	7960	0.074	1775	6630	0.061	1217	19900	0.091	5448
14	9100	0.097	2640	6820	0.087	1775	5690	0.071	1218	17060	0.106	5449
16	7960	0.111	2640	5970	0.099	1775	4980	0.082	1218	14930	0.122	5450
18	7080	0.122	2585	5310	0.109	1735	4420	0.090	1189	13270	0.134	5328
20	6370	0.135	2575	4780	0.121	1730	3980	0.099	1187	11940	0.148	5312

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HFAL3

	Material Group ISO 513	N1			N2 N3			N4			N5		
	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	α° x ae	15° x 0.5D			10° x 0.5D			7° x 0.5D			15° x 0.5D		
	Vc (m/min)	300-500			200-400			150-350			600-900		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
RAMPING	2	50000	0.015	2194	47770	0.013	1822	39810	0.011	1287	50000	0.016	2413
	3	42460	0.022	2794	31850	0.019	1822	26540	0.016	1287	50000	0.024	3620
	4	31850	0.029	2795	23890	0.025	1822	19900	0.022	1287	50000	0.032	4826
	5	25480	0.037	2795	19110	0.032	1822	15920	0.027	1287	47770	0.040	5764
	6	21230	0.043	2752	15920	0.038	1794	13270	0.032	1268	39810	0.048	5677
	8	15920	0.057	2731	11940	0.050	1780	9950	0.042	1258	29860	0.063	5634
	10	12740	0.070	2668	9550	0.061	1738	7960	0.051	1228	23890	0.077	5503
	12	10620	0.080	2542	7960	0.069	1656	6630	0.059	1169	19900	0.088	5239
	14	9100	0.093	2541	6820	0.081	1655	5690	0.069	1171	17060	0.102	5240
	16	7960	0.106	2540	5970	0.092	1656	4980	0.078	1171	14930	0.117	5241
	18	7080	0.117	2485	5310	0.102	1620	4420	0.086	1143	13270	0.129	5124
	20	6370	0.130	2477	4780	0.113	1616	3980	0.096	1141	11940	0.143	5108

	Material Group ISO 513	N1			N2 N3			N4			N5		
	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	ap x ae	D x 0.4D			D x 0.4D			D x 0.4D			D x 0.4D		
	Vc (m/min)	300-500			200-400			150-350			600-900		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
VERTICAL	2	50000	0.022	3300	47770	0.020	2840	39810	0.018	2100	50000	0.024	3630
	3	42460	0.033	4200	31850	0.030	2840	26540	0.026	2100	50000	0.036	5450
	4	31850	0.044	4200	23890	0.040	2840	19900	0.035	2100	50000	0.048	7260
	5	25480	0.055	4200	19110	0.050	2840	15920	0.044	2100	47770	0.061	8670
	6	21230	0.065	4140	15920	0.059	2790	13270	0.052	2070	39810	0.072	8540
	8	15920	0.086	4110	11940	0.077	2770	9950	0.069	2050	29860	0.095	8470
	10	12740	0.105	4010	9550	0.095	2710	7960	0.084	2010	23890	0.116	8280
	12	10620	0.120	3820	7960	0.108	2580	6630	0.096	1910	19900	0.132	7880
	14	9100	0.140	3820	6820	0.126	2580	5690	0.112	1910	17060	0.154	7880
	16	7960	0.160	3820	5970	0.144	2580	4980	0.128	1910	14930	0.176	7880
	18	7080	0.176	3740	5310	0.158	2520	4420	0.141	1870	13270	0.194	7710
	20	6370	0.195	3730	4780	0.176	2520	3980	0.156	1860	11940	0.215	7680

	Material Group ISO 513	N1			N2 N3			N4			N5		
	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	ap x ae	D x D			D x D			0.5D x D			0.5D x D		
	Vc (m/min)	270-370			190-290			150-250			500-700		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
DRILLING	2	50000	0.011	1650	38220	0.010	1140	31850	0.009	840	50000	0.012	1820
	3	33970	0.017	1680	25480	0.015	1140	21230	0.013	840	50000	0.018	2720
	4	25480	0.022	1680	19110	0.020	1140	15920	0.018	840	47770	0.024	3470
	5	20380	0.028	1680	15290	0.025	1140	12740	0.022	840	38220	0.030	3470
	6	16990	0.033	1660	12740	0.029	1120	10620	0.026	830	31850	0.036	3420
	8	12740	0.043	1640	9550	0.039	1110	7960	0.034	820	23890	0.047	3390
	10	10190	0.053	1600	7640	0.047	1080	6370	0.042	800	19110	0.058	3310
	12	8490	0.060	1530	6370	0.054	1030	5310	0.048	760	15920	0.066	3150
	14	7280	0.070	1530	5460	0.063	1030	4550	0.056	760	13650	0.077	3150
	16	6370	0.080	1530	4780	0.072	1030	3980	0.064	760	11940	0.088	3150
	18	5660	0.088	1490	4250	0.079	1010	3540	0.070	750	10620	0.097	3080
	20	5100	0.098	1490	3820	0.088	1010	3180	0.078	740	9550	0.107	3070

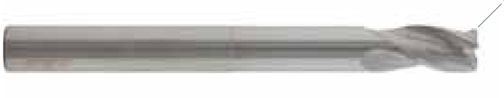
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

HFA53

cylincrical shank, reduced neck, 3 flutes, long reach, corner radius

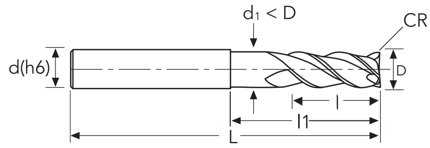
OSAWA NORM | ALU | MG BR | 30° | RADIUS | Z3 UP



P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.030	0.2	+/-0.010	6	5	18	2.80	60	3	HFA5302030	h
3	0/-0.030	0.5	+/-0.010	6	5	18	2.80	60	3	HFA5305030	h
4	0/-0.030	0.5	+/-0.010	6	6	22	3.80	60	3	HFA5305040	h
4	0/-0.030	1.0	+/-0.010	6	6	22	3.80	60	3	HFA5310040	h
5	0/-0.030	0.5	+/-0.010	6	8	24	4.80	60	3	HFA5305050	h
5	0/-0.030	1.0	+/-0.010	6	8	24	4.80	60	3	HFA5310050	h
6	0/-0.030	0.5	+/-0.010	6	9	29	5.80	65	3	HFA5305060	h
6	0/-0.030	1.0	+/-0.010	6	9	29	5.80	65	3	HFA5310060	h
6	0/-0.030	2.0	+/-0.010	6	9	29	5.80	65	3	HFA5320060	h
8	0/-0.030	0.5	+/-0.010	8	12	39	7.80	75	3	HFA5305080	h
8	0/-0.030	1.0	+/-0.010	8	12	39	7.80	75	3	HFA5310080	h
8	0/-0.030	2.0	+/-0.010	8	12	39	7.80	75	3	HFA5320080	h
8	0/-0.030	3.0	+/-0.010	8	12	39	7.80	75	3	HFA5330080	h
10	0/-0.030	0.5	+/-0.010	10	15	52	9.80	100	3	HFA5305100	h
10	0/-0.030	1.0	+/-0.010	10	15	52	9.80	100	3	HFA5310100	h
10	0/-0.030	2.0	+/-0.010	10	15	52	9.80	100	3	HFA5320100	h
10	0/-0.030	3.0	+/-0.010	10	15	52	9.80	100	3	HFA5330100	h
10	0/-0.030	4.0	+/-0.010	10	15	52	9.80	100	3	HFA5340100	h
12	0/-0.030	0.5	+/-0.010	12	18	62	11.80	120	3	HFA5305120	h
12	0/-0.030	1.0	+/-0.010	12	18	62	11.80	120	3	HFA5310120	h
12	0/-0.030	2.0	+/-0.010	12	18	62	11.80	120	3	HFA5320120	h
12	0/-0.030	3.0	+/-0.010	12	18	62	11.80	120	3	HFA5330120	h
12	0/-0.030	4.0	+/-0.010	12	18	62	11.80	120	3	HFA5340120	h
16	0/-0.030	0.5	+/-0.010	16	24	82	15.70	130	3	HFA5305160	h
16	0/-0.030	1.0	+/-0.010	16	24	82	15.70	130	3	HFA5310160	h
16	0/-0.030	2.0	+/-0.010	16	24	82	15.70	130	3	HFA5320160	h
16	0/-0.030	3.0	+/-0.010	16	24	82	15.70	130	3	HFA5330160	h
16	0/-0.030	4.0	+/-0.010	16	24	82	15.70	130	3	HFA5340160	h
20	0/-0.030	0.5	+/-0.010	20	30	100	19.70	150	3	HFA5305200	h
20	0/-0.030	1.0	+/-0.010	20	30	100	19.70	150	3	HFA5310200	h
20	0/-0.030	2.0	+/-0.010	20	30	100	19.70	150	3	HFA5320200	h
20	0/-0.030	3.0	+/-0.010	20	30	100	19.70	150	3	HFA5330200	h
20	0/-0.030	4.0	+/-0.010	20	30	100	19.70	150	3	HFA5340200	h

h stock standard   f non-standard stock   m stock exhaustion

CUTTING PARAMETERS

HFA53

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**200-500**			**150-350**			**150-250**			**500-900**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	37150	0.026	2940	26540	0.022	1790	21230	0.018	1180	50000	0.029	4360
4	27870	0.035	2940	19900	0.030	1790	15920	0.025	1180	50000	0.039	5810
5	22290	0.044	2940	15920	0.037	1790	12740	0.031	1180	44590	0.048	6470
6	18580	0.052	2900	13270	0.044	1760	10620	0.036	1160	37150	0.057	6370
8	13930	0.069	2880	9950	0.058	1750	7960	0.048	1150	27870	0.076	6330
10	11150	0.084	2810	7960	0.071	1710	6370	0.059	1120	22290	0.092	6180
12	9290	0.096	2680	6630	0.082	1620	5310	0.067	1070	18580	0.106	5890
14	7960	0.112	2670	5690	0.095	1630	4550	0.078	1070	15920	0.123	5880
16	6970	0.128	2680	4980	0.109	1630	3980	0.090	1070	13930	0.141	5880
18	6190	0.141	2610	4420	0.120	1590	3540	0.099	1050	12380	0.155	5750
20	5570	0.156	2610	3980	0.133	1580	3180	0.109	1040	11150	0.172	5740

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**			**1.5D x 0.5D**		
Vc (m/min)	**300-500**			**200-400**			**150-350**			**600-900**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	42460	0.032	4040	31850	0.029	2720	26540	0.025	2020	50000	0.035	5230
4	31850	0.042	4040	23890	0.038	2720	19900	0.034	2020	50000	0.046	6970
5	25480	0.053	4040	19110	0.048	2720	15920	0.042	2020	47770	0.058	8320
6	21230	0.062	3970	15920	0.056	2680	13270	0.050	1990	39810	0.069	8200
8	15920	0.083	3940	11940	0.074	2660	9950	0.066	1970	29860	0.091	8140
10	12740	0.101	3850	9550	0.091	2600	7960	0.081	1930	23890	0.111	7950
12	10620	0.115	3670	7960	0.104	2480	6630	0.092	1830	19900	0.127	7570
14	9100	0.134	3670	6820	0.121	2470	5690	0.108	1840	17060	0.148	7570
16	7960	0.154	3670	5970	0.138	2480	4980	0.123	1840	14930	0.169	7570
18	7080	0.169	3590	5310	0.152	2420	4420	0.135	1790	13270	0.186	7400
20	6370	0.187	3580	4780	0.168	2420	3980	0.150	1790	11940	0.206	7380

HELICAL

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
α° x ae	**8° x 0.5D**			**5° x 0.5D**			**5° x 0.5D**			**8° x 0.5D**		
Vc (m/min)	**200-500**			**150-350**			**200-400**			**500-900**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	37150	0.018	2035	26540	0.016	1300	31850	0.013	1285	50000	0.020	3010
4	27870	0.024	2035	19900	0.022	1300	23890	0.018	1285	50000	0.027	4015
5	22290	0.030	2035	15920	0.027	1300	19110	0.022	1285	44590	0.033	4475
6	18580	0.036	2005	13270	0.032	1280	15920	0.027	1265	37150	0.040	4405
8	13930	0.048	1990	9950	0.043	1270	11940	0.035	1255	27870	0.052	4375
10	11150	0.058	1945	7960	0.052	1240	9550	0.043	1225	22290	0.064	4270
12	9290	0.066	1850	6630	0.059	1180	7960	0.049	1170	18580	0.073	4070
14	7960	0.077	1850	5690	0.069	1185	6820	0.057	1170	15920	0.085	4070
16	6970	0.088	1850	4980	0.079	1185	5970	0.065	1170	13930	0.097	4070
18	6190	0.097	1810	4420	0.087	1155	5310	0.072	1145	12380	0.107	3975
20	5570	0.108	1800	3980	0.097	1155	4780	0.080	1140	11150	0.119	3970

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

HFA53

	Material Group ISO 513	N1			N2 N3			N4			N5		
RAMPING	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	α° x ae	15° x D			10° x D			7° x D			15° x D		
	Vc (m/min)	200-500			150-350			200-400			500-900		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	37150	0.018	1955	26540	0.014	1095	21230	0.013	825	50000	0.019	2895
	4	27870	0.023	1955	19900	0.018	1095	15920	0.017	825	50000	0.026	3860
	5	22290	0.029	1955	15920	0.023	1095	12740	0.022	825	44590	0.032	4305
	6	18580	0.035	1925	13270	0.027	1075	10620	0.025	810	37150	0.038	4240
	8	13930	0.046	1910	9950	0.036	1070	7960	0.034	805	27870	0.050	4205
	10	11150	0.056	1870	7960	0.044	1045	6370	0.041	785	22290	0.061	4110
	12	9290	0.064	1780	6630	0.050	995	5310	0.047	750	18580	0.070	3915
	14	7960	0.074	1780	5690	0.058	995	4550	0.055	750	15920	0.082	3910
	16	6970	0.085	1780	4980	0.067	995	3980	0.063	750	13930	0.094	3910
	18	6190	0.094	1740	4420	0.073	970	3540	0.069	735	12380	0.103	3825
	20	5570	0.104	1735	3980	0.081	970	3180	0.076	730	11150	0.114	3815

	Material Group ISO 513	N1			N2 N3			N4			N5		
VERTICAL	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	ap x ae	D x 0.4D			D x 0.4D			D x 0.4D			D x 0.4D		
	Vc (m/min)	200-500			150-350			150-250			500-900		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	37150	0.026	2940	26540	0.024	1890	21230	0.021	1350	50000	0.029	4360
	4	27870	0.035	2940	19900	0.032	1890	15920	0.028	1340	50000	0.039	5810
	5	22290	0.044	2940	15920	0.040	1890	12740	0.035	1350	44590	0.048	6470
	6	18580	0.052	2900	13270	0.047	1860	10620	0.042	1330	37150	0.057	6370
	8	13930	0.069	2880	9950	0.062	1850	7960	0.055	1310	27870	0.076	6330
	10	11150	0.084	2810	7960	0.076	1810	6370	0.067	1280	22290	0.092	6180
	12	9290	0.096	2680	6630	0.086	1720	5310	0.077	1220	18580	0.106	5890
	14	7960	0.112	2670	5690	0.101	1720	4550	0.090	1220	15920	0.123	5880
	16	6970	0.128	2680	4980	0.115	1720	3980	0.102	1220	13930	0.141	5880
	18	6190	0.141	2610	4420	0.127	1680	3540	0.113	1200	12380	0.155	5750
	20	5570	0.156	2610	3980	0.140	1680	3180	0.125	1190	11150	0.172	5740

	Material Group ISO 513	N1			N2 N3			N4			N5		
DRILLING	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
	Vc (m/min)	230-330			150-250			110-210			510-610		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	3	29720	0.013	1180	21230	0.012	760	16990	0.011	540	50000	0.015	2180
	4	22290	0.018	1180	15920	0.016	760	12740	0.014	540	44590	0.019	2590
	5	17830	0.022	1180	12740	0.020	760	10190	0.018	540	35670	0.024	2590
	6	14860	0.026	1160	10620	0.023	750	8490	0.021	530	29720	0.029	2550
	8	11150	0.034	1150	7960	0.031	740	6370	0.028	530	22290	0.038	2530
	10	8920	0.042	1120	6370	0.038	720	5100	0.034	510	17830	0.046	2470
	12	7430	0.048	1070	5310	0.043	690	4250	0.038	490	14860	0.053	2350
	14	6370	0.056	1070	4550	0.050	690	3640	0.045	490	12740	0.062	2350
	16	5570	0.064	1070	3980	0.058	690	3180	0.051	490	11150	0.070	2350
	18	4950	0.070	1050	3540	0.063	670	2830	0.056	480	9910	0.077	2300
	20	4460	0.078	1040	3180	0.070	670	2550	0.062	480	8920	0.086	2300

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

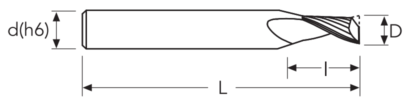
MDCSA1

cylindrical shank, 1 flute, polished

OSAWA NORM | ALU | MG POLISHED | 25° | SQUARE | Z1

P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.020			2	10		40	1	MDCSA1020	h
3	0/-0.020			3	12		40	1	MDCSA1030	h
4	0/-0.020			4	15		50	1	MDCSA1040	h
5	0/-0.020			5	16		50	1	MDCSA1050	h
6	0/-0.020			6	20		60	1	MDCSA1060	h
8	0/-0.020			8	22		63	1	MDCSA1080	h
10	0/-0.020			10	25		72	1	MDCSA1100	h
12	0/-0.020			12	30		83	1	MDCSA1120	h

h stock standard f non-standard stock m stock exhaustion

MDCSA1

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	300-500			200-400			150-350			400-600		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	50000	0.023	1130	47770	0.019	910	39810	0.016	630	50000	0.023	1130
3	42460	0.030	1270	31850	0.026	810	31850	0.021	670	50000	0.030	1500
4	35830	0.039	1400	27870	0.033	920	23890	0.027	650	39810	0.039	1550
5	28660	0.049	1400	22290	0.041	920	19110	0.034	650	38220	0.049	1860
6	23890	0.058	1380	18580	0.049	910	15920	0.040	640	31850	0.058	1840
8	17910	0.079	1410	13930	0.067	930	11940	0.055	660	23890	0.079	1880
10	14330	0.098	1400	11150	0.083	920	9550	0.068	650	19110	0.098	1860
12	11940	0.116	1390	9290	0.099	920	7960	0.081	650	15920	0.116	1850

< D3 ap x ae D x 0.25D

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	D x 0.5D			D x 0.5D			D x 0.5D			D x 0.5D		
Vc (m/min)	300-600			200-500			200-400			400-800		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	50000	0.030	1500	50000	0.026	1280	47770	0.021	1000	50000	0.030	1500
3	47770	0.040	1910	37150	0.034	1260	31850	0.028	890	50000	0.040	2000
4	35830	0.052	1860	27870	0.044	1230	23890	0.036	870	47770	0.052	2480
5	28660	0.065	1860	22290	0.055	1230	19110	0.046	870	38220	0.065	2480
6	23890	0.077	1840	18580	0.065	1220	15920	0.054	860	31850	0.077	2450
8	17910	0.105	1880	13930	0.089	1240	11940	0.074	880	23890	0.105	2510
10	14330	0.130	1860	11150	0.111	1230	9550	0.091	870	19110	0.130	2480
12	11940	0.155	1850	9290	0.132	1220	7960	0.109	860	15920	0.155	2470

< D3 ap x ae D x 0.25D

DRILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	D x D			D x D			D x D			0.5D x D		
Vc (m/min)	200-400			150-350			100-300			300-500		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	47770	0.011	540	39810	0.010	380	31850	0.008	250	50000	0.011	560
3	31850	0.015	480	26540	0.013	340	21230	0.011	220	42460	0.015	640
4	23890	0.020	470	19900	0.017	330	15920	0.014	220	31850	0.020	620
5	19110	0.024	470	15920	0.021	330	12740	0.017	220	25480	0.024	620
6	15920	0.029	460	13270	0.025	330	10620	0.020	210	21230	0.029	610
8	11940	0.039	470	9950	0.033	330	7960	0.028	220	15920	0.039	630
10	9550	0.049	470	7960	0.041	330	6370	0.034	220	12740	0.049	620
12	7960	0.058	460	6630	0.049	330	5310	0.041	220	10620	0.058	620

< D3 ap x ae 0.5D x D

MDCSA2

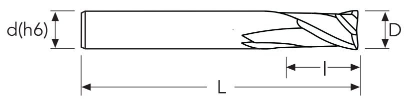
cylindrical shank, 2 flutes, polished

OSAWA NORM | ALU | MG POLISHED | 45° | SQUARE | Z2

P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		40	2	MDCSA2010	h
1.5	0/-0.020			4	4.5		40	2	MDCSA2015	h
2	0/-0.020			4	6.5		40	2	MDCSA2020	h
2.5	0/-0.020			4	6.5		40	2	MDCSA2025	h
3	0/-0.030			6	8		57	2	MDCSA2030	h
4	0/-0.030			6	11		57	2	MDCSA2040	h
5	0/-0.030			6	13		57	2	MDCSA2050	h
6	0/-0.030			6	13		57	2	MDCSA2060	h
8	0/-0.030			8	19		63	2	MDCSA2080	h
10	0/-0.030			10	22		72	2	MDCSA2100	h
12	0/-0.030			12	26		83	2	MDCSA2120	h
14	0/-0.030			14	26		83	2	MDCSA2140	h
16	0/-0.030			16	32		92	2	MDCSA2160	h
18	0/-0.030			18	32		92	2	MDCSA2180	h
20	0/-0.030			20	38		104	2	MDCSA2200	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MDCSA2

	Material Group ISO 513	N1			N2 N3			N4			N5		
	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
	Vc (m/min)	200-600			150-350			150-250			500-900		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
SLOTTING	1	50000	0.011	1120	50000	0.010	950	50000	0.008	780	50000	0.011	1120
	1.5	50000	0.017	1680	50000	0.014	1430	42460	0.012	1000	50000	0.017	1680
	2	50000	0.022	2240	39810	0.019	1520	31850	0.016	1000	50000	0.022	2240
	3	37150	0.028	2100	26540	0.024	1270	21230	0.020	840	50000	0.028	2820
	4	27870	0.038	2090	19900	0.032	1270	15920	0.026	840	50000	0.038	3750
	5	22290	0.047	2100	15920	0.040	1270	12740	0.033	840	44590	0.047	4200
	6	18580	0.056	2090	13270	0.048	1270	10620	0.039	840	37150	0.056	4190
	8	13930	0.075	2080	9950	0.064	1270	7960	0.052	830	27870	0.075	4170
	10	11150	0.094	2090	7960	0.080	1270	6370	0.066	840	22290	0.094	4170
	12	9290	0.112	2080	6630	0.095	1260	5310	0.078	830	18580	0.112	4160
	14	7960	0.130	2080	5690	0.111	1260	4550	0.091	830	15920	0.130	4150
	16	6970	0.148	2060	4980	0.126	1250	3980	0.103	820	13930	0.148	4120
	18	6190	0.166	2060	4420	0.141	1250	3540	0.116	820	12380	0.166	4120
	20	5570	0.185	2060	3980	0.157	1250	3180	0.129	820	11150	0.185	4120

< D3 ap x ae 0.25D x D

	Material Group ISO 513	N1			N2 N3			N4			N5		
	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	ap x ae	D x 0.5D			D x 0.5D			D x 0.5D			D x 0.5D		
	Vc (m/min)	300-500			200-400			150-350			600-1000		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
SIDE MILLING	1	50000	0.013	1340	50000	0.011	1140	50000	0.009	940	50000	0.013	1340
	1.5	50000	0.020	2020	50000	0.017	1710	50000	0.014	1410	50000	0.020	2020
	2	50000	0.027	2690	50000	0.023	2280	39810	0.019	1500	50000	0.027	2690
	3	42460	0.034	2880	31850	0.029	1830	26540	0.024	1260	50000	0.034	3390
	4	31850	0.045	2870	23890	0.038	1830	19900	0.032	1250	50000	0.045	4500
	5	25480	0.056	2880	19110	0.048	1830	15920	0.040	1260	50000	0.056	5640
	6	21230	0.068	2870	15920	0.057	1830	13270	0.047	1260	42460	0.068	5740
	8	15920	0.090	2860	11940	0.076	1820	9950	0.063	1250	31850	0.090	5720
	10	12740	0.112	2860	9550	0.096	1820	7960	0.079	1250	25480	0.112	5730
	12	10620	0.134	2850	7960	0.114	1820	6630	0.094	1250	21230	0.134	5710
	14	9100	0.157	2850	6820	0.133	1820	5690	0.110	1250	18200	0.157	5700
	16	7960	0.177	2820	5970	0.151	1800	4980	0.124	1240	15920	0.177	5650
	18	7080	0.200	2830	5310	0.170	1800	4420	0.140	1240	14150	0.200	5650
	20	6370	0.222	2830	4780	0.188	1800	3980	0.155	1240	12740	0.222	5650

< D3 ap x ae D x 0.5D

OSAWA

CUTTING PARAMETERS

MDCSA2

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	**0.5D x D**			**0.5D x D**			**0.5D x D**			**0.5D x D**		
Vc (m/min)	**200-400**			**150-350**			**150-350**			**500-900**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	50000	0.006	560	50000	0.005	480	50000	0.004	390	50000	0.006	560
1.5	50000	0.008	840	50000	0.007	710	50000	0.006	590	50000	0.008	840
2	47770	0.011	1070	39810	0.010	760	39810	0.008	620	50000	0.011	1120
3	31850	0.014	900	26540	0.012	640	26540	0.010	520	50000	0.014	1410
4	23890	0.019	900	19900	0.016	630	19900	0.013	520	50000	0.019	1880
5	19110	0.024	900	15920	0.020	640	15920	0.016	520	44590	0.024	2100
6	15920	0.028	900	13270	0.024	640	13270	0.020	520	37150	0.028	2090
8	11940	0.037	890	9950	0.032	630	9950	0.026	520	27870	0.037	2090
10	9550	0.047	890	7960	0.040	630	7960	0.033	520	22290	0.047	2090
12	7960	0.056	890	6630	0.048	630	6630	0.039	520	18580	0.056	2080
14	6820	0.065	890	5690	0.055	630	5690	0.046	520	15920	0.065	2080
16	5970	0.074	880	4980	0.063	630	4980	0.052	520	13930	0.074	2060
18	5310	0.083	880	4420	0.071	620	4420	0.058	510	12380	0.083	2060
20	4780	0.092	880	3980	0.079	630	3980	0.065	510	11150	0.092	2060

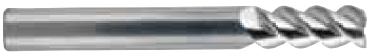
DRILLING

< D3 ap x ae 0.25D x D

MDCSA3

cylindrical shank, 3 flutes, polished

OSAWA NORM | ALU | MG POLISHED | 55° | SQUARE | Z3



P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020			4	3		50	3	MDCSA3010	h
1.5	0/-0.020			4	4.5		50	3	MDCSA3015	h
2	0/-0.020			4	6		50	3	MDCSA3020	h
3	0/-0.020			4	8		50	3	MDCSA3030	h
4	0/-0.020			4	11		50	3	MDCSA3040	h
5	0/-0.020			6	13		50	3	MDCSA3050	h
6	0/-0.020			6	15		50	3	MDCSA3060	h
8	0/-0.025			8	20		60	3	MDCSA3080	h
10	0/-0.025			10	25		75	3	MDCSA3100	h
12	0/-0.025			12	30		75	3	MDCSA3120	h
16	0/-0.030			16	40		100	3	MDCSA3160	h
20	0/-0.030			20	40		100	3	MDCSA3200	h

h stock standard f non-standard stock m stock exhaustion

MDCSA3

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	200-600			150-350			150-250			500-900		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	50000	0.010	1510	50000	0.009	1290	50000	0.007	1060	50000	0.010	1510
1.5	50000	0.015	2270	50000	0.013	1930	42460	0.011	1350	50000	0.015	2270
2	50000	0.020	3020	39810	0.017	2050	31850	0.014	1350	50000	0.020	3020
3	37150	0.025	2830	26540	0.022	1720	21230	0.018	1130	50000	0.025	3810
4	27870	0.034	2820	19900	0.029	1710	15920	0.024	1130	50000	0.034	5070
5	22290	0.042	2830	15920	0.036	1720	12740	0.030	1130	44590	0.042	5660
6	18580	0.051	2830	13270	0.043	1720	10620	0.035	1130	37150	0.051	5650
8	13930	0.067	2810	9950	0.057	1710	7960	0.047	1130	27870	0.067	5630
10	11150	0.084	2820	7960	0.072	1710	6370	0.059	1130	22290	0.084	5640
12	9290	0.101	2810	6630	0.086	1700	5310	0.071	1120	18580	0.101	5620
14	7960	0.117	2800	5690	0.100	1700	4550	0.082	1120	15920	0.117	5610
16	6970	0.133	2780	4980	0.113	1690	3980	0.093	1110	13930	0.133	5560
18	6190	0.150	2780	4420	0.127	1690	3540	0.105	1110	12380	0.150	5560
20	5570	0.166	2780	3980	0.141	1690	3180	0.116	1110	11150	0.166	5560

< D3 ap x ae 0.25D x D

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D		
Vc (m/min)	300-500			200-400			150-350			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	50000	0.012	1810	50000	0.010	1540	50000	0.008	1270	50000	0.012	1810
1.5	50000	0.018	2720	50000	0.015	2310	50000	0.013	1910	50000	0.018	2720
2	50000	0.024	3630	50000	0.021	3080	39810	0.017	2020	50000	0.024	3630
3	42460	0.030	3880	31850	0.026	2480	26540	0.021	1700	50000	0.030	4570
4	31850	0.041	3870	23890	0.034	2470	19900	0.028	1690	50000	0.041	6080
5	25480	0.051	3880	19110	0.043	2480	15920	0.036	1700	50000	0.051	7620
6	21230	0.061	3880	15920	0.052	2470	13270	0.043	1700	42460	0.061	7750
8	15920	0.081	3860	11940	0.069	2460	9950	0.057	1690	31850	0.081	7720
10	12740	0.101	3860	9550	0.086	2460	7960	0.071	1690	25480	0.101	7730
12	10620	0.121	3850	7960	0.103	2460	6630	0.085	1680	21230	0.121	7700
14	9100	0.141	3850	6820	0.120	2450	5690	0.099	1680	18200	0.141	7690
16	7960	0.160	3810	5970	0.136	2430	4980	0.112	1670	15920	0.160	7630
18	7080	0.180	3820	5310	0.153	2430	4420	0.126	1670	14150	0.180	7630
20	6370	0.200	3810	4780	0.170	2430	3980	0.140	1670	12740	0.200	7630

< D3 ap x ae D x 0.1D

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MDA310-11-12

cylindrical shank, 3 flutes polished, long

OSAWA NORM | ALU | MG POLISHED | 55° | SQUARE | Z3

MDA310

MDA311 - MDA312

P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING

D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.030			6	12		75	3	MDA310030	h
4	0/-0.030			6	16		75	3	MDA310040	h
5	0/-0.030			6	20		75	3	MDA310050	h
6	0/-0.030			6	25		75	3	MDA310060	h
3	0/-0.030			6	15		100	3	MDA311030	h
4	0/-0.030			6	20		100	3	MDA311040	h
5	0/-0.030			6	25		100	3	MDA311050	h
6	0/-0.030			6	30		100	3	MDA311060	h
8	0/-0.035			8	35		100	3	MDA311080	h
10	0/-0.035			10	40		100	3	MDA311100	h
12	0/-0.035			12	45		100	3	MDA311120	h
8	0/-0.035			8	40		150	3	MDA312080	h
10	0/-0.035			10	50		150	3	MDA312100	h
12	0/-0.035			12	50		150	3	MDA312120	h
16	0/-0.040			16	70		150	3	MDA312160	h
20	0/-0.040			20	80		150	3	MDA312200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MDA310

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	0.3D x D			0.3D x D			0.3D x D			0.3D x D		
Vc (m/min)	220-340			150-250			100-200			400-700		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	29720	0.023	2040	21230	0.019	1240	15920	0.016	760	50000	0.023	3430
4	22290	0.030	2030	15920	0.026	1230	11940	0.021	760	50000	0.030	4560
5	17830	0.038	2040	12740	0.032	1240	9550	0.027	760	35030	0.038	4000
6	14860	0.046	2030	10620	0.039	1240	7960	0.032	760	29190	0.046	4000

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	1.5D x 0.1D			1.5D x 0.1D			1.5D x 0.1D			1.5D x 0.1D		
Vc (m/min)	270-370			200-300			150-250			500-800		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	33970	0.027	2800	26540	0.023	1860	21230	0.019	1220	50000	0.027	4120
4	25480	0.036	2790	19900	0.031	1850	15920	0.026	1220	50000	0.036	5470
5	20380	0.046	2800	15920	0.039	1860	12740	0.032	1220	50000	0.046	6860
6	16990	0.055	2790	13270	0.047	1850	10620	0.038	1220	34500	0.055	5670

MDA311

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	0.3D x D			0.3D x D			0.3D x D			0.3D x D		
Vc (m/min)	180-280			110-210			100-160			350-550		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	24420	0.019	1400	16990	0.016	830	13800	0.013	550	50000	0.019	2860
4	18310	0.025	1390	12740	0.022	820	10350	0.018	550	50000	0.025	3800
5	14650	0.032	1400	10190	0.027	830	8280	0.022	550	28660	0.032	2730
6	12210	0.038	1390	8490	0.032	820	6900	0.027	550	23890	0.038	2730
8	9160	0.051	1390	6370	0.043	820	5180	0.035	550	17910	0.051	2710
10	7320	0.063	1390	5100	0.054	820	4140	0.044	550	14330	0.063	2720
12	6100	0.076	1380	4250	0.064	820	3450	0.053	550	11940	0.076	2710

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	2D x 0.05D			2D x 0.05D			2D x 0.05D			2D x 0.05D		
Vc (m/min)	210-310			150-250			110-210			420-620		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	27600	0.023	1890	21230	0.019	1240	16990	0.016	820	50000	0.023	3430
4	20700	0.030	1890	15920	0.026	1230	12740	0.021	810	50000	0.030	4560
5	16560	0.038	1890	12740	0.032	1240	10190	0.027	820	50000	0.038	5720
6	13800	0.046	1890	10620	0.039	1240	8490	0.032	810	27600	0.046	3780
8	10350	0.061	1880	7960	0.052	1230	6370	0.042	810	20700	0.061	3760
10	8280	0.076	1880	6370	0.064	1230	5100	0.053	810	16560	0.076	3770
12	6900	0.091	1880	5310	0.077	1230	4250	0.064	810	13800	0.091	3760

CUTTING PARAMETERS

MDA312

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	**0.1D x D**			**0.1D x D**			**0.1D x D**			**0.1D x D**		
Vc (m/min)	**130-230**			**100-160**			**80-120**			**250-450**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	7170	0.040	870	5180	0.034	530	3980	0.028	340	13930	0.040	1690
10	5730	0.051	870	4140	0.043	530	3180	0.035	340	11150	0.051	1690
12	4780	0.060	870	3450	0.051	530	2650	0.042	340	9290	0.060	1690
16	3580	0.080	860	2590	0.068	530	1990	0.056	330	6970	0.080	1670
20	2870	0.100	860	2070	0.085	530	1590	0.070	330	5570	0.100	1670

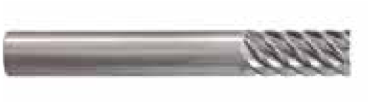
SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	**2.5D x 0.05D**			**2.5D x 0.05D**			**2.5D x 0.05D**			**2.5D x 0.05D**		
Vc (m/min)	**150-250**			**100-200**			**100-160**			**300-500**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
8	7960	0.048	1160	5970	0.041	740	5180	0.034	530	15920	0.048	2320
10	6370	0.061	1160	4780	0.052	740	4140	0.042	530	12740	0.061	2320
12	5310	0.073	1160	3980	0.062	740	3450	0.051	530	10620	0.073	2310
16	3980	0.096	1140	2990	0.081	730	2590	0.067	520	7960	0.096	2290
20	3180	0.120	1140	2390	0.102	730	2070	0.084	520	6370	0.120	2290

MDCSAM

cylindrical shank, 6F, polished

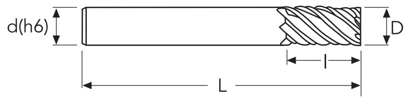
OSAWA NORM | ALU | MG POLISHED | 50° | SQUARE | Z6



P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.025			6	15		57	6	MDCSAM060	h
8	0/-0.030			8	20		64	6	MDCSAM080	h
10	0/-0.030			10	22		75	6	MDCSAM100	h
12	0/-0.030			12	25		75	6	MDCSAM120	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

MDCSAM

	Material Group ISO 513	N1			N2 N3			N4			N5		
SIDE MILLING	Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
	ap x ae	**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
	Vc (m/min)	**600-1000**			**400-800**			**300-700**			**900-1300**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	42460	0.050	12810	31850	0.043	8170	26540	0.035	5610	50000	0.050	15090
	8	31850	0.067	12770	23890	0.057	8140	19900	0.047	5580	43790	0.067	17550
	10	25480	0.084	12780	19110	0.071	8150	15920	0.059	5590	35030	0.084	17570
	12	21230	0.100	12740	15920	0.085	8120	13270	0.070	5570	29190	0.100	17510

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

OSAWA

MCA212R

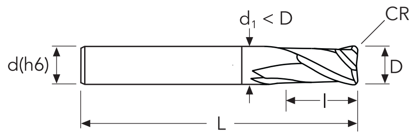
cylindrical shank, 2 flutes, corner radius

OSAWA NORM | ALU | MG PV200 | 25° | RADIUS | Z2

P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable

SLOTTING SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
2	0/-0.030	0.20	+/-0.020	3	3	6	1.90	40	2	MCA212R02020	h
3	0/-0.030	0.20	+/-0.020	3	4	8	2.80	40	2	MCA212R02030	h
4	0/-0.030	0.20	+/-0.020	4	5	12	3.70	50	2	MCA212R02040	h
5	0/-0.030	0.20	+/-0.020	5	8	14	4.80	50	2	MCA212R02050	h
6	0/-0.030	0.20	+/-0.020	6	8	18	5.50	65	2	MCA212R02060	h
8	0/-0.030	0.20	+/-0.020	8	10	22	7.40	70	2	MCA212R02080	h
10	0/-0.030	0.20	+/-0.020	10	14	28	9.70	80	2	MCA212R02100	h
12	0/-0.030	0.20	+/-0.020	12	16	35	11.00	90	2	MCA212R02120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MCA212R

SLOTTING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
Vc (m/min)	200-600			200-400			150-350			600-1000w		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	50000	0.022	2240	47770	0.019	1820	39810	0.016	1250	50000	0.022	2240
3	42460	0.028	2400	31850	0.024	1530	26540	0.020	1050	50000	0.028	2820
4	31850	0.038	2390	23890	0.032	1520	19900	0.026	1050	50000	0.038	3750
5	25480	0.047	2400	19110	0.040	1530	15920	0.033	1050	50000	0.047	4700
6	21230	0.056	2390	15920	0.048	1520	13270	0.039	1050	42460	0.056	4780
8	15920	0.075	2380	11940	0.064	1520	9950	0.052	1040	31850	0.075	4770
10	12740	0.094	2390	9550	0.080	1520	7960	0.066	1040	25480	0.094	4770
12	10620	0.112	2380	7960	0.095	1520	6630	0.078	1040	21230	0.112	4760

< D3 ap x ae 0.25D x D

SIDE MILLING

Material Group ISO 513	N1			N2 N3			N4			N5		
Material	Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae	1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D		
Vc (m/min)	300-600			250-450			200-400			600-1000		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	50000	0.027	2690	50000	0.023	2280	47770	0.019	1800	50000	0.027	2690
3	47770	0.034	3240	37150	0.029	2140	31850	0.024	1510	50000	0.034	3390
4	35830	0.045	3230	27870	0.038	2130	23890	0.032	1510	50000	0.045	4500
5	28660	0.056	3240	22290	0.048	2140	19110	0.040	1510	50000	0.056	5640
6	23890	0.068	3230	18580	0.057	2140	15920	0.047	1510	42460	0.068	5740
8	17910	0.090	3220	13930	0.076	2130	11940	0.063	1500	31850	0.090	5720
10	14330	0.112	3220	11150	0.096	2130	9550	0.079	1500	25480	0.112	5730
12	11940	0.134	3210	9290	0.114	2120	7960	0.094	1500	21230	0.134	5710

< D3 ap x ae D x 0.5D

MDCAB2

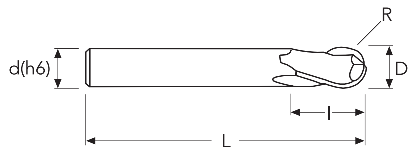
cylindrical shank, 2 flutes ball nose, polished

OSAWA NORM | ALU | MG POLISHED | 40° | BALL NOSE | Z2 BALL

P	M	K	N	S	H
			★		

★ 1st choice ☆ suitable

COPYING

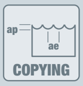


D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.50	+/-0.010	4	2		50	2	MDCAB2010	h
1.5	0/-0.020	0.75	+/-0.010	4	3		50	2	MDCAB2015	h
2	0/-0.020	1.00	+/-0.010	4	4		50	2	MDCAB2020	h
3	0/-0.020	1.50	+/-0.010	4	6		50	2	MDCAB2030	h
4	0/-0.020	2.00	+/-0.010	4	8		50	2	MDCAB2040	h
5	0/-0.020	2.50	+/-0.010	6	10		50	2	MDCAB2050	h
6	0/-0.020	3.00	+/-0.010	6	12		50	2	MDCAB2060	h
8	0/-0.025	4.00	+/-0.010	8	16		60	2	MDCAB2080	h
10	0/-0.025	5.00	+/-0.010	10	20		75	2	MDCAB2100	h
12	0/-0.025	6.00	+/-0.010	12	24		75	2	MDCAB2120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

MDCAB2



Material Group ISO 513		N1			N2 N3			N4			N5		
Material		Alluminium ≤ 12% Si - Copper Alloy			Alluminium > 12% Si - Copper Alloy			Brass and bronze			Plastics		
ap x ae		**0.2D x 0.4D**			**0.2D x 0.4D**			**0.2D x 0.4D**			**0.2D x 0.4D**		
Vc (m/min)		**200-600**			**250-450**			**200-400**			**600-1000**		
D (mm)	**D (eff.) (mm)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**
1	**0.80**	40000	0.013	1010	111460	0.011	2530	95540	0.010	1930	254780	0.013	6420
1.5	**1.20**	84930	0.017	2850	74310	0.015	2250	63690	0.013	1710	169850	0.017	5710
2	**1.60**	63690	0.017	2140	55730	0.015	1690	47770	0.013	1280	127390	0.017	4280
2.5	**2.00**	50960	0.021	2140	44590	0.019	1690	38220	0.017	1280	101910	0.021	4280
3	**2.40**	42460	0.025	2140	37150	0.023	1690	31850	0.020	1280	84930	0.025	4280
4	**3.20**	31850	0.035	2230	27870	0.032	1760	23890	0.028	1340	63690	0.035	4460
5	**4.00**	25480	0.045	2280	22290	0.040	1800	19110	0.036	1370	50960	0.045	4570
6	**4.80**	21230	0.053	2260	18580	0.048	1780	15920	0.043	1360	42460	0.053	4520
8	**6.40**	15920	0.067	2140	13930	0.060	1680	11940	0.054	1280	31850	0.067	4280
10	**8.00**	12740	0.080	2030	11150	0.072	1600	9550	0.064	1220	25480	0.080	4070
12	**9.60**	10620	0.094	1990	9290	0.084	1570	7960	0.075	1190	21230	0.094	3980

MEX

STEEL AND HARDENED STEEL 30÷55 HRC

Ultra-fine micrograin and Endless Orange coating for high perfromance machining on 30÷55 HRC materials. Wide range of tools available for general milling, roughing, copying and super finishing.

Micrograna ultrafine e rivestimento Endless Orange per lavorazione ad alto rendimento di materiali con durezza compresa tra 30÷55 HRC. Ampia gamma per soddisfare applicazioni di fresatura generale, sgrossatura, copiatura e super finitura.

Besonders feine Mikrokörnung und Beschichtung Endless Orange für Hochleistungsbearbeitungen von Materialien mit einer Härte zwischen 30 und 55 HRC. Große Produktpalette für Anwendungen zum Fräsen im Allgemeinen, Schruppen, Kopierfräsen und Schlichtbearbeitung.

Ultra Micrograin et revêtement Endless Orange pour un usinage à rendement élevé de matériaux ayant une dureté comprise entre 30÷55 HRC. Une large gamme pour satisfaire les applications de fraisage général, ébauche, copiage et super finition.

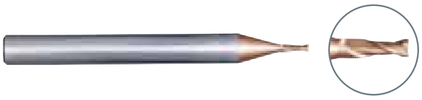
Micrograno ultrafino y revestimiento Endless Orange para el mecanizado a alto rendimiento de materiales con una dureza comprendida entre 30 y 55 HRC. Amplia gama para satisfacer aplicaciones de fresado general, desbaste, copiado y súper acabado.

Микрозернистая структура твердого сплава и покрытие Endless Orange служат для высокоэффективной обработки материалов с твёрдостью 30÷55 HRC. Представлен широкий ассортимент инструментов для стандартных операций фрезерования, черновой обработки, обработки криволинейных поверхностей и чистовой обработки.

MEXM2

cylindrical shank, 2 flutes, miniature

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SLOTTING

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.3	0/-0.020			4	0.6		40	2	MEXM20030	h
0.4	0/-0.020			4	0.8		40	2	MEXM20040	h
0.5	0/-0.020			4	1		40	2	MEXM20050	h
0.6	0/-0.020			4	1.2		40	2	MEXM20060	h
0.7	0/-0.020			4	1.4		40	2	MEXM20070	h
0.8	0/-0.020			4	1.6		40	2	MEXM20080	h
0.9	0/-0.020			4	1.8		40	2	MEXM20090	h
1	0/-0.020			3	2		40	2	MEXM20100	h
1.1	0/-0.020			3	2.2		40	2	MEXM20110	h
1.2	0/-0.020			3	2.4		40	2	MEXM20120	h
1.3	0/-0.020			3	2.6		40	2	MEXM20130	h
1.4	0/-0.020			3	2.8		40	2	MEXM20140	h
1.5	0/-0.020			3	3		40	2	MEXM20150	h
1.6	0/-0.020			3	3.2		40	2	MEXM20160	h
1.7	0/-0.020			3	3.4		40	2	MEXM20170	h
1.8	0/-0.020			3	3.6		40	2	MEXM20180	h
1.9	0/-0.020			3	3.8		40	2	MEXM20190	h
2	0/-0.020			3	4		40	2	MEXM20200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

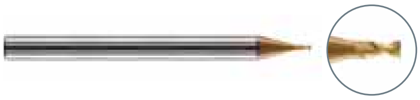
MEXM2

Material Group ISO 513		P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm		< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae		**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)		**70-110**			**50-90**			**30-70**			**20-40**		
D (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.3	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	31800	0.003	180
0.4	**0.02**	40000	0.006	480	40000	0.005	430	39800	0.005	380	23900	0.004	200
0.5	**0.03**	40000	0.007	560	40000	0.006	500	31800	0.006	355	19100	0.005	185
0.6	**0.03**	40000	0.008	640	37200	0.007	540	26500	0.006	340	15900	0.006	180
0.8	**0.04**	35800	0.010	720	27900	0.009	500	19900	0.008	320	11900	0.007	165
1	**0.05**	28700	0.012	690	22300	0.011	480	15900	0.010	305	9600	0.008	160
1.2	**0.06**	23900	0.022	1050	18600	0.020	740	13300	0.018	470	8000	0.015	245
1.4	**0.07**	20500	0.024	980	15900	0.022	690	11400	0.019	440	6800	0.017	230
1.5	**0.08**	19100	0.025	960	14900	0.023	670	10600	0.020	425	6400	0.018	225
1.6	**0.08**	17900	0.026	930	13900	0.023	650	10000	0.021	415	6000	0.018	220
1.8	**0.09**	15900	0.028	890	12400	0.025	620	8800	0.022	395	5300	0.020	210
2	**0.10**	14300	0.030	860	11100	0.027	600	8000	0.024	190	4800	0.021	200

MEXM2SC

cylindrical shank, 2 flutes, short cutting length, miniature

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SLOTTING

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.2	0/-0.020			4	0.3		50	2	MEXM2SC0020	h
0.3	0/-0.020			4	0.4		50	2	MEXM2SC0030	h
0.4	0/-0.020			4	0.6		50	2	MEXM2SC0040	h
0.5	0/-0.020			4	0.7		50	2	MEXM2SC0050	h
0.6	0/-0.020			4	0.9		50	2	MEXM2SC0060	h
0.7	0/-0.020			4	1		50	2	MEXM2SC0070	h
0.8	0/-0.020			4	1.2		50	2	MEXM2SC0080	h
0.9	0/-0.020			4	1.4		50	2	MEXM2SC0090	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXM2SC

SLOTTING

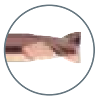
Material Group ISO 513		P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm		< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae		ap x D			ap x D			ap x D			ap x D		
Vc (m/min)		70-110			50-90			30-70			20-40		
D (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.2	**0.01**	40000	0.003	240	40000	0.003	220	40000	0.002	190	40000	0.002	170
0.3	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	31850	0.003	180
0.4	**0.02**	40000	0.006	480	40000	0.005	430	39810	0.005	380	23890	0.004	200
0.5	**0.03**	40000	0.007	560	40000	0.006	500	31850	0.006	355	19110	0.005	185
0.6	**0.03**	40000	0.008	640	37150	0.007	530	26540	0.006	340	15920	0.006	180
0.8	**0.04**	35830	0.010	720	27870	0.009	500	19900	0.008	320	11940	0.007	165
0.9	**0.05**	31850	0.012	760	24770	0.011	540	17690	0.010	340	10620	0.008	180

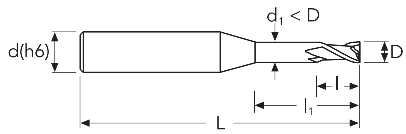
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXLN2

cylindrical shank, 2 flutes, extended and reduced neck

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2

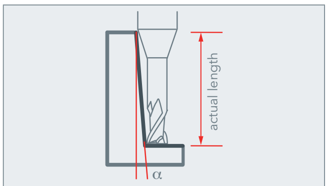




P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

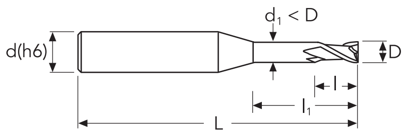
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
0.2	0/-0.020			4	0.3	0.5	0.16	50	2	0.57	0.59	0.61	0.63	0.68	MEXLN2002005	h
0.2	0/-0.020			4	0.3	1	0.16	50	2	1.09	1.12	1.16	1.21	1.30	MEXLN200201	h
0.2	0/-0.020			4	0.3	1.5	0.16	50	2	1.60	1.66	1.72	1.78	1.91	MEXLN2002015	h
0.3	0/-0.020			4	0.4	1	0.26	50	2	1.09	1.12	1.16	1.21	1.30	MEXLN200301	h
0.3	0/-0.020			4	0.4	2	0.26	50	2	2.12	2.19	2.27	2.35	2.53	MEXLN200302	h
0.3	0/-0.020			4	0.4	3	0.26	50	2	3.15	3.26	3.38	3.50	3.76	MEXLN200303	h
0.4	0/-0.020			4	0.6	2	0.37	50	2	2.12	2.19	2.27	2.35	2.53	MEXLN200402	h
0.4	0/-0.020			4	0.6	3	0.37	50	2	3.15	3.26	3.38	3.50	3.76	MEXLN200403	h
0.4	0/-0.020			4	0.6	4	0.37	50	2	4.19	4.33	4.49	4.65	5.00	MEXLN200404	h
0.4	0/-0.020			4	0.6	5	0.37	50	2	5.22	5.40	5.59	5.79	6.23	MEXLN200405	h
0.5	0/-0.020			4	0.7	2	0.45	50	2	2.16	2.23	2.31	2.40	2.57	MEXLN200502	h
0.5	0/-0.020			4	0.7	4	0.45	50	2	4.23	4.37	4.53	4.69	5.04	MEXLN200504	h
0.5	0/-0.020			4	0.7	6	0.45	50	2	6.29	6.51	6.74	6.98	7.51	MEXLN200506	h
0.5	0/-0.020			4	0.7	8	0.45	50	2	8.36	8.65	8.96	9.28	9.98	MEXLN200508	h
0.6	0/-0.020			4	0.9	2	0.55	50	2	2.16	2.23	2.31	2.40	2.57	MEXLN200602	h
0.6	0/-0.020			4	0.9	4	0.55	50	2	4.23	4.37	4.53	4.69	5.04	MEXLN200604	h
0.6	0/-0.020			4	0.9	6	0.55	50	2	6.29	6.51	6.74	6.98	7.51	MEXLN200606	h
0.6	0/-0.020			4	0.9	8	0.55	50	2	8.36	8.65	8.96	9.28	9.98	MEXLN200608	h
0.6	0/-0.020			4	0.9	10	0.55	50	2	10.43	10.79	11.17	11.57	12.44	MEXLN200610	h
0.7	0/-0.020			4	1.0	2	0.65	50	2	2.16	2.23	2.31	2.40	2.57	MEXLN200702	h
0.7	0/-0.020			4	1.0	4	0.65	50	2	4.23	4.37	4.53	4.69	5.04	MEXLN200704	h
0.7	0/-0.020			4	1.0	6	0.65	50	2	6.29	6.51	6.74	6.98	7.51	MEXLN200706	h
0.7	0/-0.020			4	1.0	8	0.65	50	2	8.36	8.65	8.96	9.28	9.98	MEXLN200708	h
0.7	0/-0.020			4	1.0	10	0.65	50	2	10.43	10.79	11.17	11.57	12.44	MEXLN200710	h
0.8	0/-0.020			4	1.2	4	0.75	50	2	4.23	4.37	4.53	4.69	5.04	MEXLN200804	h
0.8	0/-0.020			4	1.2	6	0.75	50	2	6.29	6.51	6.74	6.98	7.51	MEXLN200806	h
0.8	0/-0.020			4	1.2	8	0.75	50	2	8.36	8.65	8.96	9.28	9.98	MEXLN200808	h
0.8	0/-0.020			4	1.2	10	0.75	50	2	10.43	10.79	11.17	11.57	12.44	MEXLN200810	h
0.8	0/-0.020			4	1.2	12	0.75	50	2	12.49	12.93	13.38	13.87	14.91	MEXLN200812	h
0.9	0/-0.020			4	1.4	6	0.85	50	2	6.29	6.51	6.74	6.98	7.51	MEXLN200906	h
0.9	0/-0.020			4	1.4	8	0.85	50	2	8.36	8.65	8.96	9.28	9.98	MEXLN200908	h
0.9	0/-0.020			4	1.4	10	0.85	50	2	10.43	10.79	11.17	11.57	12.44	MEXLN200910	h
0.9	0/-0.020			4	1.4	15	0.85	50	2	15.6	16.14	16.71	17.31	18.61	MEXLN200915	h
1.0	0/-0.020			4	1.5	6	0.95	50	2	6.39	6.61	6.84	7.09	7.62	MEXLN201006	h
1.0	0/-0.020			4	1.5	8	0.95	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN201008	h
1.0	0/-0.020			4	1.5	10	0.95	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN201010	h
1.0	0/-0.020			4	1.5	12	0.95	50	2	12.59	13.03	13.49	13.97	15.02	MEXLN201012	h
1.0	0/-0.020			4	1.5	14	0.95	50	2	14.66	15.17	15.70	16.27	17.49	MEXLN201014	h
1.0	0/-0.020			4	1.5	16	0.95	50	2	16.73	17.3	17.92	18.56	19.96	MEXLN201016	h

h stock standard f non-stock standard m stock exhaustion

MEXLN2

cylindrical shank, 2 flutes, extended and reduced neck

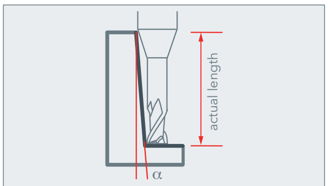
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

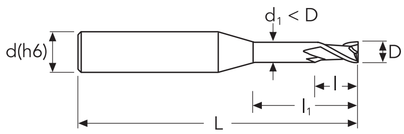
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1.2	0/-0.020			4	1.8	6	1.15	50	2	6.39	6.61	6.84	7.09	7.62	MEXLN201206	h
1.2	0/-0.020			4	1.8	8	1.15	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN201208	h
1.2	0/-0.020			4	1.8	10	1.15	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN201210	h
1.2	0/-0.020			4	1.8	12	1.15	50	2	12.59	13.03	13.49	13.97	15.02	MEXLN201212	h
1.4	0/-0.020			4	2.1	6	1.35	50	2	6.39	6.61	6.84	7.09	7.62	MEXLN201406	h
1.4	0/-0.020			4	2.1	8	1.35	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN201408	h
1.4	0/-0.020			4	2.1	10	1.35	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN201410	h
1.4	0/-0.020			4	2.1	12	1.35	50	2	12.59	13.03	13.49	13.97	15.02	MEXLN201412	h
1.4	0/-0.020			4	2.1	16	1.35	50	2	16.73	17.3	17.92	18.56	19.96	MEXLN201416	h
1.5	0/-0.020			4	2.3	6	1.45	50	2	6.39	6.61	6.84	7.09	7.62	MEXLN201506	h
1.5	0/-0.020			4	2.3	8	1.45	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN201508	h
1.5	0/-0.020			4	2.3	10	1.45	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN201510	h
1.5	0/-0.020			4	2.3	12	1.45	50	2	12.59	13.03	13.49	13.97	15.02	MEXLN201512	h
1.5	0/-0.020			4	2.3	14	1.45	50	2	14.66	15.17	15.70	16.27	17.49	MEXLN201514	h
1.5	0/-0.020			4	2.3	16	1.45	50	2	16.73	17.30	17.92	18.56	19.96	MEXLN201516	h
1.5	0/-0.020			4	2.3	18	1.45	60	2	18.79	19.44	20.13	20.86	22.43	MEXLN201518	h
1.5	0/-0.020			4	2.3	20	1.45	60	2	20.86	21.58	22.35	23.15	-	MEXLN201520	h
1.6	0/-0.020			4	2.4	6	1.55	50	2	6.39	6.61	6.84	7.09	7.62	MEXLN201606	h
1.6	0/-0.020			4	2.4	8	1.55	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN201608	h
1.6	0/-0.020			4	2.4	10	1.55	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN201610	h
1.6	0/-0.020			4	2.4	12	1.55	50	2	12.59	13.03	13.49	13.97	15.02	MEXLN201612	h
1.6	0/-0.020			4	2.4	14	1.55	50	2	14.66	15.17	15.70	16.27	17.49	MEXLN201614	h
1.6	0/-0.020			4	2.4	16	1.55	50	2	16.73	17.30	17.92	18.56	19.96	MEXLN201616	h
1.6	0/-0.020			4	2.4	18	1.55	60	2	18.79	19.44	20.13	20.86	22.43	MEXLN201618	h
1.6	0/-0.020			4	2.4	20	1.55	60	2	20.86	21.58	22.35	23.15	-	MEXLN201620	h
1.8	0/-0.020			4	2.7	6	1.75	50	2	6.39	6.61	6.84	7.09	7.62	MEXLN201806	h
1.8	0/-0.020			4	2.7	8	1.75	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN201808	h
1.8	0/-0.020			4	2.7	10	1.75	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN201810	h
1.8	0/-0.020			4	2.7	12	1.75	50	2	12.59	13.03	13.49	13.97	15.02	MEXLN201812	h
1.8	0/-0.020			4	2.7	16	1.75	50	2	16.73	17.30	17.92	18.56	19.96	MEXLN201816	h
1.8	0/-0.020			4	2.7	20	1.75	60	2	20.86	21.58	22.35	23.15	-	MEXLN201820	h
2	0/-0.020			4	3	6	1.95	50	2	6.39	6.61	6.84	7.09	7.62	MEXLN202006	h
2	0/-0.020			4	3	8	1.95	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN202008	h
2	0/-0.020			4	3	10	1.95	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN202010	h
2	0/-0.020			4	3	12	1.95	50	2	12.59	13.03	13.49	13.97	15.02	MEXLN202012	h
2	0/-0.020			4	3	14	1.95	50	2	14.66	15.17	15.70	16.27	17.49	MEXLN202014	h
2	0/-0.020			4	3	16	1.95	50	2	16.73	17.30	17.92	18.56	-	MEXLN202016	h
2	0/-0.020			4	3	18	1.95	60	2	18.79	19.44	20.13	20.86	-	MEXLN202018	h
2	0/-0.020			4	3	20	1.95	60	2	20.86	21.58	22.35	23.15	-	MEXLN202020	h

h stock standard f non-stock standard m stock exhaustion

MEXLN2

cylindrical shank, 2 flutes, extended and reduced neck

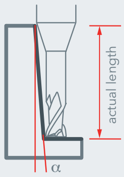
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
2	0/-0.020			4	3	25	1.95	75	2	26.03	26.93	27.88	-	-	MEXLN202025	h
2	0/-0.020			4	3	30	1.95	75	2	31.20	32.28	33.42	-	-	MEXLN202030	h
2.5	0/-0.020			4	3.7	8	2.40	50	2	8.46	8.75	9.06	9.38	10.09	MEXLN202508	h
2.5	0/-0.020			4	3.7	10	2.40	50	2	10.52	10.89	11.27	11.68	12.56	MEXLN202510	h
2.5	0/-0.020			4	3.7	12	2.40	50	2	12.59	13.03	13.49	13.97	-	MEXLN202512	h
2.5	0/-0.020			4	3.7	16	2.40	50	2	16.73	17.3	17.92	18.56	-	MEXLN202516	h
2.5	0/-0.020			4	3.7	20	2.40	60	2	20.86	21.58	22.35	-	-	MEXLN202520	h
2.5	0/-0.020			4	3.7	25	2.40	60	2	26.03	26.93	27.88	-	-	MEXLN202525	h
2.5	0/-0.020			4	3.7	30	2.40	75	2	31.20	32.28	-	-	-	MEXLN202530	h
3	0/-0.025			6	4.5	8	2.85	50	2	8.65	8.95	9.26	9.60	10.31	MEXLN203008	h
3	0/-0.025			6	4.5	10	2.85	50	2	10.72	11.09	11.48	11.89	12.78	MEXLN203010	h
3	0/-0.025			6	4.5	12	2.85	50	2	12.78	13.23	13.69	14.18	15.25	MEXLN203012	h
3	0/-0.025			6	4.5	14	2.85	50	2	14.85	15.36	15.91	16.48	17.72	MEXLN203014	h
3	0/-0.025			6	4.5	16	2.85	60	2	16.92	17.50	18.12	18.77	20.18	MEXLN203016	h
3	0/-0.025			6	4.5	18	2.85	60	2	18.99	19.64	20.34	21.07	22.65	MEXLN203018	h
3	0/-0.025			6	4.5	20	2.85	60	2	21.05	21.78	22.55	23.36	25.12	MEXLN203020	h
3	0/-0.025			6	4.5	25	2.85	75	2	26.22	27.13	28.09	29.10	-	MEXLN203025	h
4	0/-0.025			6	4.5	10	3.85	60	2	10.91	11.29	11.68	12.10	13.00	MEXLN204010	h
4	0/-0.025			6	4.5	15	3.85	60	2	16.08	16.63	17.22	17.84	19.17	MEXLN204015	h
4	0/-0.025			6	4.5	20	3.85	60	2	21.25	21.98	22.76	23.57	-	MEXLN204020	h
4	0/-0.025			6	4.5	25	3.85	75	2	26.41	27.33	28.29	-	-	MEXLN204025	h
4	0/-0.025			6	4.5	30	3.85	75	2	31.58	32.67	33.83	-	-	MEXLN204030	h
4	0/-0.025			6	4.5	40	3.85	75	2	41.92	43.37	-	-	-	MEXLN204040	h

h stock standard f non-stock standard m stock exhaustion

MEXLN2

SQUARE RIB

			Material Group ISO 513											
			P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm			< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae			ap x D			ap x D			ap x D			ap x D		
Vc (m/min)			70-110			50-90			30-70			20-40		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.2	**≤ 6D**	**0.01**	40000	0.003	240	40000	0.003	220	40000	0.002	190	40000	0.002	170
	≤ 8D	**0.01**	40000	0.003	200	40000	0.002	180	40000	0.002	165	40000	0.002	145
	≤ 10D	**0.01**	40000	0.002	170	40000	0.002	150	40000	0.002	135	38200	0.001	110
	≤ 12D	**0.01**	40000	0.002	130	40000	0.001	120	40000	0.001	105	33400	0.001	75
0.3	**≤ 6D**	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	31800	0.003	180
	≤ 8D	**0.01**	40000	0.004	290	40000	0.003	260	40000	0.003	230	28700	0.003	145
	≤ 10D	**0.01**	40000	0.003	260	40000	0.003	230	40000	0.003	205	25500	0.002	115
	≤ 12D	**0.01**	40000	0.003	220	40000	0.003	200	37200	0.002	165	22300	0.002	85
0.4	**≤ 6D**	**0.02**	40000	0.006	480	40000	0.005	430	39800	0.005	380	23900	0.004	200
	≤ 8D	**0.02**	40000	0.005	430	40000	0.005	390	35800	0.004	310	21500	0.004	165
	≤ 10D	**0.01**	40000	0.005	380	40000	0.004	350	31800	0.004	245	19100	0.003	130
	≤ 12D	**0.01**	40000	0.004	340	40000	0.004	300	27900	0.003	185	16700	0.003	100
0.5	**≤ 6D**	**0.03**	40000	0.007	560	40000	0.006	500	31800	0.006	355	19100	0.005	185
	≤ 8D	**0.02**	40000	0.006	500	40000	0.006	450	28700	0.005	290	17200	0.004	150
	≤ 10D	**0.02**	40000	0.006	450	35700	0.005	360	25500	0.004	230	15300	0.004	120
	≤ 12D	**0.01**	40000	0.005	390	31200	0.004	280	22300	0.004	175	13400	0.003	90
0.6	**≤ 6D**	**0.03**	40000	0.008	640	37200	0.007	540	26500	0.006	340	15900	0.006	180
	≤ 8D	**0.03**	40000	0.007	580	33400	0.006	430	23900	0.006	275	14300	0.005	145
	≤ 10D	**0.02**	38200	0.006	490	29700	0.006	340	21200	0.005	215	12700	0.004	115
	≤ 12D	**0.02**	33400	0.006	370	26000	0.005	260	18600	0.004	165	11100	0.004	85
0.8	**≤ 6D**	**0.04**	35800	0.010	720	27900	0.009	500	19900	0.008	320	11900	0.007	165
	≤ 8D	**0.03**	32200	0.009	580	25100	0.008	410	17900	0.007	260	10700	0.006	135
	≤ 10D	**0.03**	28700	0.008	460	22300	0.007	320	15900	0.006	205	9600	0.006	110
	≤ 12D	**0.02**	25100	0.007	350	19500	0.006	250	13900	0.006	155	8400	0.005	80
1	**≤ 6D**	**0.05**	28700	0.012	690	22300	0.011	480	15900	0.010	305	9600	0.008	160
	≤ 8D	**0.04**	25800	0.011	560	20100	0.010	390	14300	0.009	245	8600	0.008	130
	≤ 10D	**0.04**	22900	0.010	440	17800	0.009	310	12700	0.008	195	7600	0.007	100
	≤ 12D	**0.03**	20100	0.008	340	15600	0.008	240	11100	0.007	150	6700	0.006	80
1.2	**≤ 6D**	**0.06**	23900	0.022	1050	18600	0.020	740	13300	0.018	470	8000	0.015	245
	≤ 8D	**0.05**	21500	0.020	850	16700	0.018	600	11900	0.016	375	7200	0.014	200
	≤ 10D	**0.04**	19100	0.018	670	14900	0.016	470	10600	0.014	300	6400	0.012	160
	≤ 12D	**0.03**	16700	0.015	510	13000	0.014	360	9300	0.012	230	5600	0.011	120
1.4	**≤ 6D**	**0.07**	20500	0.024	980	15900	0.022	690	11400	0.019	440	6800	0.017	230
	≤ 8D	**0.06**	18400	0.022	790	14300	0.019	560	10200	0.017	355	6100	0.015	185
	≤ 10D	**0.05**	16400	0.019	630	12700	0.017	440	9100	0.015	280	5500	0.013	150
	≤ 12D	**0.04**	14300	0.017	480	11100	0.015	340	8000	0.013	215	4800	0.012	115
	≤ 15D	**0.03**	12300	0.014	350	9600	0.013	250	6800	0.012	155	4100	0.010	85
	> 15D	**0.02**	10200	0.012	240	8000	0.011	170	5700	0.010	110	3400	0.008	55
1.5	**≤ 6D**	**0.08**	19100	0.025	960	14900	0.023	670	10600	0.020	425	6400	0.018	225
	≤ 8D	**0.06**	17200	0.023	770	13400	0.020	540	9600	0.018	345	5700	0.016	180
	≤ 10D	**0.05**	15300	0.020	610	11900	0.018	430	8500	0.016	270	5100	0.014	145
	≤ 12D	**0.04**	13400	0.018	470	10400	0.016	330	7400	0.014	205	4500	0.012	110
	≤ 15D	**0.03**	11500	0.015	350	8900	0.014	240	6400	0.012	155	3800	0.011	80
	> 15D	**0.02**	9600	0.013	240	7400	0.011	170	5300	0.010	105	3200	0.009	55
1.6	**≤ 6D**	**0.08**	17900	0.026	930	13900	0.023	650	10000	0.021	415	6000	0.018	220
	≤ 8D	**0.07**	16100	0.023	750	12500	0.021	530	9000	0.019	335	5400	0.016	175
	≤ 10D	**0.06**	14300	0.021	590	11100	0.019	420	8000	0.017	265	4800	0.015	140
	≤ 12D	**0.04**	12500	0.018	450	9800	0.016	320	7000	0.015	205	4200	0.013	105
	≤ 15D	**0.04**	10700	0.016	330	8400	0.014	240	6000	0.012	150	3600	0.011	80
	> 15D	**0.02**	9000	0.013	230	7000	0.012	160	5000	0.010	105	3000	0.009	55

CUTTING PARAMETERS

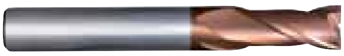
MEXLN2

Material Group ISO 513			P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm			< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**70-110**			**50-90**			**30-70**			**20-40**		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1.8	**≤ 6D**	**0.09**	15900	0.028	890	12400	0.025	620	8800	0.022	395	5300	0.020	210
	≤ 8D	**0.08**	14300	0.025	720	11100	0.023	500	8000	0.020	325	4800	0.018	170
	≤ 10D	**0.06**	12700	0.022	570	9900	0.020	400	7100	0.018	255	4200	0.016	130
	≤ 12D	**0.05**	11100	0.020	440	8700	0.018	310	6200	0.016	195	3700	0.014	100
	≤ 15D	**0.04**	9600	0.017	320	7400	0.015	220	5300	0.013	140	3200	0.012	75
	> 15D	**0.03**	8000	0.014	220	6200	0.013	160	4400	0.011	100	2700	0.010	55
2	**≤ 6D**	**0.10**	14300	0.030	860	11100	0.027	600	8000	0.024	385	4800	0.021	200
	≤ 8D	**0.09**	12900	0.027	700	10000	0.024	490	7200	0.022	310	4300	0.019	165
	≤ 10D	**0.07**	11500	0.024	550	8900	0.022	380	6400	0.019	245	3800	0.017	130
	≤ 12D	**0.06**	10000	0.021	420	7800	0.019	290	5600	0.017	190	3300	0.015	95
	≤ 15D	**0.05**	8600	0.018	310	6700	0.016	220	4800	0.014	140	2900	0.013	75
	> 15D	**0.03**	8600	0.018	310	6700	0.016	220	4800	0.014	140	2900	0.013	75
2.5	**≤ 6D**	**0.13**	11500	0.035	810	8900	0.032	560	6400	0.028	360	3800	0.025	185
	≤ 8D	**0.11**	10300	0.032	650	8000	0.028	450	5700	0.025	285	3400	0.022	150
	≤ 10D	**0.09**	9200	0.028	520	7100	0.025	360	5100	0.022	230	3100	0.020	120
	≤ 12D	**0.07**	8000	0.025	390	6200	0.022	270	4500	0.020	175	2700	0.017	95
	≤ 15D	**0.06**	6900	0.021	290	5400	0.019	200	3800	0.017	130	2300	0.015	70
	> 15D	**0.04**	6900	0.021	290	5400	0.019	200	3800	0.017	130	2300	0.015	70
3	**≤ 6D**	**0.15**	9600	0.040	770	7400	0.036	530	5300	0.032	340	3200	0.028	180
	≤ 8D	**0.13**	8600	0.036	620	6700	0.032	430	4800	0.029	275	2900	0.025	145
	≤ 10D	**0.11**	7600	0.032	490	5900	0.029	340	4200	0.026	215	2500	0.022	110
	≤ 12D	**0.08**	6700	0.028	380	5200	0.025	260	3700	0.022	165	2200	0.020	85
	≤ 15D	**0.07**	5700	0.024	270	4500	0.022	190	3200	0.019	125	1900	0.017	65
	> 15D	**0.05**	5700	0.024	270	4500	0.022	190	3200	0.019	125	1900	0.017	65
4	**≤ 6D**	**0.20**	7200	0.050	720	5600	0.045	500	4000	0.040	320	2400	0.035	170
	≤ 8D	**0.17**	6400	0.045	580	5000	0.041	410	3600	0.036	260	2100	0.032	130
	≤ 10D	**0.14**	5700	0.040	460	4500	0.036	320	3200	0.032	205	1900	0.028	105
	≤ 12D	**0.11**	5000	0.035	350	3900	0.032	250	2800	0.028	155	1700	0.025	85
	≤ 15D	**0.09**	4300	0.030	260	3300	0.027	180	2400	0.024	115	1400	0.021	60
	> 15D	**0.06**	4300	0.030	260	3300	0.027	180	2400	0.024	115	1400	0.021	60

MEXCS2

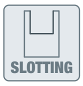
cylindrical shank, 2 flutes

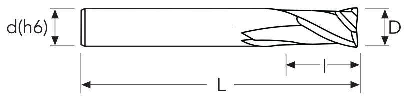
≥ Ø14



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable





D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.030			4	2.5		40	2	MEXCS2010	h
1.5	0/-0.030			4	4		40	2	MEXCS2015	h
2	0/-0.030			4	6		40	2	MEXCS2020	h
2.5	0/-0.030			4	8		40	2	MEXCS2025	h
3	0/-0.012			6	8		55	2	MEXCS2030	h
3.5	0/-0.012			6	10		55	2	MEXCS2035	h
4	0/-0.012			6	10		55	2	MEXCS2040	h
4.5	0/-0.012			6	12		55	2	MEXCS2045	h
5	0/-0.012			6	13		55	2	MEXCS2050	h
5.5	0/-0.012			6	14		55	2	MEXCS2055	h
6	0/-0.012			6	15		60	2	MEXCS2060	h
6.5	0/-0.012			8	17		65	2	MEXCS2065	h
7	0/-0.012			8	18		65	2	MEXCS2070	h
8	0/-0.012			8	20		70	2	MEXCS2080	h
8.5	0/-0.012			10	21		70	2	MEXCS2085	h
9	0/-0.012			10	23		70	2	MEXCS2090	h
10	0/-0.012			10	22		75	2	MEXCS2100	h
11	0/-0.012			12	28		75	2	MEXCS2110	h
12	0/-0.012			12	26		80	2	MEXCS2120	h
14	0/-0.030			14	32		90	2	MEXCS2140	h
16	0/-0.030			16	32		90	2	MEXCS2160	h
18	0/-0.030			18	38		100	2	MEXCS2180	h
20	0/-0.030			20	38		100	2	MEXCS2200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXCS2

SLOTTING

Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**0.5D x D**			**0.3D x D**			**0.2D x D**			**0.1D x D**		
Vc (m/min)	**70-110**			**50-90**			**30-70**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	28660	0.006	340	22290	0.005	240	15920	0.005	150	9550	0.004	80
2	14330	0.010	290	11150	0.009	200	7960	0.008	130	4780	0.007	70
3	9550	0.014	280	7430	0.013	190	5310	0.012	125	3180	0.010	65
4	7170	0.020	280	5570	0.018	200	3980	0.016	125	2390	0.014	65
5	5730	0.026	290	4460	0.023	200	3180	0.020	130	1910	0.018	70
6	4780	0.032	310	3720	0.029	220	2650	0.026	135	1590	0.023	70
8	3580	0.038	270	2790	0.034	190	1990	0.031	120	1190	0.027	65
10	2870	0.046	260	2230	0.041	180	1590	0.037	115	960	0.032	60
12	2390	0.055	260	1860	0.050	180	1330	0.044	120	800	0.039	60
14	2050	0.064	260	1590	0.057	180	1140	0.051	115	680	0.045	60
16	1790	0.072	260	1390	0.065	180	1000	0.058	115	600	0.051	60
18	1590	0.082	260	1240	0.074	180	880	0.066	115	530	0.058	60
20	1430	0.094	270	1110	0.084	190	800	0.075	120	480	0.065	65

MEXCL2

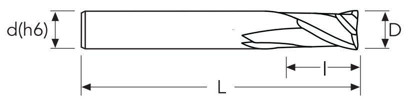
cylindrical shank, 2 flutes, long

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | SQUARE | Z2

P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SLOTTING



D	D Tol.	C	C Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.030			6	8		60	2	MEXCL2010	h
1.5	0/-0.030			6	12		60	2	MEXCL2015	h
2	0/-0.030			6	12		60	2	MEXCL2020	h
3	0/-0.030			6	15		60	2	MEXCL2030	h
4	0/-0.030			6	20		60	2	MEXCL2040	h
5	0/-0.030			6	25		70	2	MEXCL2050	h
6	0/-0.030			6	25		70	2	MEXCL2060	h
8	0/-0.030			8	30		80	2	MEXCL2080	h
10	0/-0.030			10	35		90	2	MEXCL2100	h
12	0/-0.030			12	40		90	2	MEXCL2120	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXCL2

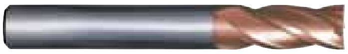
SLOTTING	**Material Group ISO 513**	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
	Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
	ap x ae	**0.3D x D**			**0.3D x D**			**0.2D x D**			**0.05D x D**		
	Vc (m/min)	**70-110**			**50-90**			**30-70**			**20-40**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	1	28700	0.005	290	22300	0.005	200	15900	0.004	125	9600	0.004	65
	1.5	19100	0.006	230	14900	0.005	160	10600	0.005	100	6400	0.004	55
	2	14300	0.009	260	11100	0.008	180	8000	0.007	115	4800	0.006	60
	3	9600	0.012	230	7400	0.011	160	5300	0.010	100	3200	0.008	55
	4	7200	0.018	260	5600	0.016	180	4000	0.014	115	2400	0.013	60
	5	5700	0.024	270	4500	0.022	190	3200	0.019	125	1900	0.017	65
	6	4800	0.029	280	3700	0.026	190	2700	0.023	125	1600	0.020	65
	8	3600	0.035	250	2800	0.032	180	2000	0.028	110	1200	0.025	60
	10	2900	0.041	240	2200	0.037	160	1600	0.033	105	1000	0.029	55
	12	2400	0.050	240	1900	0.045	170	1300	0.040	105	800	0.035	55

< D3: ap = 0.4 mm max

MEXCS4

cylindrical shank, 4 flutes

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | SQUARE | Z4



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.030			4	3		50	4	MEXCS401050	h
1.5	0/-0.030			4	4.5		50	4	MEXCS401550	h
2	0/-0.030			4	6		40	4	MEXCS4020	h
2.5	0/-0.030			4	8		40	4	MEXCS4025	h
3	0/-0.030			6	8		55	4	MEXCS4030	h
3.5	0/-0.030			6	10		55	4	MEXCS4035	h
4	0/-0.030			6	11		55	4	MEXCS4040	h
4.5	0/-0.030			6	11		55	4	MEXCS4045	h
5	0/-0.030			6	13		55	4	MEXCS4050	h
5.5	0/-0.030			6	13		55	4	MEXCS4055	h
6	0/-0.030			6	15		60	4	MEXCS4060	h
6.5	0/-0.030			8	17		65	4	MEXCS4065	h
7	0/-0.030			8	18		65	4	MEXCS4070	h
8	0/-0.030			8	20		70	4	MEXCS4080	h
9	0/-0.030			10	23		70	4	MEXCS4090	h
10	0/-0.030			10	22		75	4	MEXCS4100	h
11	0/-0.030			12	28		75	4	MEXCS4110	h
12	0/-0.030			12	26		80	4	MEXCS4120	h
14	0/-0.030			12	35		90	4	MEXCS4140	h
16	0/-0.030			16	32		100	4	MEXCS4160	h
20	0/-0.030			20	40		100	4	MEXCS4200	h
25	0/-0.030			25	40		100	4	MEXCS4250	h

h stock standard f non-stock standard m stock exhaustion

MEXCS4

SIDE MILLING

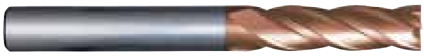
Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm^2			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**D x 0.01D**			**D x 0.01D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**80-120**			**50-90**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	31850	0.009	1080	22290	0.008	680	15920	0.007	435	9550	0.006	225
2	15920	0.017	1080	11150	0.015	680	7960	0.014	435	4780	0.012	230
3	10620	0.026	1080	7430	0.023	680	5310	0.020	435	3180	0.018	225
4	7960	0.034	1080	5570	0.031	680	3980	0.027	435	2390	0.024	230
5	6370	0.038	970	4460	0.034	610	3180	0.031	390	1910	0.027	205
6	5310	0.043	900	3720	0.038	570	2650	0.034	360	1590	0.030	190
8	3980	0.055	880	2790	0.050	550	1990	0.044	350	1190	0.039	185
10	3180	0.071	900	2230	0.064	570	1590	0.057	360	960	0.050	190
12	2650	0.085	900	1860	0.077	570	1330	0.068	360	800	0.060	190
14	2270	0.098	890	1590	0.088	560	1140	0.078	355	680	0.068	185
16	1990	0.110	880	1390	0.099	550	1000	0.088	350	600	0.077	185
18	1770	0.125	890	1240	0.113	560	880	0.100	350	530	0.088	185
20	1590	0.140	890	1110	0.126	560	800	0.112	360	480	0.098	190
22	1450	0.155	900	1010	0.140	560	720	0.124	355	430	0.109	185
25	1270	0.177	900	890	0.159	570	640	0.142	360	380	0.124	190

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXCL4

cylindrical shank, 4 flutes, long

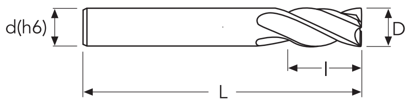
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | 40° * | SQUARE | Z4



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.020			6	8		60	4	MEXCL4020	h
3	0/-0.020			6	15		60	4	MEXCL4030	h
4	0/-0.020			6	20		60	4	MEXCL4040	h
5	0/-0.020			6	25		70	4	MEXCL4050	h
6	0/-0.020			6	25		70	4	MEXCL4060	h
8	0/-0.020			8	30		80	4	MEXCL4080	h
10	0/-0.020			10	35		90	4	MEXCL4100	h
12	0/-0.020			12	40		90	4	MEXCL4120	h
14	0/-0.020			16	50		110	4	MEXCL4140	h
16	0/-0.020			16	50		110	4	MEXCL4160	h
20	0/-0.020			20	50		110	4	MEXCL4200	h
25	0/-0.050			25	70		130	4	MEXCL4250	h
3	0/-0.025			6	25		100	4	MEXCL4030100 *	h
4	0/-0.025			6	31		100	4	MEXCL4040100 *	h
5	0/-0.025			6	31		100	4	MEXCL4050100 *	h
6	0/-0.025			6	38		100	4	MEXCL4060100 *	h
8	0/-0.030			8	41		100	4	MEXCL4080100 *	h
10	0/-0.030			10	57		125	4	MEXCL4100125 *	h
12	0/-0.030			12	75		150	4	MEXCL4120150 *	h
14	0/-0.030			14	75		150	4	MEXCL4140150 *	h
16	0/-0.030			16	75		150	4	MEXCL4160150 *	h
20	0/-0.030			20	75		150	4	MEXCL4200150 *	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

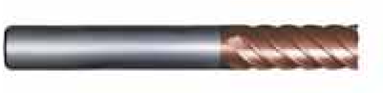
MEXCL4

Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
Vc (m/min)	**60-100**			**40-80**			**20-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	12740	0.014	740	9550	0.013	500	6370	0.012	295	4780	0.010	195
3	8490	0.022	740	6370	0.020	500	4250	0.017	295	3180	0.015	195
4	6370	0.029	740	4780	0.026	500	3180	0.023	295	2390	0.020	195
5	5100	0.033	660	3820	0.029	450	2550	0.026	265	1910	0.023	175
6	4250	0.036	610	3180	0.033	410	2120	0.029	245	1590	0.025	160
8	3180	0.047	600	2390	0.042	400	1590	0.038	240	1190	0.033	155
10	2550	0.060	620	1910	0.054	410	1270	0.048	245	960	0.042	160
12	2120	0.072	610	1590	0.065	410	1060	0.058	245	800	0.051	160
14	1820	0.083	600	1360	0.075	410	910	0.066	240	680	0.058	160
16	1590	0.094	590	1190	0.084	400	800	0.075	240	600	0.065	155
20	1270	0.119	600	960	0.107	410	640	0.095	245	480	0.083	160
25	1020	0.150	610	760	0.135	410	510	0.120	245	380	0.105	160

MEXCSHM

cylindrical shank, multi flute

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 50° | SQUARE | Z6~Z8



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.025			6	8		50	6	MEXCSHM030	h
4	0/-0.025			6	11		50	6	MEXCSHM040	h
5	0/-0.025			6	13		50	6	MEXCSHM050	h
6	0/-0.030			6	15		60	6	MEXCSHM060	h
8	0/-0.030			8	20		70	6	MEXCSHM080	h
10	0/-0.030			10	25		80	6	MEXCSHM100	h
12	0/-0.030			12	30		80	6	MEXCSHM120	h
14	0/-0.030			14	30		90	6	MEXCSHM140	h
16	0/-0.030			16	40		100	6	MEXCSHM160	h
18	0/-0.030			18	35		100	8	MEXCSHM180	h
20	0/-0.030			20	50		100	8	MEXCSHM200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXCSHM

SIDE MILLING

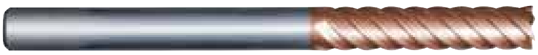
Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**1.5D x 0.1D**			**1.5D x 0.1D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
Vc (m/min)	**120-160**			**90-130**			**60-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	14860	0.008	750	11680	0.008	530	8490	0.007	340	6370	0.006	220
4	11150	0.012	800	8760	0.011	570	6370	0.010	370	4780	0.008	240
5	8920	0.014	770	7010	0.013	550	5100	0.012	350	3820	0.010	230
6	7430	0.018	800	5840	0.016	570	4250	0.014	370	3180	0.013	240
8	5570	0.028	920	4380	0.025	650	3180	0.022	420	2390	0.019	280
10	4460	0.034	900	3500	0.030	640	2550	0.027	410	1910	0.024	270
12	3720	0.041	910	2920	0.037	640	2120	0.033	420	1590	0.029	270
14	3180	0.048	920	2500	0.043	650	1820	0.038	420	1360	0.034	270
16	2790	0.056	940	2190	0.051	670	1590	0.045	430	1190	0.039	280
18	2480	0.065	970	1950	0.059	680	1420	0.052	440	1060	0.046	290
20	2230	0.073	1300	1750	0.066	920	1270	0.058	590	960	0.051	390

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXCLHM

cylindrical shank, multi flute, long

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 45° | SQUARE | Z6~Z8



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.025			6	19		75	6	MEXCLHM030	h
4	0/-0.025			6	19		75	6	MEXCLHM040	h
5	0/-0.025			6	19		75	6	MEXCLHM050	h
6	0/-0.030			6	25		80	6	MEXCLHM060	h
8	0/-0.030			8	40		100	6	MEXCLHM080	h
10	0/-0.030			10	45		120	6	MEXCLHM100	h
12	0/-0.030			12	60		120	6	MEXCLHM120	h
16	0/-0.030			16	80		150	6	MEXCLHM160	h
20	0/-0.030			20	80		150	8	MEXCLHM200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXCLHM

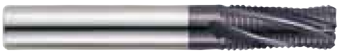
SIDE MILLING

Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
Vc (m/min)	**80-120**			**50-90**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	10620	0.007	450	7430	0.006	290	5310	0.006	180	3180	0.005	100
4	7960	0.010	490	5570	0.009	310	3980	0.008	190	2390	0.007	100
5	6370	0.012	470	4460	0.011	290	3180	0.010	190	1910	0.009	100
6	5310	0.015	490	3720	0.014	310	2650	0.012	190	1590	0.011	100
8	3980	0.023	560	2790	0.021	350	1990	0.019	220	1190	0.016	120
10	3180	0.029	540	2230	0.026	340	1590	0.023	220	960	0.020	120
12	2650	0.035	550	1860	0.031	350	1330	0.028	220	800	0.024	120
14	2270	0.041	560	1590	0.037	350	1140	0.033	220	680	0.029	120
16	1990	0.048	570	1390	0.043	360	1000	0.038	230	600	0.034	120
18	1770	0.055	580	1240	0.050	370	880	0.044	230	530	0.039	120
20	1590	0.063	800	1110	0.057	500	800	0.050	320	480	0.044	170

MEXCSFR

cylindrical shank, roughing

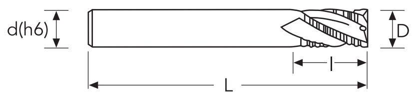
OSAWA NORM | MEX | UMG ENDLESS | <55 HRC | 20° | SQUARE | Z3~Z4



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SLOTTING SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.048	0.40	+/-0.020	6	15		60	3	MEXCSFR060	h
8	0/-0.058	0.40	+/-0.020	8	20		65	3	MEXCSFR080	h
10	0/-0.058	0.50	+/-0.020	10	25		70	4	MEXCSFR100	h
12	0/-0.070	0.50	+/-0.020	12	30		80	4	MEXCSFR120	h
14	0/-0.070	0.50	+/-0.020	14	25		100	4	MEXCSFR140	h
16	0/-0.070	0.50	+/-0.020	16	40		100	4	MEXCSFR160	h
20	0/-0.084	0.50	+/-0.020	20	50		100	4	MEXCSFR200	h

MEXCSFR

SLOTTING

Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**0.5D x D**			**0.5D x D**			**0.3D x D**			**0.1D x D**		
Vc (m/min)	**70-90**			**50-70**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4250	0.043	720	3180	0.038	490	2650	0.034	360	1590	0.030	190
8	3180	0.055	700	2390	0.050	480	1990	0.044	350	1190	0.039	185
10	2550	0.071	720	1910	0.064	490	1590	0.057	360	960	0.050	190
12	2120	0.085	720	1590	0.077	490	1330	0.068	360	800	0.060	190
14	1820	0.098	710	1360	0.088	480	1140	0.078	355	680	0.068	185
16	1590	0.110	700	1190	0.099	470	1000	0.088	350	600	0.077	185
20	1270	0.140	710	960	0.126	480	800	0.112	360	480	0.098	190

D6-8: Z=3

SIDE MILLING

Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**1.5D x 0.3D**			**1.5D x 0.3D**			**D x 0.1D**			**D x 0.05D**		
Vc (m/min)	**80-100**			**60-80**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4250	0.047	790	3180	0.042	540	2650	0.037	395	1590	0.033	210
8	3180	0.061	770	2390	0.055	520	1990	0.049	385	1190	0.043	205
10	2550	0.078	800	1910	0.070	540	1590	0.062	395	960	0.055	210
12	2120	0.094	790	1590	0.084	540	1330	0.075	400	800	0.065	210
14	1820	0.108	780	1360	0.097	530	1140	0.086	390	680	0.075	205
16	1590	0.121	770	1190	0.109	520	1000	0.097	385	600	0.085	205
20	1270	0.154	780	960	0.139	530	800	0.123	395	480	0.108	205

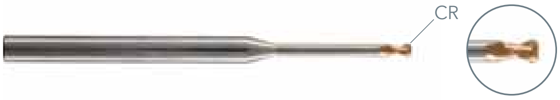
D6-8: Z=3

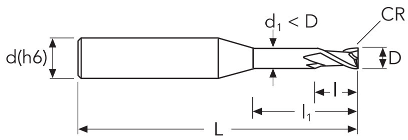
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

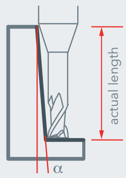




P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

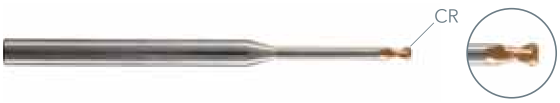
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
0.3	0/-0.020	0.05	+/-0.010	4	0.4	1	0.26	50	2	1.08	1.12	1.15	1.19	1.25	MEXLN20030001	h
0.3	0/-0.020	0.05	+/-0.010	4	0.4	1.5	0.26	50	2	1.60	1.65	1.70	1.75	1.85	MEXLN20030065	h
0.3	0/-0.020	0.05	+/-0.010	4	0.4	2	0.26	50	2	2.12	2.19	2.25	2.32	2.46	MEXLN20030002	h
0.3	0/-0.020	0.05	+/-0.010	4	0.4	3	0.26	50	2	3.15	3.25	3.35	3.46	3.66	MEXLN20030003	h
0.3	0/-0.020	0.10	+/-0.010	4	0.4	1	0.26	50	2	1.08	1.12	1.15	1.18	1.24	MEXLN20030101	h
0.3	0/-0.020	0.10	+/-0.010	4	0.4	1.5	0.26	50	2	1.60	1.65	1.70	1.75	1.84	MEXLN20030165	h
0.3	0/-0.020	0.10	+/-0.010	4	0.4	2	0.26	50	2	2.12	2.18	2.25	2.31	2.45	MEXLN20030102	h
0.3	0/-0.020	0.10	+/-0.010	4	0.4	3	0.26	50	2	3.15	3.25	3.35	3.45	3.65	MEXLN20030103	h
0.4	0/-0.020	0.05	+/-0.010	4	0.6	1	0.37	50	2	1.08	1.12	1.15	1.19	1.25	MEXLN20040001	h
0.4	0/-0.020	0.05	+/-0.010	4	0.6	2	0.37	50	2	2.12	2.19	2.25	2.32	2.46	MEXLN20040006	h
0.4	0/-0.020	0.05	+/-0.010	4	0.6	3	0.37	50	2	3.15	3.25	3.35	3.46	3.66	MEXLN20040003	h
0.4	0/-0.020	0.05	+/-0.010	4	0.6	4	0.37	50	2	4.19	4.32	4.46	4.59	4.86	MEXLN20040004	h
0.4	0/-0.020	0.10	+/-0.010	4	0.6	1	0.37	50	2	1.08	1.12	1.15	1.18	1.24	MEXLN20040101	h
0.4	0/-0.020	0.10	+/-0.010	4	0.6	2	0.37	50	2	2.12	2.18	2.25	2.31	2.45	MEXLN20040102	h
0.4	0/-0.020	0.10	+/-0.010	4	0.6	3	0.37	50	2	3.15	3.25	3.35	3.45	3.65	MEXLN20040103	h
0.4	0/-0.020	0.10	+/-0.010	4	0.6	4	0.37	50	2	4.18	4.32	4.45	4.58	4.85	MEXLN20040104	h
0.5	0/-0.020	0.05	+/-0.010	4	0.7	2	0.45	50	2	2.16	2.23	2.29	2.36	2.50	MEXLN20050002	h
0.5	0/-0.020	0.05	+/-0.010	4	0.7	4	0.45	50	2	4.22	4.36	4.50	4.63	4.90	MEXLN20050004	h
0.5	0/-0.020	0.05	+/-0.010	4	0.7	6	0.45	50	2	6.29	6.49	6.70	6.90	7.31	MEXLN20050006	h
0.5	0/-0.020	0.10	+/-0.010	4	0.7	2	0.45	50	2	2.16	2.22	2.29	2.36	2.49	MEXLN20050102	h
0.5	0/-0.020	0.10	+/-0.010	4	0.7	4	0.45	50	2	4.22	4.36	4.49	4.63	4.89	MEXLN20050104	h
0.5	0/-0.020	0.10	+/-0.010	4	0.7	6	0.45	50	2	6.29	6.49	6.69	6.89	7.30	MEXLN20050106	h
0.6	0/-0.020	0.10	+/-0.010	4	0.9	2	0.55	50	2	2.16	2.22	2.29	2.36	2.49	MEXLN20060102	h
0.6	0/-0.020	0.10	+/-0.010	4	0.9	4	0.55	50	2	4.22	4.36	4.49	4.63	4.89	MEXLN20060104	h
0.6	0/-0.020	0.10	+/-0.010	4	0.9	6	0.55	50	2	6.29	6.49	6.69	6.89	7.30	MEXLN20060106	h
0.7	0/-0.020	0.10	+/-0.010	4	1.0	4	0.65	50	2	4.22	4.36	4.49	4.63	4.89	MEXLN20070104	h
0.7	0/-0.020	0.10	+/-0.010	4	1.0	6	0.65	50	2	6.29	6.49	6.69	6.89	7.30	MEXLN20070106	h
0.8	0/-0.020	0.05	+/-0.010	4	1.2	4	0.75	50	2	4.22	4.36	4.50	4.63	4.90	MEXLN20080004	h
0.8	0/-0.020	0.05	+/-0.010	4	1.2	6	0.75	50	2	6.29	6.49	6.70	6.90	7.31	MEXLN20080006	h
0.8	0/-0.020	0.05	+/-0.010	4	1.2	8	0.75	50	2	8.36	8.63	8.90	9.17	9.71	MEXLN20080008	h
0.8	0/-0.020	0.10	+/-0.010	4	1.2	4	0.75	50	2	4.22	4.36	4.49	4.63	4.89	MEXLN20080104	h
0.8	0/-0.020	0.10	+/-0.010	4	1.2	6	0.75	50	2	6.29	6.49	6.69	6.89	7.30	MEXLN20080106	h
0.8	0/-0.020	0.10	+/-0.010	4	1.2	8	0.75	50	2	8.36	8.63	8.89	9.16	9.70	MEXLN20080108	h
0.9	0/-0.020	0.10	+/-0.010	4	1.4	8	0.85	50	2	8.36	8.63	8.89	9.16	9.70	MEXLN20090108	h
0.9	0/-0.020	0.10	+/-0.010	4	1.4	15	0.85	50	2	15.59	16.1	16.6	17.11	18.12	MEXLN20090115	h
1	0/-0.020	0.10	+/-0.010	4	1.5	4	0.95	50	2	4.32	4.46	4.59	4.73	5.01	MEXLN20100104	h
1	0/-0.020	0.10	+/-0.010	4	1.5	6	0.95	50	2	6.39	6.59	6.80	7.00	7.41	MEXLN20100106	h
1	0/-0.020	0.10	+/-0.010	4	1.5	8	0.95	50	2	8.45	8.73	9.00	9.27	9.81	MEXLN20100108	h
1	0/-0.020	0.10	+/-0.010	4	1.5	10	0.95	50	2	10.52	10.86	11.20	11.54	12.22	MEXLN20100110	h

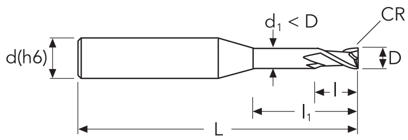
h stock standard f non-stock standard m stock exhaustion

MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

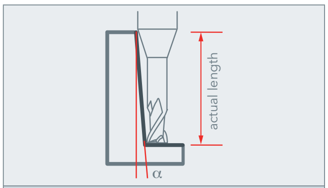




P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

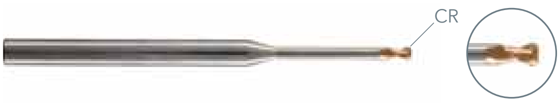
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1	0/-0.020	0.10	+/-0.010	4	1.5	12	0.95	50	2	12.59	12.99	13.40	13.81	14.62	MEXLN20100112	h
1	0/-0.020	0.10	+/-0.010	4	1.5	16	0.95	50	2	16.72	17.26	17.80	18.35	19.43	MEXLN20100116	h
1	0/-0.020	0.10	+/-0.010	4	1.5	20	0.95	50	2	20.86	21.53	22.21	22.88	24.24	MEXLN20100120	h
1	0/-0.020	0.20	+/-0.010	4	1.5	4	0.95	50	2	4.32	4.45	4.58	4.72	4.99	MEXLN20100204	h
1	0/-0.020	0.20	+/-0.010	4	1.5	6	0.95	50	2	6.38	6.58	6.79	6.99	7.39	MEXLN20100206	h
1	0/-0.020	0.20	+/-0.010	4	1.5	8	0.95	50	2	8.45	8.72	8.99	9.26	9.79	MEXLN20100208	h
1	0/-0.020	0.20	+/-0.010	4	1.5	10	0.95	50	2	10.52	10.85	11.19	11.52	12.20	MEXLN20100210	h
1	0/-0.020	0.20	+/-0.010	4	1.5	12	0.95	50	2	12.58	12.99	13.39	13.79	14.60	MEXLN20100212	h
1	0/-0.020	0.20	+/-0.010	4	1.5	16	0.95	50	2	16.72	17.26	17.79	18.33	19.41	MEXLN20100216	h
1	0/-0.020	0.20	+/-0.010	4	1.5	20	0.95	50	2	20.85	21.53	22.20	22.87	24.22	MEXLN20100220	h
1	0/-0.020	0.30	+/-0.010	4	1.5	6	0.95	50	2	6.38	6.58	6.78	6.97	7.37	MEXLN20100306	h
1	0/-0.020	0.30	+/-0.010	4	1.5	10	0.95	50	2	10.51	10.85	11.18	11.51	12.18	MEXLN20100310	h
1	0/-0.020	0.30	+/-0.010	4	1.5	16	0.95	50	2	16.72	17.25	17.78	18.32	19.39	MEXLN20100316	h
1	0/-0.020	0.30	+/-0.010	4	1.5	20	0.95	50	2	20.85	21.52	22.19	22.86	24.20	MEXLN20100320	h
1.2	0/-0.020	0.10	+/-0.010	4	1.8	6	1.15	50	2	6.39	6.59	6.80	7.00	7.41	MEXLN20120106	h
1.2	0/-0.020	0.10	+/-0.010	4	1.8	8	1.15	50	2	8.45	8.73	9.00	9.27	9.81	MEXLN20120108	h
1.2	0/-0.020	0.10	+/-0.010	4	1.8	10	1.15	50	2	10.52	10.86	11.20	11.54	12.22	MEXLN20120110	h
1.2	0/-0.020	0.10	+/-0.010	4	1.8	12	1.15	50	2	12.59	12.99	13.40	13.81	14.62	MEXLN20120112	h
1.4	0/-0.020	0.10	+/-0.010	4	2.1	6	1.35	50	2	6.39	6.59	6.80	7.00	7.41	MEXLN20140106	h
1.4	0/-0.020	0.10	+/-0.010	4	2.1	8	1.35	50	2	8.45	8.73	9.00	9.27	9.81	MEXLN20140108	h
1.4	0/-0.020	0.10	+/-0.010	4	2.1	10	1.35	50	2	10.52	10.86	11.20	11.54	12.22	MEXLN20140110	h
1.4	0/-0.020	0.10	+/-0.010	4	2.1	12	1.35	50	2	12.59	12.99	13.40	13.81	14.62	MEXLN20140112	h
1.4	0/-0.020	0.10	+/-0.010	4	2.1	16	1.35	50	2	16.72	17.26	17.80	18.35	19.43	MEXLN20140116	h
1.5	0/-0.020	0.10	+/-0.010	4	2.3	4	1.45	50	2	4.32	4.46	4.59	4.73	5.01	MEXLN20150104	h
1.5	0/-0.020	0.10	+/-0.010	4	2.3	8	1.45	50	2	8.45	8.73	9.00	9.27	9.81	MEXLN20150108	h
1.5	0/-0.020	0.10	+/-0.010	4	2.3	12	1.45	50	2	12.59	12.99	13.40	13.81	14.62	MEXLN20150112	h
1.5	0/-0.020	0.10	+/-0.010	4	2.3	16	1.45	50	2	16.72	17.26	17.80	18.35	19.43	MEXLN20150116	h
1.5	0/-0.020	0.10	+/-0.010	4	2.3	20	1.45	60	2	20.86	21.53	22.21	22.88	24.24	MEXLN20150120	h
1.5	0/-0.020	0.20	+/-0.010	4	2.3	8	1.45	50	2	8.45	8.72	8.99	9.26	9.79	MEXLN20150208	h
1.5	0/-0.020	0.20	+/-0.010	4	2.3	10	1.45	50	2	10.52	10.85	11.19	11.52	12.20	MEXLN20150210	h
1.5	0/-0.020	0.20	+/-0.010	4	2.3	12	1.45	50	2	12.58	12.99	13.39	13.79	14.60	MEXLN20150212	h
1.5	0/-0.020	0.20	+/-0.010	4	2.3	16	1.45	50	2	16.72	17.26	17.79	18.33	19.41	MEXLN20150216	h
1.5	0/-0.020	0.20	+/-0.010	4	2.3	20	1.45	60	2	20.85	21.53	22.20	22.87	24.22	MEXLN20150220	h
1.5	0/-0.020	0.30	+/-0.010	4	2.3	8	1.45	50	2	8.45	8.71	8.98	9.24	9.77	MEXLN20150308	h
1.5	0/-0.020	0.30	+/-0.010	4	2.3	16	1.45	50	2	16.72	17.25	17.78	18.32	19.39	MEXLN20150316	h
1.5	0/-0.020	0.30	+/-0.010	4	2.3	20	1.45	60	2	20.85	21.52	22.19	22.86	24.20	MEXLN20150320	h
1.6	0/-0.020	0.10	+/-0.010	4	2.4	8	1.55	50	2	8.45	8.73	9.00	9.27	9.81	MEXLN20160108	h
1.6	0/-0.020	0.10	+/-0.010	4	2.4	12	1.55	50	2	12.59	12.99	13.40	13.81	14.62	MEXLN20160112	h
1.6	0/-0.020	0.10	+/-0.010	4	2.4	16	1.55	50	2	16.72	17.26	17.80	18.35	19.43	MEXLN20160116	h

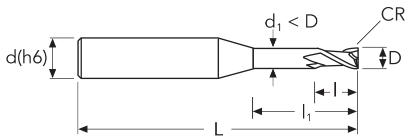
h stock standard f non-stock standard m stock exhaustion

MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

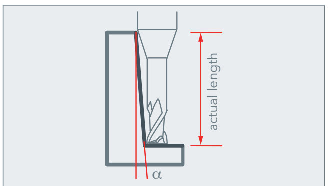




P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1.8	0/-0.020	0.20	+/-0.010	4	2.7	8	1.75	50	2	8.45	8.72	8.99	9.26	9.79	MEXLN20180208	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	12	1.75	50	2	12.58	12.99	13.39	13.79	14.60	MEXLN20180212	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	16	1.75	50	2	16.72	17.26	17.79	18.33	19.41	MEXLN20180216	h
2	0/-0.020	0.20	+/-0.010	4	3	6	1.95	50	2	6.38	6.58	6.79	6.99	7.39	MEXLN20200206	h
2	0/-0.020	0.20	+/-0.010	4	3	8	1.95	50	2	8.45	8.72	8.99	9.26	9.79	MEXLN20200208	h
2	0/-0.020	0.20	+/-0.010	4	3	10	1.95	50	2	10.52	10.85	11.19	11.52	12.20	MEXLN20200210	h
2	0/-0.020	0.20	+/-0.010	4	3	12	1.95	50	2	12.58	12.99	13.39	13.79	14.60	MEXLN20200212	h
2	0/-0.020	0.20	+/-0.010	4	3	14	1.95	50	2	14.65	15.12	15.59	16.06	17.01	MEXLN20200214	h
2	0/-0.020	0.20	+/-0.010	4	3	16	1.95	50	2	16.72	17.26	17.79	18.33	19.41	MEXLN20200216	h
2	0/-0.020	0.20	+/-0.010	4	3	20	1.95	60	2	20.85	21.53	22.20	22.87	-	MEXLN20200220	h
2	0/-0.020	0.20	+/-0.010	4	3	25	1.95	75	2	26.02	26.86	27.70	28.54	-	MEXLN20200225	h
2	0/-0.020	0.20	+/-0.010	4	3	30	1.95	75	2	31.19	32.20	33.21	-	-	MEXLN20200230	h
2	0/-0.020	0.50	+/-0.010	4	3	6	1.95	50	2	6.37	6.56	6.75	6.95	7.33	MEXLN20200506	h
2	0/-0.020	0.50	+/-0.010	4	3	8	1.95	50	2	8.44	8.70	8.96	9.22	9.73	MEXLN20200508	h
2	0/-0.020	0.50	+/-0.010	4	3	12	1.95	50	2	12.57	12.97	13.36	13.75	14.54	MEXLN20200512	h
2	0/-0.020	0.50	+/-0.010	4	3	16	1.95	50	2	16.71	17.24	17.76	18.29	19.35	MEXLN20200516	h
2	0/-0.020	0.50	+/-0.010	4	3	20	1.95	60	2	20.84	21.51	22.17	22.83	-	MEXLN20200520	h
2	0/-0.020	0.50	+/-0.010	4	3	25	1.95	75	2	26.01	26.84	27.67	28.50	-	MEXLN20200525	h
2	0/-0.020	0.50	+/-0.010	4	3	30	1.95	75	2	31.18	32.18	33.18	-	-	MEXLN20200530	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	8	2.40	50	2	8.45	8.71	8.98	9.24	9.77	MEXLN20250308	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	12	2.40	50	2	12.58	12.98	13.38	13.78	14.58	MEXLN20250312	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	16	2.40	50	2	16.72	17.25	17.78	18.32	-	MEXLN20250316	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	20	2.40	60	2	20.85	21.52	22.19	-	-	MEXLN20250320	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	25	2.40	60	2	26.02	26.86	27.69	-	-	MEXLN20250325	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	30	2.40	75	2	31.19	32.19	-	-	-	MEXLN20250330	h
2.5	0/-0.020	0.50	+/-0.010	4	3.7	8	2.40	50	2	8.44	8.70	8.96	9.22	9.73	MEXLN20250508	h
2.5	0/-0.020	0.50	+/-0.010	4	3.7	12	2.40	50	2	12.57	12.97	13.36	13.75	14.54	MEXLN20250512	h
2.5	0/-0.020	0.50	+/-0.010	4	3.7	16	2.40	50	2	16.71	17.24	17.76	18.29	-	MEXLN20250516	h
2.5	0/-0.020	0.50	+/-0.010	4	3.7	20	2.40	60	2	20.84	21.51	22.17	-	-	MEXLN20250520	h
2.5	0/-0.020	0.50	+/-0.010	4	3.7	25	2.40	60	2	26.01	26.84	27.67	-	-	MEXLN20250525	h
2.5	0/-0.020	0.50	+/-0.010	4	3.7	30	2.40	75	2	31.18	32.18	-	-	-	MEXLN20250530	h
3	0/-0.025	0.20	+/-0.010	6	4.5	10	2.85	50	2	10.71	11.05	11.39	11.74	12.42	MEXLN20300210	h
3	0/-0.025	0.20	+/-0.010	6	4.5	12	2.85	50	2	12.78	13.19	13.60	14.00	14.82	MEXLN20300212	h
3	0/-0.025	0.20	+/-0.010	6	4.5	16	2.85	60	2	16.91	17.46	18.00	18.54	19.63	MEXLN20300216	h
3	0/-0.025	0.20	+/-0.010	6	4.5	20	2.85	60	2	21.05	21.72	22.40	23.08	24.44	MEXLN20300220	h
3	0/-0.025	0.20	+/-0.010	6	4.5	25	2.85	75	2	26.21	27.06	27.91	28.75	30.45	MEXLN20300225	h
3	0/-0.025	0.30	+/-0.010	6	4.5	10	2.85	50	2	10.71	11.04	11.38	11.72	12.40	MEXLN20300310	h
3	0/-0.025	0.30	+/-0.010	6	4.5	12	2.85	50	2	12.77	13.18	13.59	13.99	14.80	MEXLN20300312	h
3	0/-0.025	0.30	+/-0.010	6	4.5	16	2.85	60	2	16.91	17.45	17.99	18.53	19.61	MEXLN20300316	h

h stock standard f non-stock standard m stock exhaustion

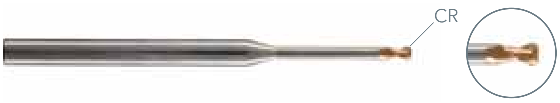
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

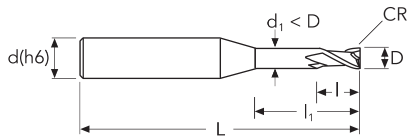
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

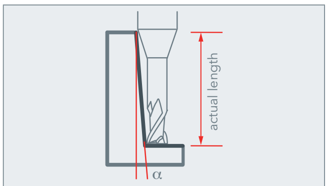




P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
3	0/-0.025	0.30	+/-0.010	6	4.5	20	2.85	60	2	21.04	21.72	22.39	23.07	24.42	MEXLN20300320	h
3	0/-0.025	0.30	+/-0.010	6	4.5	25	2.85	75	2	26.21	27.05	27.90	28.74	30.43	MEXLN20300325	h
3	0/-0.025	0.50	+/-0.010	6	4.5	10	2.85	50	2	10.70	11.03	11.36	11.70	12.36	MEXLN20300510	h
3	0/-0.025	0.50	+/-0.010	6	4.5	12	2.85	50	2	12.77	13.17	13.57	13.96	14.76	MEXLN20300512	h
3	0/-0.025	0.50	+/-0.010	6	4.5	16	2.85	60	2	16.90	17.44	17.97	18.50	19.57	MEXLN20300516	h
3	0/-0.025	0.50	+/-0.010	6	4.5	20	2.85	60	2	21.04	21.70	22.37	23.04	24.38	MEXLN20300520	h
3	0/-0.025	0.50	+/-0.010	6	4.5	25	2.85	75	2	26.20	27.04	27.88	28.71	30.39	MEXLN20300525	h
4	0/-0.025	0.30	+/-0.010	6	4.5	10	3.85	60	2	10.90	11.24	11.59	11.93	12.62	MEXLN20400310	h
4	0/-0.025	0.30	+/-0.010	6	4.5	15	3.85	60	2	16.07	16.58	17.09	17.61	18.63	MEXLN20400315	h
4	0/-0.025	0.30	+/-0.010	6	4.5	20	3.85	60	2	21.24	21.92	22.60	23.28	-	MEXLN20400320	h
4	0/-0.025	0.30	+/-0.010	6	4.5	25	3.85	75	2	26.40	27.25	28.10	28.95	-	MEXLN20400325	h
4	0/-0.025	0.30	+/-0.010	6	4.5	30	3.85	75	2	31.57	32.59	33.61	-	-	MEXLN20400330	h
4	0/-0.025	0.30	+/-0.010	6	4.5	40	3.85	75	2	41.91	43.26	-	-	-	MEXLN20400340	h
4	0/-0.025	0.50	+/-0.010	6	4.5	10	3.85	60	2	10.89	11.23	11.57	11.91	12.58	MEXLN20400510	h
4	0/-0.025	0.50	+/-0.010	6	4.5	15	3.85	60	2	16.06	16.57	17.07	17.58	18.59	MEXLN20400515	h
4	0/-0.025	0.50	+/-0.010	6	4.5	20	3.85	60	2	21.23	21.90	22.58	23.25	-	MEXLN20400520	h
4	0/-0.025	0.50	+/-0.010	6	4.5	25	3.85	75	2	26.40	27.24	28.08	28.92	-	MEXLN20400525	h
4	0/-0.025	0.50	+/-0.010	6	4.5	30	3.85	75	2	31.57	32.58	33.59	-	-	MEXLN20400530	h
4	0/-0.025	0.50	+/-0.010	6	4.5	40	3.85	75	2	41.9	43.25	-	-	-	MEXLN20400540	h

h stock standard   f non-stock standard   m stock exhaustion

MEXLN2R

SQUARE RIB

Material Group ISO 513			P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm			< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**70-110**			**50-90**			**30-70**			**20-40**		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.3	**≤ 6D**	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	31800	0.003	180
	≤ 8D	**0.01**	40000	0.004	290	40000	0.003	260	40000	0.003	230	28700	0.003	145
	≤ 10D	**0.01**	40000	0.003	260	40000	0.003	230	40000	0.003	205	25500	0.002	115
	≤ 12D	**0.01**	40000	0.003	220	40000	0.003	200	37200	0.002	165	22300	0.002	85
0.4	**≤ 6D**	**0.02**	40000	0.006	480	40000	0.005	430	39800	0.005	380	23900	0.004	200
	≤ 8D	**0.02**	40000	0.005	430	40000	0.005	390	35800	0.004	310	21500	0.004	165
	≤ 10D	**0.01**	40000	0.005	380	40000	0.004	350	31800	0.004	245	19100	0.003	130
	≤ 12D	**0.01**	40000	0.004	340	39000	0.004	290	27900	0.003	185	16700	0.003	100
0.5	**≤ 6D**	**0.03**	40000	0.007	560	40000	0.006	500	31800	0.006	355	19100	0.005	185
	≤ 8D	**0.02**	40000	0.006	500	40000	0.006	450	28700	0.005	290	17200	0.004	150
	≤ 10D	**0.02**	40000	0.006	450	35700	0.005	360	25500	0.004	230	15300	0.004	120
	≤ 12D	**0.01**	40000	0.005	390	31200	0.004	280	22300	0.004	175	13400	0.003	90
0.6	**≤ 6D**	**0.03**	40000	0.008	640	37200	0.007	540	26500	0.006	340	15900	0.006	180
	≤ 8D	**0.03**	40000	0.007	580	33400	0.006	430	23900	0.006	275	14300	0.005	145
	≤ 10D	**0.02**	38200	0.006	490	29700	0.006	340	21200	0.005	215	12700	0.004	115
	≤ 12D	**0.02**	33400	0.006	370	26000	0.005	260	18600	0.004	165	11100	0.004	85
0.8	**≤ 6D**	**0.04**	35800	0.010	720	27900	0.009	500	19900	0.008	320	11900	0.007	165
	≤ 8D	**0.03**	32200	0.009	580	25100	0.008	410	17900	0.007	260	10700	0.006	135
	≤ 10D	**0.03**	28700	0.008	460	22300	0.007	320	15900	0.006	205	9600	0.006	110
	≤ 12D	**0.02**	25100	0.007	350	19500	0.006	250	13900	0.006	155	8400	0.005	80
1	**≤ 6D**	**0.05**	28700	0.012	690	22300	0.011	480	15900	0.010	305	9600	0.008	160
	≤ 8D	**0.04**	25800	0.011	560	20100	0.010	390	14300	0.009	245	8600	0.008	130
	≤ 10D	**0.04**	22900	0.010	440	17800	0.009	310	12700	0.008	195	7600	0.007	100
	≤ 12D	**0.03**	20100	0.008	340	15600	0.008	240	11100	0.007	150	6700	0.006	80
1.2	**≤ 6D**	**0.06**	23900	0.022	1050	18600	0.020	740	13300	0.018	470	8000	0.015	245
	≤ 8D	**0.05**	21500	0.020	850	16700	0.018	600	11900	0.016	375	7200	0.014	200
	≤ 10D	**0.04**	19100	0.018	670	14900	0.016	470	10600	0.014	300	6400	0.012	160
	≤ 12D	**0.03**	16700	0.015	510	13000	0.014	360	9300	0.012	230	5600	0.011	120
1.4	**≤ 6D**	**0.07**	20500	0.024	980	15900	0.022	690	11400	0.019	440	6800	0.017	230
	≤ 8D	**0.06**	18400	0.022	790	14300	0.019	560	10200	0.017	355	6100	0.015	185
	≤ 10D	**0.05**	16400	0.019	630	12700	0.017	440	9100	0.015	280	5500	0.013	150
	≤ 12D	**0.04**	14300	0.017	480	11100	0.015	340	8000	0.013	215	4800	0.012	115
	≤ 15D	**0.03**	12300	0.014	350	9600	0.013	250	6800	0.012	155	4100	0.010	85
	> 15D	**0.02**	10200	0.012	240	8000	0.011	170	5700	0.010	110	3400	0.008	55
1.5	**≤ 6D**	**0.08**	19100	0.025	960	14900	0.023	670	10600	0.020	425	6400	0.018	225
	≤ 8D	**0.06**	17200	0.023	770	13400	0.020	540	9600	0.018	345	5700	0.016	180
	≤ 10D	**0.05**	15300	0.020	610	11900	0.018	430	8500	0.016	270	5100	0.014	145
	≤ 12D	**0.04**	13400	0.018	470	10400	0.016	330	7400	0.014	205	4500	0.012	110
	≤ 15D	**0.03**	11500	0.015	350	8900	0.014	240	6400	0.012	155	3800	0.011	80
	> 15D	**0.02**	9600	0.013	240	7400	0.011	170	5300	0.010	105	3200	0.009	55
1.6	**≤ 6D**	**0.08**	17900	0.026	930	13900	0.023	650	10000	0.021	415	6000	0.018	220
	≤ 8D	**0.07**	16100	0.023	750	12500	0.021	530	9000	0.019	335	5400	0.016	175
	≤ 10D	**0.06**	14300	0.021	590	11100	0.019	420	8000	0.017	265	4800	0.015	140
	≤ 12D	**0.04**	12500	0.018	450	9800	0.016	320	7000	0.015	205	4200	0.013	105
	≤ 15D	**0.04**	10700	0.016	330	8400	0.014	240	6000	0.012	150	3600	0.011	80
	> 15D	**0.02**	9000	0.013	230	7000	0.012	160	5000	0.010	105	3000	0.009	55

CUTTING PARAMETERS

MEXLN2R

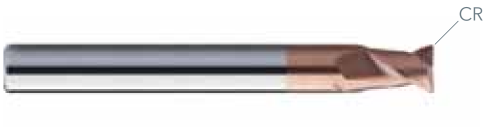
SQUARE RIB

Material Group ISO 513			P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm			< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**70-110**			**50-90**			**30-70**			**20-40**		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1.8	**≤ 6D**	**0.09**	15900	0.028	890	12400	0.025	620	8800	0.022	395	5300	0.020	210
	≤ 8D	**0.08**	14300	0.025	720	11100	0.023	500	8000	0.020	325	4800	0.018	170
	≤ 10D	**0.06**	12700	0.022	570	9900	0.020	400	7100	0.018	255	4200	0.016	130
	≤ 12D	**0.05**	11100	0.020	440	8700	0.018	310	6200	0.016	195	3700	0.014	100
	≤ 15D	**0.04**	9600	0.017	320	7400	0.015	220	5300	0.013	140	3200	0.012	75
	> 15D	**0.03**	8000	0.014	220	6200	0.013	160	4400	0.011	100	2700	0.010	55
2	**≤ 6D**	**0.10**	14300	0.030	860	11100	0.027	600	8000	0.024	385	4800	0.021	200
	≤ 8D	**0.09**	12900	0.027	700	10000	0.024	490	7200	0.022	310	4300	0.019	165
	≤ 10D	**0.07**	11500	0.024	550	8900	0.022	380	6400	0.019	245	3800	0.017	130
	≤ 12D	**0.06**	10000	0.021	420	7800	0.019	290	5600	0.017	190	3300	0.015	95
	≤ 15D	**0.05**	8600	0.018	310	6700	0.016	220	4800	0.014	140	2900	0.013	75
	> 15D	**0.03**	8600	0.018	310	6700	0.016	220	4800	0.014	140	2900	0.013	75
2.5	**≤ 6D**	**0.13**	11500	0.035	810	8900	0.032	560	6400	0.028	360	3800	0.025	185
	≤ 8D	**0.11**	10300	0.032	650	8000	0.028	450	5700	0.025	285	3400	0.022	150
	≤ 10D	**0.09**	9200	0.028	520	7100	0.025	360	5100	0.022	230	3100	0.020	120
	≤ 12D	**0.07**	8000	0.025	390	6200	0.022	270	4500	0.020	175	2700	0.017	95
	≤ 15D	**0.06**	6900	0.021	290	5400	0.019	200	3800	0.017	130	2300	0.015	70
	> 15D	**0.04**	6900	0.021	290	5400	0.019	200	3800	0.017	130	2300	0.015	70
3	**≤ 6D**	**0.15**	9600	0.040	770	7400	0.036	530	5300	0.032	340	3200	0.028	180
	≤ 8D	**0.13**	8600	0.036	620	6700	0.032	430	4800	0.029	275	2900	0.025	145
	≤ 10D	**0.11**	7600	0.032	490	5900	0.029	340	4200	0.026	215	2500	0.022	110
	≤ 12D	**0.08**	6700	0.028	380	5200	0.025	260	3700	0.022	165	2200	0.020	85
	≤ 15D	**0.07**	5700	0.024	270	4500	0.022	190	3200	0.019	125	1900	0.017	65
	> 15D	**0.05**	5700	0.024	270	4500	0.022	190	3200	0.019	125	1900	0.017	65
4	**≤ 6D**	**0.20**	7200	0.050	720	5600	0.045	500	4000	0.040	320	2400	0.035	170
	≤ 8D	**0.17**	6400	0.045	580	5000	0.041	410	3600	0.036	260	2100	0.032	130
	≤ 10D	**0.14**	5700	0.040	460	4500	0.036	320	3200	0.032	205	1900	0.028	105
	≤ 12D	**0.11**	5000	0.035	350	3900	0.032	250	2800	0.028	155	1700	0.025	85
	≤ 15D	**0.09**	4300	0.030	260	3300	0.027	180	2400	0.024	115	1400	0.021	60
	> 15D	**0.06**	4300	0.030	260	3300	0.027	180	2400	0.024	115	1400	0.021	60

MEXLS2R

cylindrical shank, 2 flutes, long, corner radius

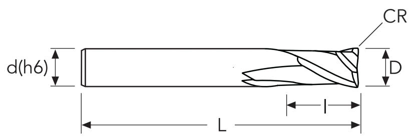
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SLOTTING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.020	0.30	+/-0.010	6	4		75	2	MEXLS2R03020	h
3	0/-0.025	0.30	+/-0.010	6	5		75	2	MEXLS2R03030	h
3	0/-0.025	0.50	+/-0.010	6	5		75	2	MEXLS2R05030	h
4	0/-0.025	0.30	+/-0.010	6	8		75	2	MEXLS2R03040	h
4	0/-0.025	0.50	+/-0.010	6	8		75	2	MEXLS2R05040	h
5	0/-0.025	0.30	+/-0.010	6	9		75	2	MEXLS2R03050	h
5	0/-0.025	0.50	+/-0.010	6	9		75	2	MEXLS2R05050	h
6	0/-0.025	0.30	+/-0.010	6	10		75	2	MEXLS2R03060	h
6	0/-0.025	0.50	+/-0.010	6	10		75	2	MEXLS2R05060	h
6	0/-0.025	1.00	+/-0.010	6	10		75	2	MEXLS2R10060	h
8	0/-0.030	0.30	+/-0.010	8	12		75	2	MEXLS2R03080	h
8	0/-0.030	0.50	+/-0.010	8	12		75	2	MEXLS2R05080	h
8	0/-0.030	1.00	+/-0.010	8	12		75	2	MEXLS2R10080	h
10	0/-0.030	0.50	+/-0.010	10	14		100	2	MEXLS2R05100	h
10	0/-0.030	1.00	+/-0.010	10	14		100	2	MEXLS2R10100	h
12	0/-0.030	0.50	+/-0.010	12	16		100	2	MEXLS2R05120	h
12	0/-0.030	1.00	+/-0.010	12	16		100	2	MEXLS2R10120	h
16	0/-0.030	0.50	+/-0.010	16	22		125	2	MEXLS2R05160	h
16	0/-0.030	1.00	+/-0.010	16	22		125	2	MEXLS2R10160	h

h stock standard f non-stock standard m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

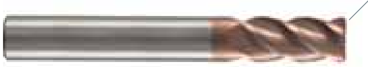
MEXLS2R

	Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
	Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
	ap x ae	**0.3D x D**			**0.3D x D**			**0.2D x D**			**0.05D x D**		
	Vc (m/min)	**70-110**			**50-90**			**30-70**			**20-40**		
SLOTTING	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	2	14300	0.009	260	11440	0.008	190	8580	0.007	125	5150	0.006	65
	3	9600	0.012	230	7680	0.011	170	5760	0.010	110	3460	0.008	60
	4	7200	0.018	260	5760	0.016	190	4320	0.014	125	2590	0.013	65
	5	5700	0.024	270	4560	0.022	200	3420	0.019	130	2050	0.017	70
	6	4800	0.029	280	3840	0.026	200	2880	0.023	135	1730	0.020	70
	8	3600	0.035	250	2880	0.032	180	2160	0.028	120	1300	0.025	65
	10	2900	0.041	240	2320	0.037	170	1740	0.033	115	1040	0.029	60
	12	2400	0.050	240	1920	0.045	170	1440	0.040	115	860	0.035	60
	16	1800	0.065	230	1400	0.059	160	1000	0.052	105	600	0.046	55

< D3: ap = 0.4 mm max

MEXCS4R

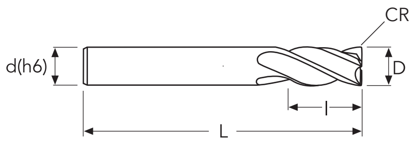
cylindrical shank, 4 flutes, corner radius



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.20	+/-0.010	4	3		50	4	MEXCS4R01002	h
1.5	0/-0.020	0.20	+/-0.010	4	4.5		50	4	MEXCS4R01502	h
2	0/-0.020	0.20	+/-0.010	4	6.5		50	4	MEXCS4R02002	h
2	0/-0.020	0.30	+/-0.010	4	6.5		50	4	MEXCS4R02003	h
2.5	0/-0.020	0.20	+/-0.010	4	6.5		50	4	MEXCS4R02502	h
2.5	0/-0.020	0.50	+/-0.010	4	6.5		50	4	MEXCS4R02505	h
3	0/-0.025	0.20	+/-0.010	4	9		50	4	MEXCS4R03002	h
3	0/-0.025	0.30	+/-0.010	4	9		50	4	MEXCS4R03003	h
3	0/-0.025	0.50	+/-0.010	4	9		50	4	MEXCS4R03005	h
4	0/-0.025	0.30	+/-0.010	4	12		50	4	MEXCS4R04003	h
4	0/-0.025	0.50	+/-0.010	4	12		50	4	MEXCS4R04005	h
4	0/-0.025	1.00	+/-0.010	4	12		50	4	MEXCS4R04010	h
5	0/-0.025	0.30	+/-0.010	5	15		50	4	MEXCS4R05003	h
5	0/-0.025	0.50	+/-0.010	5	15		50	4	MEXCS4R05005	h
5	0/-0.025	1.00	+/-0.010	5	15		50	4	MEXCS4R05010	h
6	0/-0.025	0.30	+/-0.010	6	16		50	4	MEXCS4R06003	h
6	0/-0.025	0.50	+/-0.010	6	16		50	4	MEXCS4R06005	h
6	0/-0.025	1.00	+/-0.010	6	16		50	4	MEXCS4R06010	h
8	0/-0.030	0.30	+/-0.010	8	20		64	4	MEXCS4R08003	h
8	0/-0.030	0.50	+/-0.010	8	20		64	4	MEXCS4R08005	h
8	0/-0.030	1.00	+/-0.010	8	20		64	4	MEXCS4R08010	h
8	0/-0.030	1.50	+/-0.010	8	20		64	4	MEXCS4R08015	h
8	0/-0.030	2.00	+/-0.010	8	20		64	4	MEXCS4R08020	h
10	0/-0.030	0.30	+/-0.010	10	22		75	4	MEXCS4R10003	h
10	0/-0.030	0.50	+/-0.010	10	22		75	4	MEXCS4R10005	h
10	0/-0.030	1.00	+/-0.010	10	22		75	4	MEXCS4R10010	h
10	0/-0.030	1.50	+/-0.010	10	22		75	4	MEXCS4R10015	h
10	0/-0.030	2.00	+/-0.010	10	22		75	4	MEXCS4R10020	h
12	0/-0.030	0.30	+/-0.010	12	25		75	4	MEXCS4R12003	h
12	0/-0.030	0.50	+/-0.010	12	25		75	4	MEXCS4R12005	h
12	0/-0.030	1.00	+/-0.010	12	25		75	4	MEXCS4R12010	h
12	0/-0.030	1.50	+/-0.010	12	25		75	4	MEXCS4R12015	h
12	0/-0.030	2.00	+/-0.010	12	25		75	4	MEXCS4R12020	h
12	0/-0.030	3.00	+/-0.010	12	25		75	4	MEXCS4R12030	h
14	0/-0.030	0.50	+/-0.010	14	32		90	4	MEXCS4R14005	f
14	0/-0.030	1.00	+/-0.010	14	32		90	4	MEXCS4R14010	h
14	0/-0.030	2.00	+/-0.010	14	32		90	4	MEXCS4R14020	f
16	0/-0.030	0.50	+/-0.010	16	32		90	4	MEXCS4R16005	h
16	0/-0.030	1.00	+/-0.010	16	32		90	4	MEXCS4R16010	h

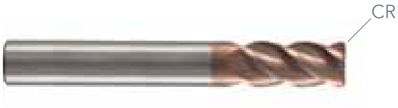
h stock standard f non-stock standard m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXCS4R

cylindrical shank, 4 flutes, corner radius

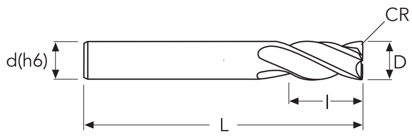
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z4



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
16	0/-0.030	2.00	+/-0.010	16	32		90	4	MEXCS4R16020	h
16	0/-0.030	3.00	+/-0.010	16	32		90	4	MEXCS4R16030	h
18	0/-0.030	0.50	+/-0.010	18	38		100	4	MEXCS4R18005	h
18	0/-0.030	1.00	+/-0.010	18	38		100	4	MEXCS4R18010	h
20	0/-0.030	0.50	+/-0.010	20	38		100	4	MEXCS4R20005	h
20	0/-0.030	1.00	+/-0.010	20	38		100	4	MEXCS4R20010	h
20	0/-0.030	2.00	+/-0.010	20	38		100	4	MEXCS4R20020	h
20	0/-0.030	3.00	+/-0.010	20	38		100	4	MEXCS4R20030	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXCS4R

SIDE MILLING

Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**D x 0.1D**			**D x 0.1D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**80-120**			**50-90**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	31850	0.009	1080	22290	0.008	680	15920	0.007	435	9550	0.006	225
2	15920	0.017	1080	11150	0.015	680	7960	0.014	435	4780	0.012	230
3	10620	0.026	1080	7430	0.023	680	5310	0.020	435	3180	0.018	225
4	7960	0.034	1080	5570	0.031	680	3980	0.027	435	2390	0.024	230
5	6370	0.038	970	4460	0.034	610	3180	0.031	390	1910	0.027	205
6	5310	0.043	900	3720	0.038	570	2650	0.034	360	1590	0.030	190
8	3980	0.055	880	2790	0.050	550	1990	0.044	350	1190	0.039	185
10	3180	0.071	900	2230	0.064	570	1590	0.057	360	960	0.050	190
12	2650	0.085	900	1860	0.077	570	1330	0.068	360	800	0.060	190
14	2270	0.098	890	1590	0.088	560	1140	0.078	355	680	0.068	185
16	1990	0.110	880	1390	0.099	550	1000	0.088	350	600	0.077	185
18	1770	0.125	890	1240	0.113	560	880	0.100	350	530	0.088	185
20	1590	0.140	890	1110	0.126	560	800	0.112	360	480	0.098	190

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEX410R

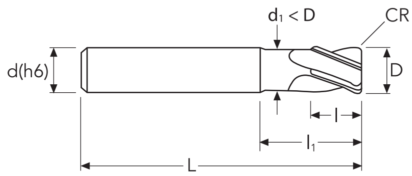
cylindrical shank, 4 flutes, short, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | RADIUS | Z4

P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
2	0/-0.012	0.20	+/-0.020	6	2.5	5	1.90	50	4	MEX410R02020	h
2.5	0/-0.012	0.25	+/-0.020	6	3	6	2.40	50	4	MEX410R025025	h
3	0/-0.012	0.30	+/-0.020	6	4	7	2.80	50	4	MEX410R03030	h
4	0/-0.012	0.50	+/-0.020	6	5	9	3.70	50	4	MEX410R05040	h
5	0/-0.012	0.50	+/-0.020	6	6	12	4.60	50	4	MEX410R05050	h
6	0/-0.012	0.50	+/-0.020	6	7	14	5.60	60	4	MEX410R05060	h
8	0/-0.015	1.00	+/-0.020	8	10	18	7.40	70	4	MEX410R10080	h
10	0/-0.015	1.00	+/-0.020	10	12	25	9.40	75	4	MEX410R10100	h
12	0/-0.015	1.00	+/-0.020	12	15	30	11.40	80	4	MEX410R10120	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEX410R

SIDE MILLING

Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**D x 0.1D**			**D x 0.1D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**80-120**			**50-90**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	15920	0.015	970	11150	0.014	610	7960	0.012	390	4780	0.011	205
3	10620	0.023	970	7430	0.021	610	5310	0.018	390	3180	0.016	205
4	7960	0.031	970	5570	0.028	610	3980	0.024	390	2390	0.021	205
5	6370	0.034	880	4460	0.031	550	3180	0.028	350	1910	0.024	185
6	5310	0.038	810	3720	0.034	510	2650	0.031	325	1590	0.027	170
8	3980	0.050	790	2790	0.045	500	1990	0.040	315	1190	0.035	165
10	3180	0.065	830	2230	0.059	520	1590	0.052	330	960	0.046	175
12	2650	0.077	810	1860	0.069	510	1330	0.061	325	800	0.054	170

MEXLS4R

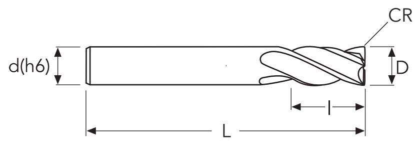
cylindrical shank, 4 flutes, long, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z4

P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	0/-0.020	0.30	+/-0.010	6	4		75	4	MEXLS4R03020	h
3	0/-0.025	0.30	+/-0.010	6	5		75	4	MEXLS4R03030	h
3	0/-0.025	0.50	+/-0.010	6	5		75	4	MEXLS4R05030	h
4	0/-0.025	0.30	+/-0.010	6	8		75	4	MEXLS4R03040	h
4	0/-0.025	0.50	+/-0.010	6	8		75	4	MEXLS4R05040	h
5	0/-0.025	0.30	+/-0.010	6	9		75	4	MEXLS4R03050	h
5	0/-0.025	0.50	+/-0.010	6	9		75	4	MEXLS4R05050	h
6	0/-0.025	0.30	+/-0.010	6	10		75	4	MEXLS4R03060	h
6	0/-0.025	0.50	+/-0.010	6	10		75	4	MEXLS4R05060	h
6	0/-0.025	1.00	+/-0.010	6	10		75	4	MEXLS4R10060	h
8	0/-0.030	0.30	+/-0.010	8	12		75	4	MEXLS4R03080	h
8	0/-0.030	0.50	+/-0.010	8	12		75	4	MEXLS4R05080	h
8	0/-0.030	1.00	+/-0.010	8	12		75	4	MEXLS4R10080	h
10	0/-0.030	0.50	+/-0.010	10	14		100	4	MEXLS4R05100	h
10	0/-0.030	1.00	+/-0.010	10	14		100	4	MEXLS4R10100	h
12	0/-0.030	0.50	+/-0.010	12	16		100	4	MEXLS4R05120	h
12	0/-0.030	1.00	+/-0.010	12	16		100	4	MEXLS4R10120	h
16	0/-0.030	0.50	+/-0.010	16	22		125	4	MEXLS4R05160	h
16	0/-0.030	1.00	+/-0.010	16	22		125	4	MEXLS4R10160	h

h stock standard   f non-stock standard   m stock exhaustion

MEXLS4R

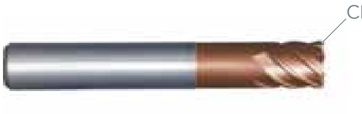
SIDE MILLING

Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**D x 0.05D**			**D x 0.05D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**70-110**			**50-90**			**40-60**			**20-40**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	14330	0.014	830	11150	0.013	580	7960	0.012	370	4780	0.010	195
3	9550	0.022	830	7430	0.020	580	5310	0.017	370	3180	0.015	195
4	7170	0.029	830	5570	0.026	580	3980	0.023	370	2390	0.020	195
5	5730	0.033	750	4460	0.029	520	3180	0.026	330	1910	0.023	175
6	4780	0.036	690	3720	0.033	480	2650	0.029	305	1590	0.025	160
8	3580	0.047	670	2790	0.042	470	1990	0.038	300	1190	0.033	155
10	2870	0.060	690	2230	0.054	480	1590	0.048	305	960	0.042	160
12	2390	0.072	690	1860	0.065	480	1330	0.058	305	800	0.051	160
16	1790	0.094	670	1390	0.084	470	1000	0.075	300	600	0.065	155

MEX610R

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 45° | RADIUS | Z6

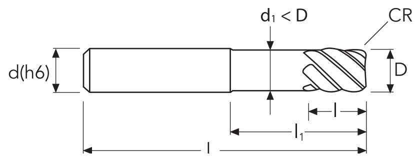
cylindrical shank, multi flute, short, corner radius



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
6	0/-0.030	0.50	+/-0.020	6	6	14	5.50	50	6	MEX610R05060	h
8	0/-0.030	0.50	+/-0.020	8	8	24	7.40	60	6	MEX610R05080	h
10	0/-0.030	1.00	+/-0.020	10	10	30	9.20	70	6	MEX610R10100	h
12	0/-0.030	1.00	+/-0.020	12	12	30	11.00	75	6	MEX610R10120	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEX610R

SIDE MILLING												
Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**D x 0.1D**			**D x 0.1D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**120-160**			**90-130**			**60-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	7430	0.018	800	5840	0.016	570	4250	0.014	370	3180	0.013	240
8	5570	0.028	920	4380	0.025	650	3180	0.022	420	2390	0.019	280
10	4460	0.034	900	3500	0.030	640	2550	0.027	410	1910	0.024	270
12	3720	0.041	910	2920	0.037	640	2120	0.033	420	1590	0.029	270

MEX611R

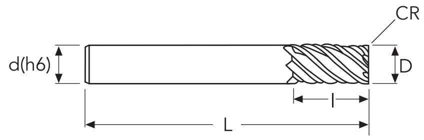
cylindrical shank, multi flute, long, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 45° | RADIUS | Z6

P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.030	0.50	+/-0.020	6	15		90	6	MEX611R05060	h
8	0/-0.030	0.50	+/-0.020	8	20		100	6	MEX611R05080	h
10	0/-0.030	0.50	+/-0.020	10	25		100	6	MEX611R05100	h
10	0/-0.030	1.00	+/-0.020	10	25		100	6	MEX611R10100	h
12	0/-0.030	0.50	+/-0.020	12	30		100	6	MEX611R05120	h
12	0/-0.030	1.00	+/-0.020	12	30		100	6	MEX611R10120	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEX611R

SIDE MILLING

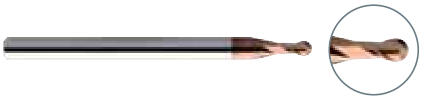
Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae	**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
Vc (m/min)	**100-140**			**80-120**			**40-80**			**20-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6370	0.015	580	5310	0.014	440	3180	0.012	230	2120	0.011	140
8	4780	0.023	670	3980	0.021	500	2390	0.019	270	1590	0.016	160
10	3820	0.029	650	3180	0.026	490	1910	0.023	260	1270	0.020	150
12	3180	0.035	660	2650	0.031	500	1590	0.028	260	1060	0.024	150
14	2730	0.041	670	2270	0.037	500	1360	0.033	270	910	0.029	160
16	2390	0.048	690	1990	0.043	520	1190	0.038	270	800	0.034	160
18	2120	0.055	700	1770	0.050	530	1060	0.044	280	710	0.039	160
20	1910	0.063	720	1590	0.057	540	960	0.050	290	640	0.044	170

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXMB2

cylindrical shank, 2 flutes ball nose, miniature

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

COPYING

D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.2	0/-0.020	0.10	0/-0.020	4	0.4		40	2	MEXMB20020	h
0.3	0/-0.020	0.15	0/-0.020	4	0.6		40	2	MEXMB20030	h
0.4	0/-0.020	0.20	0/-0.020	4	0.8		40	2	MEXMB20040	h
0.5	0/-0.020	0.25	0/-0.020	4	1.2		40	2	MEXMB20050	h
0.6	0/-0.020	0.30	0/-0.020	4	1.4		40	2	MEXMB20060	h
0.7	0/-0.020	0.35	0/-0.020	4	1.6		40	2	MEXMB20070	h
0.8	0/-0.020	0.40	0/-0.020	4	1.8		40	2	MEXMB20080	h
0.9	0/-0.020	0.45	0/-0.020	4	2		40	2	MEXMB20090	h
1	0/-0.020	0.50	0/-0.020	4	3		50	2	MEXMB2010050	h
1.5	0/-0.020	0.75	0/-0.020	4	3		50	2	MEXMB2015050	h
2	0/-0.020	1.00	0/-0.020	4	4		50	2	MEXMB2020050	h

h stock standard f non-stock standard m stock exhaustion

MEXMB2

	Material Group ISO 513		P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
	Hardness/Rm		< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
	ap x ae		**0.05D x 0.2D**			**0.05D x 0.1D**			**0.05D x 0.1D**			**0.05D x 0.1D**		
	Vc (m/min)		**110-130**			**90-110**			**50-70**			**45-55**		
	D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
COPYING	**0.2**	**0.09**	40000	0.006	480	40000	0.005	430	40000	0.005	360	40000	0.004	310
	0.3	**0.13**	40000	0.007	580	40000	0.006	520	40000	0.006	460	40000	0.005	405
	0.4	**0.17**	40000	0.009	720	40000	0.008	650	40000	0.007	575	40000	0.006	505
	0.5	**0.22**	40000	0.011	860	40000	0.010	780	38220	0.009	660	31850	0.008	480
	0.6	**0.26**	40000	0.014	1080	40000	0.012	970	31850	0.011	690	26540	0.009	500
	0.7	**0.31**	40000	0.016	1300	40000	0.015	1170	27300	0.013	710	22750	0.011	515
	0.8	**0.35**	40000	0.018	1440	40000	0.016	1300	23890	0.014	690	19900	0.013	500
	0.9	**0.39**	40000	0.021	1660	35390	0.019	1320	21230	0.017	705	17690	0.014	515
	1	**0.44**	38220	0.023	1790	40000	0.021	1680	19110	0.019	715	15920	0.016	520
	1.5	**0.65**	25480	0.036	1830	21230	0.032	1380	12740	0.029	735	10620	0.025	535
	2	**0.87**	19110	0.050	1890	15920	0.045	1420	9550	0.040	755	7960	0.035	550

α	α	n (rpm)	Vf (mm/min)
	15°	x 1.1	x 1.1

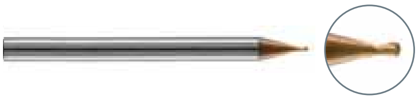
OSAWA

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXMB2SC

cylindrical shank, 2 flutes ball nose, short cutting length, miniature

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

COPYING

D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.2	0/-0.020	0.10	0/-0.020	4	0.2		50	2	MEXMB2SC0020	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3		50	2	MEXMB2SC0030	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4		50	2	MEXMB2SC0040	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4		50	2	MEXMB2SC0050	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5		50	2	MEXMB2SC0060	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6		50	2	MEXMB2SC0080	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXMB2SC

COPYING

Material Group ISO 513		P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm		< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae		**0.05D x 0.1D**			**0.05D x 0.1D**			**0.05D x 0.1D**			**0.05D x 0.1D**		
Vc (m/min)		**110-130**			**90-110**			**50-70**			**45-55**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.2	**0.09**	40000	0.006	480	40000	0.005	430	40000	0.005	385	40000	0.004	335
0.3	**0.13**	40000	0.008	640	40000	0.007	580	40000	0.006	510	40000	0.006	450
0.4	**0.17**	40000	0.010	800	40000	0.009	720	40000	0.008	640	40000	0.007	560
0.5	**0.22**	40000	0.012	960	40000	0.011	860	38220	0.010	735	31850	0.008	535
0.6	**0.26**	40000	0.015	1200	40000	0.014	1080	31850	0.012	765	26540	0.011	555
0.8	**0.35**	40000	0.018	1440	40000	0.016	1300	27300	0.014	785	22750	0.013	575

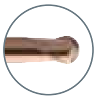
α	n (rpm)	Vf (mm/min)
15°	x 1.1	x 1.1

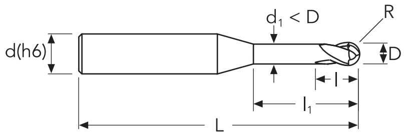
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEXLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL

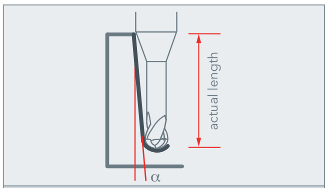




P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

ROUND RIB



actual length according to α angle

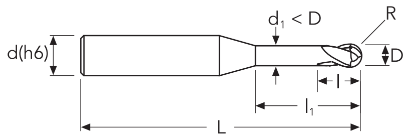
D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
0.2	0/-0.020	0.10	0/-0.020	4	0.2	0.5	0.15	50	2	0.57	0.58	0.6	0.62	0.66	MEXLNB2002005	h
0.2	0/-0.020	0.10	0/-0.020	4	0.2	1	0.15	50	2	1.08	1.12	1.15	1.19	1.27	MEXLNB200201	h
0.2	0/-0.020	0.10	0/-0.020	4	0.2	1.5	0.15	50	2	1.60	1.65	1.71	1.76	1.89	MEXLNB2002015	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3	1	0.25	50	2	1.08	1.11	1.15	1.18	1.26	MEXLNB200301	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3	2	0.25	50	2	2.12	2.18	2.25	2.33	2.49	MEXLNB200302	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3	3	0.25	50	2	3.15	3.25	3.36	3.48	3.73	MEXLNB200303	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	1	0.35	50	2	1.08	1.11	1.14	1.18	1.25	MEXLNB200401	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	2	0.35	50	2	2.11	2.18	2.25	2.32	2.48	MEXLNB200402	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	3	0.35	50	2	3.15	3.25	3.36	3.47	3.72	MEXLNB200403	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	4	0.35	50	2	4.18	4.32	4.46	4.62	4.95	MEXLNB200404	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	5	0.35	50	2	5.21	5.39	5.57	5.77	6.18	MEXLNB200405	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	2	0.45	50	2	2.15	2.22	2.29	2.36	2.52	MEXLNB200502	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	3	0.45	50	2	3.18	3.29	3.39	3.51	3.75	MEXLNB200503	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	4	0.45	50	2	4.22	4.35	4.5	4.65	4.98	MEXLNB200504	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	5	0.45	50	2	5.25	5.42	5.61	5.8	6.22	MEXLNB200505	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	6	0.45	50	2	6.28	6.49	6.71	6.95	7.45	MEXLNB200506	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	8	0.45	50	2	8.35	8.63	8.93	9.24	9.92	MEXLNB200508	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	2	0.55	50	2	2.15	2.21	2.28	2.35	2.50	MEXLNB200602	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	3	0.55	50	2	3.18	3.28	3.39	3.50	3.74	MEXLNB200603	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	4	0.55	50	2	4.22	4.35	4.49	4.65	4.97	MEXLNB200604	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	5	0.55	50	2	5.25	5.42	5.60	5.79	6.21	MEXLNB200605	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	6	0.55	50	2	6.28	6.49	6.71	6.94	7.44	MEXLNB200606	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	8	0.55	50	2	8.35	8.63	8.92	9.23	9.91	MEXLNB200608	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	2	0.75	50	2	2.15	2.21	2.27	2.34	2.48	MEXLNB200802	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	4	0.75	50	2	4.21	4.34	4.48	4.63	4.95	MEXLNB200804	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	5	0.75	50	2	5.25	5.41	5.59	5.78	6.18	MEXLNB200805	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	6	0.75	50	2	6.28	6.48	6.70	6.93	7.42	MEXLNB200806	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	7	0.75	50	2	7.31	7.55	7.81	8.07	8.65	MEXLNB200807	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	8	0.75	50	2	8.35	8.62	8.91	9.22	9.88	MEXLNB200808	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	10	0.75	50	2	10.41	10.76	11.13	11.51	12.35	MEXLNB200810	h
1	0/-0.020	0.50	0/-0.020	4	0.8	3	0.95	50	2	3.27	3.37	3.47	3.57	3.80	MEXLNB201003	h
1	0/-0.020	0.50	0/-0.020	4	0.8	4	0.95	50	2	4.31	4.44	4.58	4.72	5.04	MEXLNB201004	h
1	0/-0.020	0.50	0/-0.020	4	0.8	5	0.95	50	2	5.34	5.51	5.68	5.87	6.27	MEXLNB201005	h
1	0/-0.020	0.50	0/-0.020	4	0.8	6	0.95	50	2	6.37	6.58	6.79	7.02	7.50	MEXLNB201006	h
1	0/-0.020	0.50	0/-0.020	4	0.8	7	0.95	50	2	7.41	7.64	7.90	8.16	8.74	MEXLNB201007	h
1	0/-0.020	0.50	0/-0.020	4	0.8	8	0.95	50	2	8.44	8.71	9.00	9.31	9.97	MEXLNB201008	h
1	0/-0.020	0.50	0/-0.020	4	0.8	9	0.95	50	2	9.47	9.78	10.11	10.46	11.21	MEXLNB201009	h
1	0/-0.020	0.50	0/-0.020	4	0.8	10	0.95	50	2	10.51	10.85	11.22	11.61	12.44	MEXLNB201010	h
1	0/-0.020	0.50	0/-0.020	4	0.8	12	0.95	50	2	12.57	12.99	13.43	13.9	14.91	MEXLNB201012	h

h stock standard f non-stock standard m stock exhaustion

MEXLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck

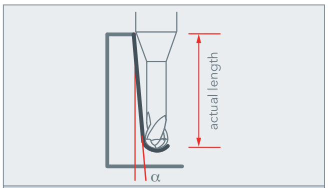
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

ROUND RIB



actual length according to α angle

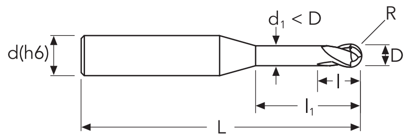
D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1	0/-0.020	0.50	0/-0.020	4	0.8	14	0.95	50	2	14.64	15.13	15.65	16.19	17.37	MEXLNB201014	h
1	0/-0.020	0.50	0/-0.020	4	0.8	16	0.95	50	2	16.71	15.13	15.65	16.19	17.37	MEXLNB201016	h
1	0/-0.020	0.50	0/-0.020	4	0.8	20	0.95	60	2	20.84	21.55	22.29	23.08	24.78	MEXLNB201020	h
1.2	0/-0.020	0.60	0/-0.020	4	1	6	1.15	50	2	6.37	6.57	6.78	7.00	7.48	MEXLNB201206	h
1.2	0/-0.020	0.60	0/-0.020	4	1	8	1.15	50	2	8.44	8.71	8.99	9.30	9.95	MEXLNB201208	h
1.2	0/-0.020	0.60	0/-0.020	4	1	10	1.15	50	2	10.50	10.85	11.21	11.59	12.42	MEXLNB201210	h
1.2	0/-0.020	0.60	0/-0.020	4	1	12	1.15	50	2	12.57	12.98	13.42	13.89	14.88	MEXLNB201212	h
1.4	0/-0.020	0.70	0/-0.020	4	1.1	8	1.35	50	2	8.43	8.70	8.98	9.28	9.93	MEXLNB201408	h
1.4	0/-0.020	0.70	0/-0.020	4	1.1	12	1.35	50	2	12.57	12.98	13.41	13.87	14.86	MEXLNB201412	h
1.4	0/-0.020	0.70	0/-0.020	4	1.1	16	1.35	50	2	16.70	17.26	17.84	18.46	19.8	MEXLNB201416	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	8	1.45	50	2	8.43	8.70	8.98	9.27	9.91	MEXLNB201508	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	12	1.45	50	2	12.57	12.97	13.41	13.86	14.85	MEXLNB201512	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	16	1.45	50	2	16.7	17.25	17.84	18.45	19.78	MEXLNB201516	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	18	1.45	60	2	18.77	19.39	20.05	20.75	22.25	MEXLNB201518	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	8	1.55	50	2	8.43	8.69	8.97	9.27	9.90	MEXLNB201608	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	12	1.55	50	2	12.56	12.97	13.40	13.86	14.84	MEXLNB201612	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	16	1.55	50	2	16.7	17.25	17.83	18.45	19.77	MEXLNB201616	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	20	1.55	60	2	20.83	21.53	22.26	23.03	-	MEXLNB201620	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	8	1.75	50	2	8.43	8.69	8.96	9.25	9.88	MEXLNB201808	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	12	1.75	50	2	12.56	12.96	13.39	13.84	14.81	MEXLNB201812	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	16	1.75	50	2	16.7	17.24	17.82	18.43	19.75	MEXLNB201816	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	20	1.75	60	2	20.83	21.52	22.25	23.02	-	MEXLNB201820	h
2	0/-0.020	1.00	0/-0.020	4	1.6	4	1.95	50	2	4.29	4.40	4.52	4.65	4.92	MEXLNB202004	h
2	0/-0.020	1.00	0/-0.020	4	1.6	6	1.95	50	2	6.36	6.54	6.74	6.94	7.39	MEXLNB202006	h
2	0/-0.020	1.00	0/-0.020	4	1.6	8	1.95	50	2	8.42	8.68	8.95	9.24	9.86	MEXLNB202008	h
2	0/-0.020	1.00	0/-0.020	4	1.6	10	1.95	50	2	10.49	10.82	11.17	11.53	12.32	MEXLNB202010	h
2	0/-0.020	1.00	0/-0.020	4	1.6	12	1.95	50	2	12.56	12.96	13.38	13.83	14.79	MEXLNB202012	h
2	0/-0.020	1.00	0/-0.020	4	1.6	14	1.95	50	2	14.62	15.10	15.59	16.12	17.26	MEXLNB202014	h
2	0/-0.020	1.00	0/-0.020	4	1.6	16	1.95	50	2	16.69	17.23	17.81	18.42	19.73	MEXLNB202016	h
2	0/-0.020	1.00	0/-0.020	4	1.6	18	1.95	60	2	18.76	19.37	20.02	20.71	-	MEXLNB202018	h
2	0/-0.020	1.00	0/-0.020	4	1.6	20	1.95	60	2	20.83	21.51	22.24	23.00	-	MEXLNB202020	h
2	0/-0.020	1.00	0/-0.020	4	1.6	25	1.95	75	2	25.99	26.86	27.77	28.74	-	MEXLNB202025	h
2	0/-0.020	1.00	0/-0.020	4	1.6	30	1.95	75	2	31.16	32.21	33.31	-	-	MEXLNB202030	h
3	0/-0.025	1.50	0/-0.020	6	2.4	8	2.85	50	2	8.60	8.84	9.10	9.37	9.96	MEXLNB203008	h
3	0/-0.025	1.50	0/-0.020	6	2.4	10	2.85	50	2	10.67	10.98	11.32	11.67	12.43	MEXLNB203010	h
3	0/-0.025	1.50	0/-0.020	6	2.4	16	2.85	60	2	16.87	17.4	17.96	18.55	19.83	MEXLNB203016	h
3	0/-0.025	1.50	0/-0.020	6	2.4	20	2.85	60	2	21.00	21.68	22.39	23.14	24.77	MEXLNB203020	h
3	0/-0.025	1.50	0/-0.020	6	2.4	25	2.85	75	2	26.17	27.02	27.93	28.88	-	MEXLNB203025	h
3	0/-0.025	1.50	0/-0.020	6	2.4	30	2.85	75	2	31.34	32.37	33.46	34.62	-	MEXLNB203030	h

h stock standard f non-stock standard m stock exhaustion

MEXLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck

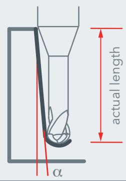
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

ROUND RIB



actual length according to α angle

D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
3	0/-0.025	1.50	0/-0.020	6	2.4	35	2.85	75	2	36.51	37.72	39.00	40.35	-	MEXLNB203035	h
4	0/-0.025	2.00	0/-0.020	6	3.2	10	3.85	50	2	10.84	11.15	11.47	11.81	12.54	MEXLNB204010	h
4	0/-0.025	2.00	0/-0.020	6	3.2	16	3.85	60	2	17.04	17.56	18.11	18.69	19.94	MEXLNB204016	h
4	0/-0.025	2.00	0/-0.020	6	3.2	20	3.85	60	2	21.18	21.84	22.54	23.28	-	MEXLNB204020	h
4	0/-0.025	2.00	0/-0.020	6	3.2	25	3.85	75	2	26.35	27.19	28.08	29.02	-	MEXLNB204025	h
4	0/-0.025	2.00	0/-0.020	6	3.2	30	3.85	75	2	31.51	32.53	33.61	-	-	MEXLNB204030	h
4	0/-0.025	2.00	0/-0.020	6	3.2	35	3.85	75	2	36.68	37.88	39.15	-	-	MEXLNB204035	h
4	0/-0.025	2.00	0/-0.020	6	3.2	40	3.85	100	2	41.85	43.23	-	-	-	MEXLNB204040	h
4	0/-0.025	2.00	0/-0.020	6	3.2	50	3.85	100	2	52.19	53.92	-	-	-	MEXLNB204050	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXLNB2

ROUND RIB

Material Group ISO 513				P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm				< 1000 N/mm^2			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae				**ap x 0.2D**			**ap x 0.1D**			**ap x 0.1D**			**ap x 0.1D**		
Vc (m/min)				**110-130**			**90-110**			**50-70**			**45-55**		
D (mm)	l1 (mm)	ap (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.2	**≤ 6D**	**0.01**	**0.09**	40000	0.007	580	40000	0.006	520	40000	0.006	460	40000	0.005	405
	≤ 8D	**0.01**	**0.08**	40000	0.006	520	40000	0.005	420	40000	0.005	375	40000	0.004	325
	≤ 10D	**0.01**	**0.07**	40000	0.006	460	40000	0.004	330	40000	0.004	295	40000	0.003	260
0.3	**≤ 6D**	**0.02**	**0.13**	40000	0.009	720	40000	0.008	650	40000	0.007	575	40000	0.006	505
	≤ 8D	**0.01**	**0.12**	40000	0.008	650	40000	0.007	520	40000	0.006	465	40000	0.005	410
	≤ 10D	**0.01**	**0.11**	40000	0.007	580	40000	0.005	410	40000	0.005	370	40000	0.004	325
0.4	**≤ 6D**	**0.02**	**0.17**	40000	0.012	940	40000	0.011	840	40000	0.009	750	40000	0.008	655
	≤ 8D	**0.02**	**0.16**	40000	0.011	840	40000	0.009	680	40000	0.008	605	35830	0.007	475
	≤ 10D	**0.01**	**0.15**	40000	0.009	750	40000	0.007	540	38220	0.006	460	31850	0.005	335
0.5	**≤ 6D**	**0.03**	**0.22**	40000	0.015	1220	40000	0.014	1100	38220	0.012	935	31850	0.011	680
	≤ 8D	**0.02**	**0.20**	40000	0.014	1100	40000	0.011	890	34390	0.010	680	28660	0.009	495
	≤ 10D	**0.02**	**0.18**	40000	0.012	980	40000	0.009	710	30570	0.008	480	25480	0.007	350
0.6	**≤ 6D**	**0.03**	**0.26**	40000	0.019	1510	40000	0.017	1360	31850	0.015	965	26540	0.013	700
	≤ 8D	**0.03**	**0.24**	40000	0.017	1360	40000	0.014	1100	28660	0.012	700	23890	0.011	510
	≤ 10D	**0.02**	**0.22**	40000	0.015	1210	40000	0.011	870	25480	0.010	495	21230	0.008	360
0.8	**≤ 6D**	**0.04**	**0.35**	40000	0.023	1800	39810	0.020	1610	23890	0.018	860	19900	0.016	625
	≤ 8D	**0.03**	**0.32**	40000	0.020	1620	35830	0.016	1180	21500	0.015	625	17910	0.013	455
	≤ 10D	**0.03**	**0.29**	38220	0.018	1380	31850	0.013	830	19110	0.012	440	15920	0.010	320
1	**≤ 6D**	**0.05**	**0.44**	38220	0.027	2060	31850	0.024	1550	19110	0.022	825	15920	0.019	600
	≤ 8D	**0.04**	**0.40**	34390	0.024	1670	28660	0.020	1130	17200	0.017	600	14330	0.015	440
	≤ 10D	**0.04**	**0.37**	30570	0.022	1320	25480	0.016	790	15290	0.014	425	12740	0.012	310
	≤ 12D	**0.03**	**0.33**	26750	0.019	1010	22290	0.012	530	13380	0.011	285	11150	0.009	205
	> 12D	**0.02**	**0.30**	22930	0.016	740	19110	0.009	330	11460	0.008	180	9550	0.007	130
1.2	**≤ 6D**	**0.06**	**0.52**	31850	0.032	2010	21230	0.028	1200	15920	0.025	800	13270	0.022	585
	≤ 8D	**0.05**	**0.48**	28660	0.028	1630	19110	0.023	880	14330	0.020	585	11940	0.018	425
	≤ 10D	**0.04**	**0.44**	25480	0.025	1280	16990	0.018	620	12740	0.016	410	10620	0.014	300
	≤ 12D	**0.03**	**0.39**	22290	0.022	980	14860	0.014	410	11150	0.012	275	9290	0.011	200
	> 12D	**0.03**	**0.36**	19110	0.019	720	12740	0.010	260	9550	0.009	175	7960	0.008	125
1.5	**≤ 6D**	**0.08**	**0.65**	25480	0.041	2060	21230	0.036	1550	12740	0.032	825	10620	0.028	600
	≤ 8D	**0.06**	**0.61**	22930	0.036	1670	19110	0.030	1130	11460	0.026	600	9550	0.023	440
	≤ 10D	**0.05**	**0.55**	20380	0.032	1320	16990	0.023	790	10190	0.021	425	8490	0.018	310
	≤ 12D	**0.04**	**0.49**	17830	0.028	1010	14860	0.018	530	8920	0.016	285	7430	0.014	205
	> 12D	**0.03**	**0.44**	15290	0.024	740	12740	0.013	330	7640	0.012	180	6370	0.010	130
2	**≤ 6D**	**0.10**	**0.87**	19110	0.054	2060	15920	0.049	1550	9550	0.043	825	7960	0.038	600
	≤ 8D	**0.09**	**0.81**	17200	0.049	1670	14330	0.039	1130	8600	0.035	600	7170	0.031	440
	≤ 10D	**0.07**	**0.74**	15290	0.043	1320	12740	0.031	790	7640	0.028	420	6370	0.024	310
	≤ 12D	**0.06**	**0.65**	13380	0.038	1010	11150	0.024	530	6690	0.021	285	5570	0.019	205
	> 12D	**0.05**	**0.59**	11460	0.032	740	9550	0.017	330	5730	0.016	180	4780	0.014	130
2.5	**≤ 6D**	**0.13**	**1.09**	15290	0.054	1650	12740	0.049	1240	7640	0.043	660	6370	0.038	480
	≤ 8D	**0.11**	**1.01**	13760	0.049	1340	11460	0.039	900	6880	0.035	480	5730	0.031	350
	≤ 10D	**0.09**	**0.92**	12230	0.043	1060	10190	0.031	630	6110	0.028	340	5100	0.024	245
	≤ 12D	**0.07**	**0.82**	10700	0.038	810	8920	0.024	420	5350	0.021	225	4460	0.019	165
	> 12D	**0.06**	**0.74**	9170	0.032	590	7640	0.017	270	4590	0.016	145	3820	0.014	105

α	n (rpm)	Vf (mm/min)
45°	x 1.65	x 1.65
30°	x 1.30	x 1.30
15°	x 1.15	x 1.15

OSAWA

MEXLNB2

Material Group ISO 513				P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm				< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae				**ap x 0.2D**			**ap x 0.1D**			**ap x 0.1D**			**ap x 0.1D**		
Vc (m/min)				**110-130**			**90-110**			**50-70**			**45-55**		
D (mm)	l1 (mm)	ap (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	**≤ 6D**	**0.15**	**1.31**	12740	0.068	1720	10620	0.061	1290	6370	0.054	690	5310	0.047	500
	≤ 8D	**0.13**	**1.21**	11460	0.061	1390	9550	0.049	940	5730	0.044	500	4780	0.038	365
	≤ 10D	**0.11**	**1.10**	10190	0.054	1100	8490	0.039	660	5100	0.035	355	4250	0.030	255
	≤ 12D	**0.08**	**0.98**	8920	0.047	840	7430	0.030	440	4460	0.026	235	3720	0.023	170
	> 12D	**0.07**	**0.89**	7640	0.041	620	6370	0.022	280	3820	0.019	150	3180	0.017	110
4	**≤ 6D**	**0.20**	**1.74**	9550	0.086	1630	7960	0.077	1230	4780	0.068	655	3980	0.060	475
	≤ 8D	**0.17**	**1.61**	8600	0.077	1320	7170	0.062	890	4300	0.055	475	3580	0.048	345
	≤ 10D	**0.14**	**1.47**	7640	0.068	1050	6370	0.049	630	3820	0.044	335	3180	0.038	245
	≤ 12D	**0.11**	**1.31**	6690	0.060	800	5570	0.038	420	3340	0.034	225	2790	0.029	165
	> 12D	**0.09**	**1.19**	5730	0.051	590	4780	0.028	260	2870	0.025	140	2390	0.022	105

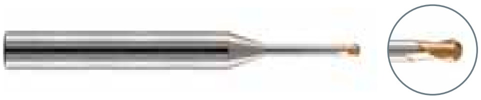
ROUND RIB

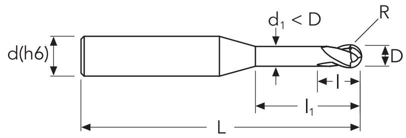
α	n (rpm)	Vf (mm/min)
45°	x 1.65	x 1.65
30°	x 1.30	x 1.30
15°	x 1.15	x 1.15

MEXLNB206

cylindrical shank, 2 flutes ball nose,
extended and reduced neck, 6 mm. shank

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL

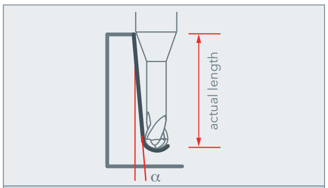




P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

ROUND RIB



D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	actual length according to α angle					EDP No.	Stock
										30′	1°	1°30′	2°	3°		
0.5	0/-0.020	0.25	0/-0.020	6	0.5	2.5	0.45	60	2	2.67	2.75	2.82	2.90	2.90	MEXLNB2005026	h
0.6	0/-0.020	0.30	0/-0.020	6	0.6	6	0.55	60	2	6.28	6.48	6.67	6.87	6.87	MEXLNB2006066	h
0.8	0/-0.020	0.40	0/-0.020	6	0.8	4	0.75	60	2	4.21	4.34	4.46	4.58	4.58	MEXLNB2008046	h
0.8	0/-0.020	0.40	0/-0.020	6	0.8	8	0.75	60	2	8.35	8.61	8.86	9.12	9.12	MEXLNB2008086	h
1	0/-0.020	0.50	0/-0.020	6	1.5	5	0.95	60	2	5.34	5.50	5.65	5.81	5.81	MEXLNB2010056	h
1	0/-0.020	0.50	0/-0.020	6	1.5	8	0.95	60	2	8.44	8.70	8.96	9.22	9.22	MEXLNB2010086	h
1	0/-0.020	0.50	0/-0.020	6	1.5	12	0.95	60	2	12.57	12.97	13.36	13.75	13.75	MEXLNB2010126	h
1.2	0/-0.020	0.60	0/-0.020	6	1.8	6	1.15	60	2	6.37	6.56	6.74	6.93	6.93	MEXLNB2012066	h
1.5	0/-0.020	0.75	0/-0.020	6	2.3	8	1.45	60	2	8.43	8.68	8.93	9.18	9.18	MEXLNB2015086	h
1.5	0/-0.020	0.75	0/-0.020	6	2.3	12	1.45	60	2	12.57	12.95	13.34	13.72	13.72	MEXLNB2015126	h
1.5	0/-0.020	0.75	0/-0.020	6	2.3	16	1.45	60	2	16.70	17.22	17.74	18.26	18.26	MEXLNB2015166	h
1.6	0/-0.020	0.80	0/-0.020	6	2.4	16	1.55	60	2	16.70	17.22	17.73	18.25	18.25	MEXLNB2016166	h
1.8	0/-0.020	0.90	0/-0.020	6	2.7	16	1.75	60	2	16.70	17.21	17.72	18.24	18.24	MEXLNB2018166	h
2	0/-0.020	1.00	0/-0.020	6	3	12	1.95	60	2	12.56	12.93	13.31	13.69	13.69	MEXLNB2020126	h
2	0/-0.020	1.00	0/-0.020	6	3	16	1.95	60	2	16.69	17.2	17.71	18.22	18.22	MEXLNB2020166	h
2	0/-0.020	1.00	0/-0.020	6	3	20	1.95	75	2	20.83	21.47	22.12	22.76	22.76	MEXLNB2020206	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXLNB206

Material Group ISO 513				P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm				< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae				**ap x 0.2D**			**ap x 0.1D**			**ap x 0.1D**			**ap x 0.1D**		
Vc (m/min)				**110-130**			**90-110**			**50-70**			**45-55**		
D (mm)	l1 (mm)	ap (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.5	**≤ 6D**	**0.03**	**0.22**	40000	0.015	1220	40000	0.014	1100	38220	0.012	935	31850	0.011	680
	≤ 10D	**0.02**	**0.22**	40000	0.015	1210	40000	0.011	870	25480	0.010	495	21230	0.008	360
0.8	**≤ 6D**	**0.04**	**0.35**	40000	0.023	1800	39810	0.020	1610	23890	0.018	860	19900	0.016	625
	≤ 10D	**0.03**	**0.29**	38220	0.018	1380	31850	0.013	830	19110	0.012	440	15920	0.010	320
1	**≤ 6D**	**0.05**	**0.44**	38220	0.027	2060	31850	0.024	1550	19110	0.022	825	15920	0.019	600
	≤ 8D	**0.04**	**0.40**	34390	0.024	1670	28660	0.020	1130	17200	0.017	600	14330	0.015	440
	≤ 12D	**0.03**	**0.33**	26750	0.019	1010	22290	0.012	530	13380	0.011	285	11150	0.009	205
1.2	**≤ 6D**	**0.06**	**0.52**	31850	0.032	2010	21230	0.028	1200	15920	0.025	800	13270	0.022	585
1.5	**≤ 6D**	**0.08**	**0.65**	25480	0.041	2060	21230	0.036	1550	12740	0.032	825	10620	0.028	600
	≤ 8D	**0.06**	**0.61**	22930	0.036	1670	19110	0.030	1130	11460	0.026	600	9550	0.023	440
	≤ 12D	**0.04**	**0.49**	17830	0.028	1010	14860	0.018	530	8920	0.016	285	7430	0.014	205
1.6	**≤ 10D**	**0.06**	**0.59**	19110	0.030	1130	15920	0.021	680	9550	0.019	360	7960	0.017	265
1.8	**≤ 10D**	**0.06**	**0.66**	16990	0.032	1100	14150	0.023	660	8490	0.021	350	7080	0.018	255
2	**≤ 6D**	**0.10**	**0.87**	19110	0.054	2060	15920	0.049	1550	9550	0.043	825	7960	0.038	600
	≤ 8D	**0.09**	**0.81**	17200	0.049	1670	14330	0.039	1130	8600	0.035	600	7170	0.031	440
	≤ 10D	**0.07**	**0.74**	15290	0.043	1320	12740	0.031	790	7640	0.028	420	6370	0.024	310

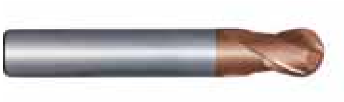
ROUND RIB

α	n (rpm)	Vf (mm/min)
45°	x 1.65	x 1.65
30°	x 1.30	x 1.30
15°	x 1.15	x 1.15

MEXCSB2

cylindrical shank, 2 flutes ball nose

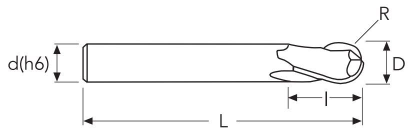
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.030	0.50	+/-0.010	3	3		38	2	MEXCSB2010	h
1.5	0/-0.030	0.75	+/-0.010	3	3		38	2	MEXCSB2015	h
2	0/-0.030	1.00	+/-0.010	6	3		50	2	MEXCSB2020	h
2.5	0/-0.030	1.25	0/-0.020	4	4		50	2	MEXCSB202550	h
3	0/-0.030	1.50	+/-0.010	6	4		50	2	MEXCSB2030	h
4	0/-0.030	2.00	+/-0.010	6	5		54	2	MEXCSB2040	h
5	0/-0.030	2.50	+/-0.010	6	6		54	2	MEXCSB2050	h
6	0/-0.030	3.00	+/-0.010	6	12		60	2	MEXCSB2060	h
8	0/-0.030	4.00	+/-0.010	8	14		60	2	MEXCSB2080	h
10	0/-0.030	5.00	+/-0.010	10	18		70	2	MEXCSB2100	h
12	0/-0.030	6.00	+/-0.010	12	22		80	2	MEXCSB2120	h
14	0/-0.030	7.00	0/-0.020	14	32		90	2	MEXCSB2140	h
16	0/-0.030	8.00	0/-0.020	16	32		90	2	MEXCSB2160	h
18	0/-0.030	9.00	0/-0.020	18	38		100	2	MEXCSB2180	h
20	0/-0.030	10.00	0/-0.020	20	38		100	2	MEXCSB2200	h

h stock standard f non-stock standard m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

MEXCSB2

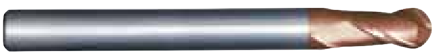
COPYING	Material Group ISO 513		P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
	Hardness/Rm		< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
	ap x ae		**0.05D x 0.2D**			**0.05D x 0.1D**			**0.05D x 0.1D**			**0.05D x 0.1D**		
	Vc (m/min)		**120-160**			**80-120**			**60-100**			**50-70**		
	D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	1	**0.44**	40000	0.009	720	31850	0.008	520	25480	0.007	370	19110	0.006	240
	1.5	**0.79**	29720	0.012	710	21230	0.011	460	16990	0.010	330	12740	0.008	210
	2	**1.20**	22290	0.012	530	15920	0.011	340	12740	0.010	240	9550	0.008	160
	2.5	**1.65**	17830	0.015	530	12740	0.014	340	10190	0.012	240	7640	0.011	160
	3	**2.14**	14860	0.018	530	10620	0.016	340	8490	0.014	240	6370	0.013	160
	4	**3.20**	11150	0.025	560	7960	0.023	360	6370	0.020	250	4780	0.018	170
	5	**4.33**	8920	0.032	570	6370	0.029	370	5100	0.026	260	3820	0.022	170
	6	**5.50**	7430	0.038	560	5310	0.034	360	4250	0.030	260	3180	0.027	170
	8	**7.84**	5570	0.048	530	3980	0.043	340	3180	0.038	240	2390	0.034	160
	10	**10.00**	4460	0.057	510	3180	0.051	330	2550	0.046	230	1910	0.040	150
	12	**11.76**	3720	0.067	500	2650	0.060	320	2120	0.054	230	1590	0.047	150
	14	**12.83**	3180	0.08	510	2270	0.072	330	1820	0.064	230	1360	0.056	150
	16	**12.80**	2790	0.095	530	1990	0.086	340	1590	0.076	240	1190	0.067	160
	18	**10.80**	2480	0.108	540	1770	0.097	340	1420	0.086	250	1060	0.076	160
	20	**12.00**	2230	0.108	480	1590	0.097	310	1270	0.086	220	960	0.076	150

	α	n (rpm)	Vf (mm/min)
α	15°	x 1.1	x 1.1

MEXCLSB2

cylindrical shank, 2 flutes ball nose, long reach

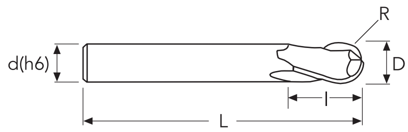
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.012	0.50	+/-0.010	4	2.5		50	2	MEXCLSB2010	h
1.2	0/-0.030	0.60	0/-0.020	4	3		50	2	MEXCLSB2012	h
1.5	0/-0.012	0.75	+/-0.010	4	4		50	2	MEXCLSB2015	h
2	0/-0.012	1.00	+/-0.010	6	5		50	2	MEXCLSB2020	h
2.5	0/-0.012	1.25	+/-0.010	6	6		60	2	MEXCLSB2025	h
3	0/-0.012	1.50	+/-0.010	6	8		60	2	MEXCLSB2030	h
4	0/-0.012	2.00	+/-0.010	6	8		70	2	MEXCLSB2040	h
5	0/-0.012	2.50	+/-0.010	6	10		80	2	MEXCLSB2050	h
6	0/-0.012	3.00	+/-0.010	6	12		90	2	MEXCLSB2060	h
8	0/-0.015	4.00	+/-0.010	8	14		100	2	MEXCLSB2080	h
10	0/-0.015	5.00	+/-0.010	10	18		100	2	MEXCLSB2100	h
12	0/-0.015	6.00	+/-0.010	12	22		110	2	MEXCLSB2120	h
14	0/-0.030	7.00	0/-0.020	14	32		125	2	MEXCLSB2140	h
16	0/-0.030	8.00	0/-0.020	16	32		150	2	MEXCLSB2160	h
20	0/-0.030	10.00	0/-0.020	20	38		150	2	MEXCLSB2200	h

h stock standard f non-stock standard m stock exhaustion

CUTTING PARAMETERS

MEXCLSB2

Material Group ISO 513		P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
Hardness/Rm		< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
ap x ae		**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**		
Vc (m/min)		**100-140**			**80-120**			**60-80**			**40-60**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.44**	38220	0.015	1150	31850	0.014	860	22290	0.012	530	15920	0.011	330
2	**0.87**	19110	0.021	810	15920	0.019	610	11150	0.017	380	7960	0.015	240
3	**1.31**	12740	0.027	690	10620	0.024	520	7430	0.022	320	5310	0.019	200
4	**1.74**	9550	0.037	700	7960	0.033	520	5570	0.029	330	3980	0.026	200
5	**2.18**	7640	0.045	690	6370	0.041	520	4460	0.036	320	3180	0.032	200
6	**2.62**	6370	0.051	650	5310	0.046	490	3720	0.041	300	2650	0.036	190
8	**3.49**	4780	0.060	570	3980	0.054	430	2790	0.048	270	1990	0.042	170
10	**4.36**	3820	0.068	520	3180	0.061	390	2230	0.054	240	1590	0.048	150
12	**5.23**	3180	0.077	490	2650	0.069	360	1860	0.061	230	1330	0.054	140
14	**6.10**	2730	0.089	490	2270	0.080	360	1590	0.071	230	1140	0.062	140
16	**6.97**	2390	0.102	490	1990	0.092	370	1390	0.082	230	1000	0.071	140
18	**7.85**	2120	0.115	490	1770	0.103	370	1240	0.092	230	880	0.080	140
20	**8.72**	1910	0.132	500	1590	0.119	380	1110	0.106	230	800	0.092	150

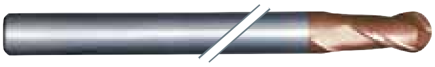
α	n (rpm)	Vf (mm/min)
30°	x 0.8	x 0.8
15°	x 0.7	x 0.7
0°	x 0.6	x 0.6

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

MEX253

cylindrical shank, 2 flutes ball nose, extra long reach

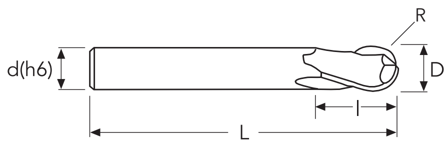
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
★		★			★

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.50	0/-0.020	4	3		75	2	MEX25301075	h
1	0/-0.020	0.50	0/-0.020	4	3		100	2	MEX253010100	h
1.5	0/-0.020	0.75	0/-0.020	4	3		75	2	MEX25301575	h
1.5	0/-0.020	0.75	0/-0.020	4	3		100	2	MEX253015100	h
2	0/-0.020	1.00	0/-0.020	4	4		75	2	MEX25302075	h
2	0/-0.020	1.00	0/-0.020	4	4		100	2	MEX253020100	h
3	0/-0.025	1.50	0/-0.020	6	5		75	2	MEX25303075	h
3	0/-0.025	1.50	0/-0.020	6	5		100	2	MEX253030	h
4	0/-0.025	2.00	0/-0.020	6	8		100	2	MEX253040	h
5	0/-0.025	2.50	0/-0.020	6	9		100	2	MEX253050100	h
6	0/-0.025	3.00	0/-0.020	6	10		150	2	MEX253060150	h
8	0/-0.030	4.00	0/-0.020	8	12		150	2	MEX253080	h
10	0/-0.030	5.00	0/-0.020	10	14		150	2	MEX25310150	h
12	0/-0.030	6.00	0/-0.020	12	16		150	2	MEX25312150	h
16	0/-0.030	8.00	0/-0.020	16	32		200	2	MEX253160	h
20	0/-0.030	10.00	0/-0.020	20	38		200	2	MEX253200	h

h stock standard   f non-stock standard   m stock exhaustion

CUTTING PARAMETERS

MEX253

α 45°		Material Group ISO 513	P2 P3 P4 K1 K2			P4 P5 K3			P6 K4			H1 H4 H5		
		Hardness/Rm	< 1000 N/mm²			< 35 HRC			35 - 45 HRC			45 - 55 HRC		
		ap x ae	**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**		
		Vc (m/min)	**90-130**			**60-100**			**50-70**			**30-50**		
	D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	1	**0.44**	35030	0.015	1050	25480	0.014	690	19110	0.012	460	12740	0.011	270
	2	**0.87**	17520	0.021	740	12740	0.019	490	9550	0.017	320	6370	0.015	190
	3	**1.31**	11680	0.027	640	8490	0.024	420	6370	0.022	280	4250	0.019	160
	4	**1.74**	8760	0.037	640	6370	0.033	420	4780	0.029	280	3180	0.026	160
	5	**2.18**	7010	0.045	630	5100	0.041	410	3820	0.036	280	2550	0.032	160
	6	**2.62**	5840	0.051	600	4250	0.046	390	3180	0.041	260	2120	0.036	150
	8	**3.49**	4380	0.060	520	3180	0.054	340	2390	0.048	230	1590	0.042	130
	10	**4.36**	3500	0.068	480	2550	0.061	310	1910	0.054	210	1270	0.048	120
	12	**5.23**	2920	0.077	450	2120	0.069	290	1590	0.061	190	1060	0.054	110
	14	**6.10**	2500	0.089	450	1820	0.080	290	1360	0.071	190	910	0.062	110
	16	**6.97**	2190	0.102	450	1590	0.092	290	1190	0.082	190	800	0.071	110
	18	**7.85**	1950	0.115	450	1420	0.103	290	1060	0.092	190	710	0.080	110
	20	**8.72**	1750	0.132	460	1270	0.119	300	960	0.106	200	640	0.092	120

COPYING	α	n (rpm)	Vf (mm/min)
	30°	x 0.8	x 0.8
	15°	x 0.7	x 0.7
	0°	x 0.6	x 0.6

UH

STEEL AND HARDENED STEEL < 70 HRC

Nano micrograin and UH RED TiSi base coating for high performance milling on hardened steel up to 70 HRC. High reliability and long life in dry milling operation adopting high speed or high feed strategy. The cutting geometry has been specifically designed to obtain high precision and high quality surface finishing.

Nano micrograna e rivestimento UH RED a base TiSi per la fresatura di materiali temprati sino a 70 HRC. Grande affidabilità e durata nell'utilizzo di strategie di lavorazione ad alta velocità o alto avanzamento e con la possibilità di evitare l'utilizzo del refrigerante. Le geometrie di taglio specifiche garantiscono elevata precisione ed eccellente finitura della superficie lavorata.

Nano-Mikrokörnung und Beschichtung UH RED auf TiSi-Basis für das Fräsen von gehärteten Materialien bis zu 70 HRC. Hohe Zuverlässigkeit und lange Standzeit auch bei Bearbeitungsverfahren mit hoher Geschwindigkeit und großem Vorschub und mit der Möglichkeit, ohne Kühlmittel zu arbeiten. Die spezifischen Schnittgeometrien gewährleisten eine hohe Präzision und eine hervorragende Endbearbeitung der bearbeiteten Fläche.

Nano micrograin et revêtement UH RED à base TiSi pour le fraisage de matériaux trempés jusqu'à 70 HRC. Grande fiabilité et durée dans l'utilisation stratégique d'usinage à haute vitesse ou avancement élevé et avec la possibilité d'éviter l'utilisation de lubrifiant. Les géométries de coupe spécifiques garantissent une précision élevée et une excellente finition de la surface usinée.

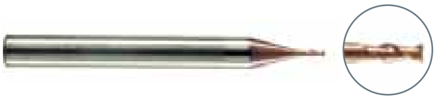
Nano micrograno y revestimiento UH RED a base de TiSi para el fresado de materiales templados hasta 70 HRC. Gran fiabilidad y duración en la utilización de estrategias de elaboración a alta velocidad o alto avance con la posibilidad de evitar la utilización del refrigerante. Las geometrías de corte específicas garantizan una elevada precisión y excelente acabado de la superficie trabajada.

Микрозернистая наноструктура твердого сплава и покрытие UH RED на основе TiSi служат для фрезерования закалённых сталей с твёрдостью до 70 HRC. Высокая надёжность и стойкость при работе с высокой скоростью резания и подачей без использования СОЖ. Режущая геометрия специально создана для достижения высокой точности и низкой шероховатости обработанной поверхности.

UHM204

cylindrical shank, 2F, miniature

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | SQUARE | Z2



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SLOTTING

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.1	0/-0.020			4	0.2		40	2	UHM200104	h
0.2	0/-0.020			4	0.3		50	2	UHM200204	h
0.3	0/-0.020			4	0.4		50	2	UHM200304	h
0.4	0/-0.020			4	0.6		50	2	UHM200404	h
0.5	0/-0.020			4	0.7		50	2	UHM200504	h
0.6	0/-0.020			4	0.9		50	2	UHM200604	h
0.7	0/-0.020			4	1		50	2	UHM200704	h
0.8	0/-0.020			4	1.2		50	2	UHM200804	h
0.9	0/-0.020			4	1.4		50	2	UHM200904	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UHM204

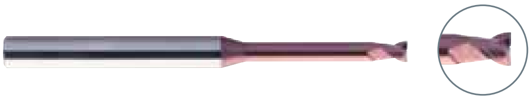
	Material Group ISO 513		P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
	Hardness/Rm		< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
	ap x ae		ap x D			ap x D			ap x D			ap x D		
	Vc (m/min)		80-120			60-100			50-70			30-50		
SLOTTING	D (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	0.1	**0.01**	40000	0.002	160	40000	0.002	140	40000	0.002	130	40000	0.001	110
	0.2	**0.01**	40000	0.003	240	40000	0.003	220	40000	0.002	190	40000	0.002	170
	0.3	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	40000	0.003	225
	0.4	**0.02**	40000	0.006	480	40000	0.005	430	40000	0.005	385	31850	0.004	270
	0.5	**0.03**	40000	0.007	560	40000	0.006	500	38220	0.006	430	25480	0.005	250
	0.6	**0.03**	40000	0.008	640	40000	0.007	580	31850	0.006	410	21230	0.006	240
	0.8	**0.04**	39810	0.010	800	31850	0.009	570	23890	0.008	380	15920	0.007	225
	0.9	**0.05**	35390	0.012	850	28310	0.011	610	21230	0.010	410	14150	0.008	240

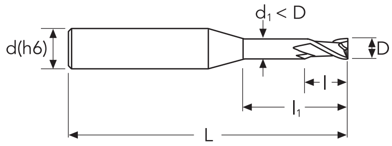
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHLN2

cylindrical shank, 2F, extended and reduced neck

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | SQUARE | Z2

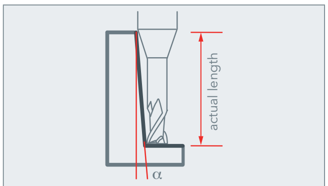




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

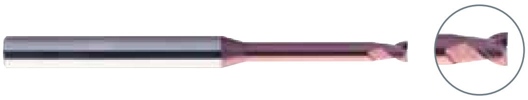
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
0.2	0/-0.020			4	0.3	0.5	0.16	50	2	0.57	0.59	0.61	0.63	0.68	UHLN2002005	h
0.2	0/-0.020			4	0.3	1	0.16	50	2	1.09	1.12	1.16	1.21	1.30	UHLN200201	h
0.2	0/-0.020			4	0.3	1.5	0.16	50	2	1.60	1.66	1.72	1.78	1.91	UHLN2002015	h
0.3	0/-0.020			4	0.4	1	0.26	50	2	1.09	1.12	1.16	1.21	1.30	UHLN200301	h
0.3	0/-0.020			4	0.4	2	0.26	50	2	2.12	2.19	2.27	2.35	2.53	UHLN200302	h
0.3	0/-0.020			4	0.4	3	0.26	50	2	3.15	3.26	3.38	3.50	3.76	UHLN200303	h
0.4	0/-0.020			4	0.6	2	0.37	50	2	2.12	2.19	2.27	2.35	2.53	UHLN200402	h
0.4	0/-0.020			4	0.6	3	0.37	50	2	3.15	3.26	3.38	3.50	3.76	UHLN200403	h
0.4	0/-0.020			4	0.6	4	0.37	50	2	4.19	4.33	4.49	4.65	5.00	UHLN200404	h
0.4	0/-0.020			4	0.6	5	0.37	50	2	5.22	5.40	5.59	5.79	6.23	UHLN200405	h
0.5	0/-0.020			4	0.7	2	0.45	50	2	2.16	2.23	2.31	2.40	2.57	UHLN200502	h
0.5	0/-0.020			4	0.7	4	0.45	50	2	4.23	4.37	4.53	4.69	5.04	UHLN200504	h
0.5	0/-0.020			4	0.7	6	0.45	50	2	6.29	6.51	6.74	6.98	7.51	UHLN200506	h
0.5	0/-0.020			4	0.7	8	0.45	50	2	8.36	8.65	8.96	9.28	9.98	UHLN200508	h
0.6	0/-0.020			4	0.9	2	0.55	50	2	2.16	2.23	2.31	2.40	2.57	UHLN200602	h
0.6	0/-0.020			4	0.9	4	0.55	50	2	4.23	4.37	4.53	4.69	5.04	UHLN200604	h
0.6	0/-0.020			4	0.9	6	0.55	50	2	6.29	6.51	6.74	6.98	7.51	UHLN200606	h
0.6	0/-0.020			4	0.9	8	0.55	50	2	8.36	8.65	8.96	9.28	9.98	UHLN200608	h
0.6	0/-0.020			4	0.9	10	0.55	50	2	10.43	10.79	11.17	11.57	12.44	UHLN200610	h
0.7	0/-0.020			4	1.0	2	0.65	50	2	2.16	2.23	2.31	2.40	2.57	UHLN200702	h
0.7	0/-0.020			4	1.0	4	0.65	50	2	4.23	4.37	4.53	4.69	5.04	UHLN200704	h
0.7	0/-0.020			4	1.0	6	0.65	50	2	6.29	6.51	6.74	6.98	7.51	UHLN200706	h
0.7	0/-0.020			4	1.0	8	0.65	50	2	8.36	8.65	8.96	9.28	9.98	UHLN200708	h
0.7	0/-0.020			4	1.0	10	0.65	50	2	10.43	10.79	11.17	11.57	12.44	UHLN200710	h
0.8	0/-0.020			4	1.2	4	0.75	50	2	4.23	4.37	4.53	4.69	5.04	UHLN200804	h
0.8	0/-0.020			4	1.2	6	0.75	50	2	6.29	6.51	6.74	6.98	7.51	UHLN200806	h
0.8	0/-0.020			4	1.2	8	0.75	50	2	8.36	8.65	8.96	9.28	9.98	UHLN200808	h
0.8	0/-0.020			4	1.2	10	0.75	50	2	10.43	10.79	11.17	11.57	12.44	UHLN200810	h
0.8	0/-0.020			4	1.2	12	0.75	50	2	12.49	12.93	13.38	13.87	14.91	UHLN200812	h
0.9	0/-0.020			4	1.4	6	0.85	50	2	6.29	6.51	6.74	6.98	7.51	UHLN200906	h
0.9	0/-0.020			4	1.4	8	0.85	50	2	8.36	8.65	8.96	9.28	9.98	UHLN200908	h
0.9	0/-0.020			4	1.4	10	0.85	50	2	10.43	10.79	11.17	11.57	12.44	UHLN200910	h
0.9	0/-0.020			4	1.4	15	0.85	50	2	15.6	16.14	16.71	17.31	18.61	UHLN200915	h
1	0/-0.020			4	1.5	6	0.95	50	2	6.39	6.61	6.84	7.09	7.62	UHLN201006	h
1	0/-0.020			4	1.5	8	0.95	50	2	8.46	8.75	9.06	9.38	10.09	UHLN201008	h
1	0/-0.020			4	1.5	10	0.95	50	2	10.52	10.89	11.27	11.68	12.56	UHLN201010	h
1	0/-0.020			4	1.5	12	0.95	50	2	12.59	13.03	13.49	13.97	15.02	UHLN201012	h
1	0/-0.020			4	1.5	14	0.95	50	2	14.66	15.17	15.70	16.27	17.49	UHLN201014	h
1	0/-0.020			4	1.5	16	0.95	50	2	16.73	17.30	17.92	18.56	19.96	UHLN201016	h

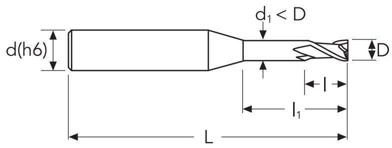
h stock standard f non-standard stock m stock exhaustion

UHLN2

cylindrical shank, 2F, extended and reduced neck

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | SQUARE | Z2

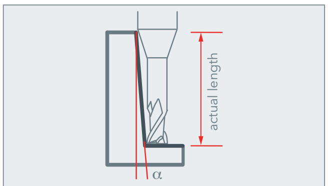




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1.2	0/-0.020			4	1.8	6	1.15	50	2	6.39	6.61	6.84	7.09	7.62	UHLN201206	h
1.2	0/-0.020			4	1.8	8	1.15	50	2	8.46	8.75	9.06	9.38	10.09	UHLN201208	h
1.2	0/-0.020			4	1.8	10	1.15	50	2	10.52	10.89	11.27	11.68	12.56	UHLN201210	h
1.2	0/-0.020			4	1.8	12	1.15	50	2	12.59	13.03	13.49	13.97	15.02	UHLN201212	h
1.4	0/-0.020			4	2.1	6	1.35	50	2	6.39	6.61	6.84	7.09	7.62	UHLN201406	h
1.4	0/-0.020			4	2.1	8	1.35	50	2	8.46	8.75	9.06	9.38	10.09	UHLN201408	h
1.4	0/-0.020			4	2.1	10	1.35	50	2	10.52	10.89	11.27	11.68	12.56	UHLN201410	h
1.4	0/-0.020			4	2.1	12	1.35	50	2	12.59	13.03	13.49	13.97	15.02	UHLN201412	h
1.4	0/-0.020			4	2.1	14	1.35	50	2	14.66	15.17	15.70	16.27	17.49	UHLN201414	h
1.4	0/-0.020			4	2.1	16	1.35	50	2	16.73	17.30	17.92	18.56	19.96	UHLN201416	h
1.5	0/-0.020			4	2.3	6	1.45	50	2	6.39	6.61	6.84	7.09	7.62	UHLN201506	h
1.5	0/-0.020			4	2.3	8	1.45	50	2	8.46	8.75	9.06	9.38	10.09	UHLN201508	h
1.5	0/-0.020			4	2.3	10	1.45	50	2	10.52	10.89	11.27	11.68	12.56	UHLN201510	h
1.5	0/-0.020			4	2.3	12	1.45	50	2	12.59	13.03	13.49	13.97	15.02	UHLN201512	h
1.5	0/-0.020			4	2.3	14	1.45	50	2	14.66	15.17	15.7	16.27	17.49	UHLN201514	h
1.5	0/-0.020			4	2.3	16	1.45	50	2	16.73	17.30	17.92	18.56	19.96	UHLN201516	h
1.5	0/-0.020			4	2.3	18	1.45	60	2	18.79	19.44	20.13	20.86	22.43	UHLN201518	h
1.5	0/-0.020			4	2.3	20	1.45	60	2	20.86	21.58	22.35	23.15	-	UHLN201520	h
1.6	0/-0.020			4	2.4	6	1.55	50	2	6.39	6.61	6.84	7.09	7.62	UHLN201606	h
1.6	0/-0.020			4	2.4	8	1.55	50	2	8.46	8.75	9.06	9.38	10.09	UHLN201608	h
1.6	0/-0.020			4	2.4	10	1.55	50	2	10.52	10.89	11.27	11.68	12.56	UHLN201610	h
1.6	0/-0.020			4	2.4	12	1.55	50	2	12.59	13.03	13.49	13.97	15.02	UHLN201612	h
1.6	0/-0.020			4	2.4	14	1.55	50	2	14.66	15.17	15.70	16.27	17.49	UHLN201614	h
1.6	0/-0.020			4	2.4	16	1.55	50	2	16.73	17.30	17.92	18.56	19.96	UHLN201616	h
1.6	0/-0.020			4	2.4	18	1.55	60	2	18.79	19.44	20.13	20.86	22.43	UHLN201618	h
1.6	0/-0.020			4	2.4	20	1.55	60	2	20.86	21.58	22.35	23.15	-	UHLN201620	h
1.8	0/-0.020			4	2.7	6	1.75	50	2	6.39	6.61	6.84	7.09	7.62	UHLN201806	h
1.8	0/-0.020			4	2.7	8	1.75	50	2	8.46	8.75	9.06	9.38	10.09	UHLN201808	h
1.8	0/-0.020			4	2.7	10	1.75	50	2	10.52	10.89	11.27	11.68	12.56	UHLN201810	h
1.8	0/-0.020			4	2.7	12	1.75	50	2	12.59	13.03	13.49	13.97	15.02	UHLN201812	h
1.8	0/-0.020			4	2.7	14	1.75	50	2	14.66	15.17	15.70	16.27	17.49	UHLN201814	h
1.8	0/-0.020			4	2.7	16	1.75	50	2	16.73	17.30	17.92	18.56	19.96	UHLN201816	h
1.8	0/-0.020			4	2.7	18	1.75	60	2	18.79	19.44	20.13	20.86	-	UHLN201818	h
1.8	0/-0.020			4	2.7	20	1.75	60	2	20.86	21.58	22.35	23.15	-	UHLN201820	h
2	0/-0.020			4	3	6	1.95	50	2	6.39	6.61	6.84	7.09	7.62	UHLN202006	h
2	0/-0.020			4	3	8	1.95	50	2	8.46	8.75	9.06	9.38	10.09	UHLN202008	h
2	0/-0.020			4	3	10	1.95	50	2	10.52	10.89	11.27	11.68	12.56	UHLN202010	h
2	0/-0.020			4	3	12	1.95	50	2	12.59	13.03	13.49	13.97	15.02	UHLN202012	h
2	0/-0.020			4	3	14	1.95	50	2	14.66	15.17	15.70	16.27	17.49	UHLN202014	h

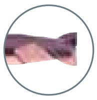
h stock standard f non-standard stock m stock exhaustion

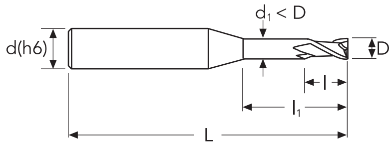
OSAWA

UHLN2

cylindrical shank, 2F, extended and reduced neck

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | SQUARE | Z2

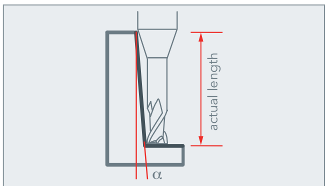




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
2	0/-0.020			4	3	16	1.95	50	2	16.73	17.30	17.92	18.56	-	UHLN202016	h
2	0/-0.020			4	3	18	1.95	60	2	18.79	19.44	20.13	20.86	-	UHLN202018	h
2	0/-0.020			4	3	20	1.95	60	2	20.86	21.58	22.35	23.15	-	UHLN202020	h
2	0/-0.020			4	3	25	1.95	75	2	26.03	26.93	27.88	-	-	UHLN202025	h
2	0/-0.020			4	3	30	1.95	75	2	31.2	32.28	33.42	-	-	UHLN202030	h
2.5	0/-0.020			4	3.7	8	2.4	50	2	8.46	8.75	9.06	9.38	10.09	UHLN202508	h
2.5	0/-0.020			4	3.7	10	2.4	50	2	10.52	10.89	11.27	11.68	12.56	UHLN202510	h
2.5	0/-0.020			4	3.7	12	2.4	50	2	12.59	13.03	13.49	13.97	-	UHLN202512	h
2.5	0/-0.020			4	3.7	14	2.4	50	2	14.66	15.17	15.70	16.27	-	UHLN202514	h
2.5	0/-0.020			4	3.7	16	2.4	50	2	16.73	17.30	17.92	18.56	-	UHLN202516	h
2.5	0/-0.020			4	3.7	18	2.4	60	2	18.79	19.44	20.13	20.86	-	UHLN202518	h
2.5	0/-0.020			4	3.7	20	2.4	60	2	20.86	21.58	22.35	-	-	UHLN202520	h
2.5	0/-0.020			4	3.7	25	2.4	75	2	24.1	24.94	25.83	-	-	UHLN202525	h
2.5	0/-0.020			4	3.7	30	2.4	75	2	31.2	32.28	-	-	-	UHLN202530	h
3	0/-0.025			6	4.5	8	2.85	50	2	8.65	8.95	9.26	9.60	10.31	UHLN203008	h
3	0/-0.025			6	4.5	10	2.85	50	2	10.72	11.09	11.48	11.89	12.78	UHLN203010	h
3	0/-0.025			6	4.5	12	2.85	50	2	12.78	13.23	13.69	14.18	15.25	UHLN203012	h
3	0/-0.025			6	4.5	14	2.85	50	2	14.85	15.36	15.91	16.48	17.72	UHLN203014	h
3	0/-0.025			6	4.5	16	2.85	60	2	16.92	17.50	18.12	18.77	20.18	UHLN203016	h
3	0/-0.025			6	4.5	18	2.85	60	2	18.99	19.64	20.34	21.07	22.65	UHLN203018	h
3	0/-0.025			6	4.5	20	2.85	60	2	21.05	21.78	22.55	23.36	25.12	UHLN203020	h
3	0/-0.025			6	4.5	25	2.85	75	2	26.22	27.13	28.09	29.10	-	UHLN203025	h
4	0/-0.025			6	4.5	10	3.85	60	2	10.91	11.29	11.68	12.10	13.00	UHLN204010	h
4	0/-0.025			6	4.5	15	3.85	60	2	16.08	16.63	17.22	17.84	19.17	UHLN204015	h
4	0/-0.025			6	4.5	20	3.85	60	2	21.25	21.98	22.76	23.57	-	UHLN204020	h
4	0/-0.025			6	4.5	25	3.85	75	2	26.41	27.33	28.29	-	-	UHLN204025	h
4	0/-0.025			6	4.5	30	3.85	75	2	31.58	32.67	33.83	-	-	UHLN204030	h
4	0/-0.025			6	4.5	40	3.85	75	2	41.92	43.37	-	-	-	UHLN204040	h

h stock standard f non-standard stock m stock exhaustion

UHLN2

Material Group ISO 513			P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm			< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**80-120**			**60-100**			**50-70**			**30-50**		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.2	**≤ 6D**	**0.01**	40000	0.003	240	40000	0.003	220	40000	0.002	190	40000	0.002	170
	≤ 8D	**0.01**	40000	0.003	200	40000	0.002	180	40000	0.002	165	40000	0.002	145
	≤ 10D	**0.01**	40000	0.002	170	40000	0.002	150	40000	0.002	135	40000	0.001	120
	≤ 12D	**0.01**	40000	0.002	130	40000	0.001	120	40000	0.001	105	40000	0.001	90
0.3	**≤ 6D**	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	40000	0.003	225
	≤ 8D	**0.01**	40000	0.003	270	40000	0.003	240	40000	0.003	220	38200	0.002	180
	≤ 10D	**0.01**	40000	0.003	220	40000	0.003	200	40000	0.002	180	34000	0.002	135
	≤ 12D	**0.01**	40000	0.002	180	40000	0.002	160	40000	0.002	140	29700	0.002	90
0.4	**≤ 6D**	**0.02**	40000	0.006	480	40000	0.005	430	40000	0.005	385	31800	0.004	265
	≤ 8D	**0.02**	40000	0.005	410	40000	0.005	370	40000	0.004	325	28700	0.004	205
	≤ 10D	**0.01**	40000	0.004	340	40000	0.004	300	38200	0.003	255	25500	0.003	150
	≤ 12D	**0.01**	40000	0.003	260	40000	0.003	240	33400	0.003	175	22300	0.002	105
0.5	**≤ 6D**	**0.03**	40000	0.007	560	40000	0.006	500	38200	0.006	430	25500	0.005	250
	≤ 8D	**0.02**	40000	0.006	480	40000	0.005	430	34400	0.005	325	22900	0.004	190
	≤ 10D	**0.02**	40000	0.005	390	40000	0.004	350	30600	0.004	240	20400	0.003	140
	≤ 12D	**0.01**	35000	0.004	270	35700	0.003	250	26800	0.003	165	17800	0.003	95
0.6	**≤ 6D**	**0.03**	40000	0.008	640	40000	0.007	580	31800	0.006	405	21200	0.006	235
	≤ 8D	**0.03**	40000	0.007	540	38200	0.006	470	28700	0.005	310	19100	0.005	180
	≤ 10D	**0.02**	40000	0.006	450	34000	0.005	340	25500	0.004	230	17000	0.004	135
	≤ 12D	**0.02**	37200	0.004	330	29700	0.004	240	22300	0.004	155	14900	0.003	90
0.8	**≤ 6D**	**0.04**	39800	0.010	800	31800	0.009	570	23900	0.008	380	15900	0.007	225
	≤ 8D	**0.03**	35800	0.009	610	28700	0.008	440	21500	0.007	290	14300	0.006	170
	≤ 10D	**0.03**	31800	0.007	450	25500	0.006	320	19100	0.006	215	12700	0.005	125
	≤ 12D	**0.02**	27900	0.006	310	22300	0.005	220	16700	0.004	145	11100	0.004	85
1	**≤ 6D**	**0.05**	31800	0.012	760	25500	0.011	550	19100	0.010	365	12700	0.008	215
	≤ 8D	**0.04**	28700	0.010	590	22900	0.009	420	17200	0.008	280	11500	0.007	165
	≤ 10D	**0.04**	25500	0.008	430	20400	0.008	310	15300	0.007	205	10200	0.006	120
	≤ 12D	**0.03**	22300	0.007	290	17800	0.006	210	13400	0.005	140	8900	0.005	80
1.2	**≤ 6D**	**0.06**	26500	0.022	1170	21200	0.020	840	15900	0.018	560	10600	0.015	325
	≤ 8D	**0.05**	23900	0.019	890	19120	0.017	640	14340	0.015	430	9560	0.013	250
	≤ 10D	**0.04**	21200	0.015	650	16960	0.014	470	12720	0.012	315	8480	0.011	185
	≤ 12D	**0.03**	18600	0.012	450	14880	0.011	320	11160	0.010	215	7440	0.008	125
1.4	**≤ 6D**	**0.07**	22700	0.024	1090	18160	0.022	780	13620	0.019	525	9080	0.017	305
	≤ 8D	**0.06**	20500	0.020	840	16400	0.018	600	12300	0.016	400	8200	0.014	235
	≤ 10D	**0.05**	18200	0.017	610	14560	0.015	440	10920	0.013	295	7280	0.012	170
	≤ 12D	**0.04**	15900	0.013	420	12720	0.012	300	9540	0.011	200	6360	0.009	120
	≤ 15D	**0.03**	13600	0.011	290	10880	0.010	210	8160	0.009	140	5440	0.008	80
	> 15D	**0.02**	11400	0.007	160	9120	0.006	120	6840	0.006	80	4560	0.005	45
1.5	**≤ 6D**	**0.08**	21200	0.025	1060	16960	0.023	760	12720	0.020	510	8480	0.018	295
	≤ 8D	**0.06**	19100	0.021	810	15280	0.019	580	11460	0.017	390	7640	0.015	225
	≤ 10D	**0.05**	17000	0.018	590	13600	0.016	430	10200	0.014	285	6800	0.012	165
	≤ 12D	**0.04**	14900	0.014	410	11920	0.012	300	8940	0.011	195	5960	0.010	115
	≤ 15D	**0.03**	12700	0.011	290	10160	0.010	210	7620	0.009	135	5080	0.008	80
	> 15D	**0.02**	10600	0.008	160	8480	0.007	110	6360	0.006	75	4240	0.005	45
1.6	**≤ 6D**	**0.08**	19900	0.026	1030	15920	0.023	750	11940	0.021	495	7960	0.018	290
	≤ 8D	**0.07**	17900	0.022	790	14320	0.020	570	10740	0.018	380	7160	0.015	220
	≤ 10D	**0.06**	15900	0.018	580	12720	0.016	420	9540	0.015	280	6360	0.013	160
	≤ 12D	**0.04**	13900	0.014	400	11120	0.013	290	8340	0.011	190	5560	0.010	110
	≤ 15D	**0.04**	11900	0.012	280	9520	0.011	200	7140	0.009	135	4760	0.008	80
	> 15D	**0.02**	10000	0.008	160	8000	0.007	110	6000	0.006	75	4000	0.005	45

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

UHLN2

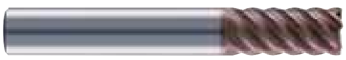
Material Group ISO 513			P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm			< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**80-120**			**60-100**			**50-70**			**30-50**		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1.8	**≤ 6D**	**0.09**	17700	0.028	990	14160	0.025	710	10620	0.022	475	7080	0.020	280
	≤ 8D	**0.08**	15900	0.024	760	12720	0.021	540	9540	0.019	365	6360	0.017	210
	≤ 10D	**0.06**	14200	0.020	560	11360	0.018	400	8520	0.016	265	5680	0.014	155
	≤ 12D	**0.05**	12400	0.015	380	9920	0.014	270	7440	0.012	185	4960	0.011	105
	≤ 15D	**0.04**	10600	0.013	270	8480	0.011	190	6360	0.010	130	4240	0.009	75
	> 15D	**0.03**	8800	0.008	150	7040	0.008	110	5280	0.007	70	3520	0.006	40
2	**≤ 6D**	**0.10**	15900	0.030	950	12720	0.027	690	9540	0.024	460	6360	0.021	265
	≤ 8D	**0.09**	14300	0.026	730	11440	0.023	530	8580	0.020	350	5720	0.018	205
	≤ 10D	**0.07**	12700	0.021	530	10160	0.019	380	7620	0.017	255	5080	0.015	150
	≤ 12D	**0.06**	11100	0.017	370	8880	0.015	260	6660	0.013	175	4440	0.012	105
	≤ 15D	**0.05**	9600	0.014	260	7680	0.012	190	5760	0.011	125	3840	0.009	75
	> 15D	**0.03**	9600	0.009	170	7680	0.008	120	5760	0.007	85	3840	0.006	50
2.5	**≤ 6D**	**0.13**	12700	0.035	890	10160	0.032	640	7620	0.028	425	5080	0.025	250
	≤ 8D	**0.11**	11500	0.030	680	9200	0.027	490	6900	0.024	330	4600	0.021	190
	≤ 10D	**0.09**	10200	0.025	500	8160	0.022	360	6120	0.020	240	4080	0.017	140
	≤ 12D	**0.07**	8900	0.019	340	7120	0.017	250	5340	0.015	165	3560	0.013	95
	≤ 15D	**0.06**	7600	0.016	240	6080	0.014	170	4560	0.013	115	3040	0.011	65
	> 15D	**0.04**	7600	0.011	160	6080	0.009	110	4560	0.008	75	3040	0.007	45
3	**≤ 6D**	**0.15**	10600	0.040	850	8480	0.036	610	6360	0.032	405	4240	0.028	235
	≤ 8D	**0.13**	9600	0.034	650	7680	0.031	470	5760	0.027	315	3840	0.024	185
	≤ 10D	**0.11**	8500	0.028	480	6800	0.025	340	5100	0.022	230	3400	0.020	135
	≤ 12D	**0.08**	7400	0.022	330	5920	0.020	230	4440	0.018	155	2960	0.015	90
	≤ 15D	**0.07**	6400	0.018	230	5120	0.016	170	3840	0.014	110	2560	0.013	65
	> 15D	**0.05**	6400	0.012	150	5120	0.011	110	3840	0.010	75	2560	0.008	45
4	**≤ 6D**	**0.20**	8000	0.050	800	6400	0.045	580	4800	0.040	385	3200	0.035	225
	≤ 8D	**0.17**	7200	0.043	610	5760	0.038	440	4320	0.034	295	2880	0.030	170
	≤ 10D	**0.14**	6400	0.035	450	5120	0.032	320	3840	0.028	215	2560	0.025	125
	≤ 12D	**0.11**	5600	0.028	310	4480	0.025	220	3360	0.022	150	2240	0.019	85
	≤ 15D	**0.09**	4800	0.023	220	3840	0.020	160	2880	0.018	105	1920	0.016	60
	> 15D	**0.06**	4800	0.015	140	3840	0.014	100	2880	0.012	70	1920	0.011	40

SQUARE RIB

UH600

cylindrical shank, multi flute

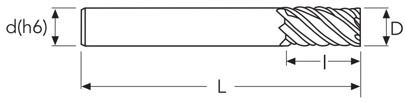
OSAWA NORM | UH | NMG UH RED | <70 HRC | 50° | SQUARE | Z6~Z8



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
3	0/-0.025			6	8		50	6	UH600030	h
4	0/-0.025			6	11		50	6	UH600040	h
5	0/-0.025			6	13		50	6	UH600050	h
6	0/-0.025			6	20		60	6	UH600060	h
8	0/-0.030			8	20		64	6	UH600080	h
10	0/-0.030			10	22		70	6	UH600100	h
12	0/-0.030			12	25		75	6	UH600120	h
14	0/-0.030			14	30		90	6	UH600140	h
16	0/-0.030			16	30		90	8	UH600160	h
20	0/-0.030			20	38		100	8	UH600200	h

h stock standard f non-standard stock m stock exhaustion

OSAWA

CUTTING PARAMETERS

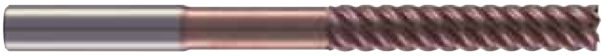
UH600

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**1.5D x 0.1D**			**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
Vc (m/min)	**140-180**			**100-140**			**80-100**			**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	16990	0.008	860	12740	0.008	580	9550	0.007	390	7430	0.006	260
4	12740	0.012	920	9550	0.011	620	7170	0.010	410	5570	0.008	280
5	10190	0.014	880	7640	0.013	590	5730	0.012	400	4460	0.010	270
6	8490	0.018	920	6370	0.016	620	4780	0.014	410	3720	0.013	280
8	6370	0.028	1050	4780	0.025	710	3580	0.022	470	2790	0.019	320
10	5100	0.034	1030	3820	0.030	690	2870	0.027	460	2230	0.024	310
12	4250	0.041	1040	3180	0.037	700	2390	0.033	470	1860	0.029	320
14	3640	0.048	1050	2730	0.043	710	2050	0.038	470	1590	0.034	320
16	3180	0.056	1080	2390	0.051	730	1790	0.045	480	1390	0.039	330
18	2830	0.066	1120	2120	0.059	760	1590	0.053	500	1240	0.046	340
20	2550	0.078	1190	1910	0.070	800	1430	0.062	540	1110	0.055	360

UH612

cylindrical shank, multi flute, long

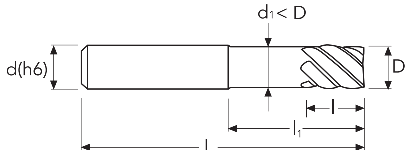
OSAWA NORM | UH | NMG UH RED | <70 HRC | 50° | SQUARE | Z6~Z8



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.025			6	19	30	2.80	75	6	UH612030	h
4	0/-0.025			6	19	32	3.70	75	6	UH612040	h
5	0/-0.025			6	19	32	4.60	75	6	UH612050	h
6	0/-0.025			6	38	60	5.50	100	6	UH612060	h
8	0/-0.030			8	41	60	7.40	100	6	UH612080	h
10	0/-0.030			10	57	85	9.20	125	6	UH612100	h
12	0/-0.030			12	75	110	11.00	150	6	UH612120	h
16	0/-0.030			16	75	110	15.00	150	8	UH612160	h
20	0/-0.030			20	75	110	19.00	150	8	UH612200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

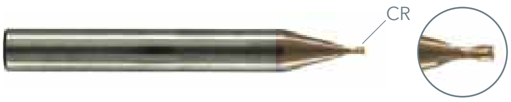
UH612

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
Vc (m/min)	**90-130**			**70-110**			**50-70**			**20-40**		
D (mm)	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**
3	11680	0.007	500	9550	0.006	370	6370	0.006	220	3180	0.005	100
4	8760	0.010	540	7170	0.009	390	4780	0.008	230	2390	0.007	100
5	7010	0.012	510	5730	0.011	380	3820	0.010	220	1910	0.009	100
6	5840	0.015	540	4780	0.014	390	3180	0.012	230	1590	0.011	100
8	4380	0.023	620	3580	0.021	450	2390	0.019	270	1190	0.016	120
10	3500	0.029	600	2870	0.026	440	1910	0.023	260	960	0.020	120
12	2920	0.035	610	2390	0.031	450	1590	0.028	260	800	0.024	120
14	2500	0.041	610	2050	0.037	450	1360	0.033	270	680	0.029	120
16	2190	0.048	630	1790	0.043	460	1190	0.038	270	600	0.034	120
18	1950	0.056	660	1590	0.050	480	1060	0.045	290	530	0.039	120
20	1750	0.066	700	1430	0.060	510	960	0.053	310	480	0.046	130

UHM206

cylindrical shank, 2F, miniature, 6 mm. shank

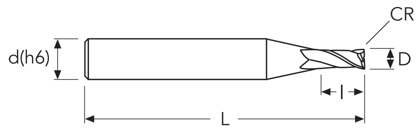
OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | SQUARE < Ø0.5 | RADIUS ≤ Ø0.5 | Z2



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SLOTTING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.3	0/-0.012			6	0.45		50	2	UHM200306	h
0.4	0/-0.012			6	0.6		50	2	UHM200406	h
0.5	0/-0.012	0.05	+/-0.010	6	0.7		50	2	UHM200506	h
0.6	0/-0.012	0.05	+/-0.010	6	0.9		50	2	UHM200606	h
0.8	0/-0.012	0.05	+/-0.010	6	1.2		50	2	UHM200806	h
1	0/-0.012	0.10	+/-0.010	6	1.5		50	2	UHM201006	h
1.5	0/-0.012	0.15	+/-0.010	6	2.2		50	2	UHM201506	h
2	0/-0.012	0.15	+/-0.010	6	2.2		50	2	UHM202006	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

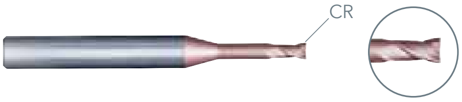
UHM206

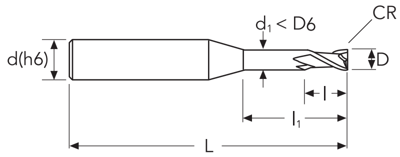
	Material Group ISO 513		P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
	Hardness/Rm		< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
	ap x ae		**ap x D**			**ap x D**			**ap x D**			**ap x D**		
	Vc (m/min)		**80-120**			**60-100**			**50-70**			**30-50**		
SLOTTING	D (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	0.3	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	40000	0.003	225
	0.4	**0.02**	40000	0.006	480	40000	0.005	430	40000	0.005	385	31850	0.004	270
	0.5	**0.03**	40000	0.007	560	40000	0.006	500	38220	0.006	430	25480	0.005	250
	0.6	**0.03**	40000	0.008	640	40000	0.007	580	31850	0.006	410	21230	0.006	240
	0.8	**0.04**	39810	0.010	800	31850	0.009	570	23890	0.008	380	15920	0.007	225
	1	**0.05**	31850	0.012	760	25480	0.011	550	19110	0.010	365	12740	0.008	215
	1.5	**0.08**	21230	0.025	1060	16990	0.023	760	12740	0.020	510	8490	0.018	295
	2	**0.10**	15920	0.030	960	12740	0.027	690	9550	0.024	460	6370	0.021	270

UH211

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | RADIUS | Z2

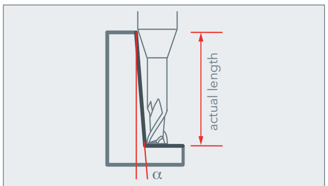




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1	0/-0.012	0.10	+/-0.010	4	2	4	0.95	50	2	4.36	4.60	4.86	5.16	5.89	UH2110100104	h
1	0/-0.012	0.10	+/-0.010	4	2	6	0.95	50	2	6.46	6.82	7.21	7.66	8.74	UH2110100106	h
1	0/-0.012	0.10	+/-0.010	4	2	8	0.90	50	2	8.45	8.73	9.00	9.27	9.81	UH2110100108	h
1	0/-0.012	0.20	+/-0.010	4	2	4	0.95	50	2	4.36	4.60	4.86	5.16	5.89	UH2110100204	h
1	0/-0.012	0.20	+/-0.010	4	2	8	0.95	50	2	8.57	9.04	9.56	10.15	11.18	UH2110100208	h
1	0/-0.012	0.30	+/-0.010	4	2	4	0.90	50	2	4.31	4.44	4.57	4.70	4.97	UH2110100304	h
1	0/-0.012	0.30	+/-0.010	4	2	8	0.95	50	2	8.57	9.04	9.56	10.15	11.18	UH2110100308	h
1.5	0/-0.012	0.10	+/-0.010	4	2.5	6	1.45	50	2	6.30	6.52	6.75	7.01	7.57	UH2110150106	h
1.5	0/-0.012	0.10	+/-0.010	4	2.5	10	1.45	50	2	10.43	10.8	11.19	11.61	12.55	UH2110150110	h
1.5	0/-0.012	0.20	+/-0.010	4	2.5	8	1.45	50	2	8.37	8.66	8.97	9.31	10.06	UH2110150208	h
1.5	0/-0.012	0.20	+/-0.010	4	2.5	12	1.45	50	2	12.50	12.94	13.40	13.91	15.03	UH2110150212	h
2	0/-0.012	0.10	+/-0.010	4	3	6	1.95	50	2	6.30	6.52	6.75	7.01	7.57	UH2110200106	h
2	0/-0.012	0.10	+/-0.010	4	3	12	1.95	50	2	12.50	12.94	13.40	13.91	15.03	UH2110200112	h
2	0/-0.012	0.20	+/-0.010	4	3	6	1.95	50	2	6.30	6.52	6.75	7.01	7.57	UH2110200206	h
2	0/-0.012	0.20	+/-0.010	4	3	12	1.95	50	2	12.50	12.94	13.40	13.91	15.03	UH2110200212	h
2	0/-0.012	0.30	+/-0.010	4	3	8	1.95	50	2	8.37	8.66	8.97	9.31	10.06	UH2110200308	h
2	0/-0.012	0.30	+/-0.010	4	3	12	1.95	50	2	12.50	12.94	13.40	13.91	15.03	UH2110200312	h
2	0/-0.012	0.30	+/-0.010	4	3	16	1.95	50	2	16.64	17.21	17.84	18.50	-	UH2110200316	h
2	0/-0.012	0.50	+/-0.010	4	3	6	1.95	50	2	6.30	6.52	6.75	7.01	7.57	UH2110200506	h
2	0/-0.012	0.50	+/-0.010	4	3	12	1.95	50	2	12.50	12.94	13.40	13.91	15.03	UH2110200512	h
3	0/-0.012	0.30	+/-0.010	6	4.5	10	2.80	55	2	10.71	11.04	11.38	11.72	12.40	UH2110300310	h
3	0/-0.012	0.30	+/-0.010	6	4.5	16	2.85	55	2	16.83	17.41	18.04	18.72	20.24	UH2110300316	h
3	0/-0.012	0.50	+/-0.010	6	4.5	10	2.85	55	2	10.63	11.00	11.39	11.82	12.78	UH2110300510	h
3	0/-0.012	0.50	+/-0.010	6	4.5	16	2.85	55	2	16.83	17.41	18.04	18.72	20.24	UH2110300516	h
4	0/-0.012	0.20	+/-0.010	6	6	20	3.85	60	2	20.96	21.69	22.48	23.32	-	UH2110400220	h
4	0/-0.012	0.30	+/-0.010	6	6	12	3.85	55	2	12.69	13.14	13.61	14.12	15.27	UH2110400312	h
4	0/-0.012	0.30	+/-0.010	6	6	20	3.85	60	2	20.96	21.69	22.48	23.32	-	UH2110400320	h
4	0/-0.012	0.50	+/-0.010	6	6	12	3.85	55	2	12.69	13.14	13.61	14.12	15.27	UH2110400512	h
4	0/-0.012	0.50	+/-0.010	6	6	20	3.85	60	2	20.96	21.69	22.48	23.32	-	UH2110400520	h
4	0/-0.012	1.00	+/-0.010	6	6	16	3.85	55	2	16.83	17.41	18.04	18.72	-	UH2110401016	h
6	0/-0.015	0.50	+/-0.015	6	9	15	5.85	60	2	-	-	-	-	-	UH2110600520	h
6	0/-0.015	1.00	+/-0.015	6	9	15	5.85	60	2	-	-	-	-	-	UH2110601020	h
6	0/-0.015	2.00	+/-0.015	6	9	15	5.85	60	2	-	-	-	-	-	UH2110602020	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UH211

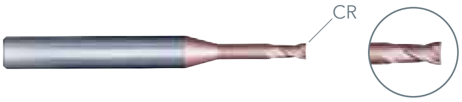
SQUARE RIB

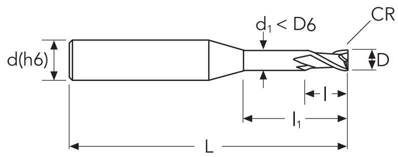
Material Group ISO 513			P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm			< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae			ap x D			ap x D			ap x D			ap x D		
Vc (m/min)			80-120			60-100			50-70			30-50		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**≤ 6D**	**0.05**	30000	0.012	720	24000	0.011	520	18000	0.010	345	12000	0.008	200
	≤ 8D	**0.04**	28700	0.010	590	22960	0.009	420	17220	0.008	280	11480	0.007	165
	≤ 10D	**0.04**	25500	0.008	430	20400	0.008	310	15300	0.007	205	10200	0.006	120
	≤ 12D	**0.03**	22300	0.007	290	17840	0.006	210	13380	0.005	140	8920	0.005	80
1.5	**≤ 6D**	**0.08**	21200	0.025	1060	16960	0.023	760	12720	0.020	510	8480	0.018	295
	≤ 8D	**0.06**	19100	0.021	810	15280	0.019	580	11460	0.017	390	7640	0.015	225
	≤ 10D	**0.05**	17000	0.018	590	13600	0.016	430	10200	0.014	285	6800	0.012	165
	≤ 12D	**0.04**	14900	0.014	410	11920	0.012	300	8940	0.011	195	5960	0.010	115
	≤ 15D	**0.03**	12700	0.011	290	10160	0.010	210	7620	0.009	135	5080	0.008	80
	> 15D	**0.02**	10600	0.008	160	8480	0.007	110	6360	0.006	75	4240	0.005	45
2	**≤ 6D**	**0.10**	15900	0.030	950	12720	0.027	690	9540	0.024	460	6360	0.021	265
	≤ 8D	**0.09**	14300	0.026	730	11440	0.023	530	8580	0.020	350	5720	0.018	205
	≤ 10D	**0.07**	12700	0.021	530	10160	0.019	380	7620	0.017	255	5080	0.015	150
	≤ 12D	**0.06**	11100	0.017	370	8880	0.015	260	6660	0.013	175	4440	0.012	105
	≤ 15D	**0.05**	9600	0.014	260	7680	0.012	190	5760	0.011	125	3840	0.009	75
	> 15D	**0.03**	9600	0.009	170	7680	0.008	120	5760	0.007	85	3840	0.006	50
2.5	**≤ 6D**	**0.13**	12700	0.035	890	10160	0.032	640	7620	0.028	425	5080	0.025	250
	≤ 8D	**0.11**	11500	0.030	680	9200	0.027	490	6900	0.024	330	4600	0.021	190
	≤ 10D	**0.09**	10200	0.025	500	8160	0.022	360	6120	0.020	240	4080	0.017	140
	≤ 12D	**0.07**	8900	0.019	340	7120	0.017	250	5340	0.015	165	3560	0.013	95
	≤ 15D	**0.06**	7600	0.016	240	6080	0.014	170	4560	0.013	115	3040	0.011	65
	> 15D	**0.04**	7600	0.011	160	6080	0.009	110	4560	0.008	75	3040	0.007	45
3	**≤ 6D**	**0.15**	10600	0.040	850	8480	0.036	610	6360	0.032	405	4240	0.028	235
	≤ 8D	**0.13**	9600	0.034	650	7680	0.031	470	5760	0.027	315	3840	0.024	185
	≤ 10D	**0.11**	8500	0.028	480	6800	0.025	340	5100	0.022	230	3400	0.020	135
	≤ 12D	**0.08**	7400	0.022	330	5920	0.020	230	4440	0.018	155	2960	0.015	90
	≤ 15D	**0.07**	6400	0.018	230	5120	0.016	170	3840	0.014	110	2560	0.013	65
	> 15D	**0.05**	6400	0.012	150	5120	0.011	110	3840	0.010	75	2560	0.008	45
4	**≤ 6D**	**0.20**	8000	0.050	800	6400	0.045	580	4800	0.040	385	3200	0.035	225
	≤ 8D	**0.17**	7200	0.043	610	5760	0.038	440	4320	0.034	295	2880	0.030	170
	≤ 10D	**0.14**	6400	0.035	450	5120	0.032	320	3840	0.028	215	2560	0.025	125
	≤ 12D	**0.11**	5600	0.028	310	4480	0.025	220	3360	0.022	150	2240	0.019	85
	≤ 15D	**0.09**	4800	0.023	220	3840	0.020	160	2880	0.018	105	1920	0.016	60
	> 15D	**0.06**	4800	0.015	140	3840	0.014	100	2880	0.012	70	1920	0.011	40
6	**≤ 6D**	**0.30**	5300	0.070	740	4240	0.063	530	3180	0.056	355	2120	0.049	210
	≤ 8D	**0.26**	4800	0.060	570	3840	0.054	410	2880	0.048	275	1920	0.042	160
	≤ 10D	**0.21**	4200	0.049	410	3360	0.044	300	2520	0.039	200	1680	0.034	115
	≤ 12D	**0.17**	3700	0.039	280	2960	0.035	210	2220	0.031	135	1480	0.027	80
	> 12D	**0.14**	3200	0.032	200	2560	0.028	150	1920	0.025	95	1280	0.022	55

UH212

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | RADIUS | Z2

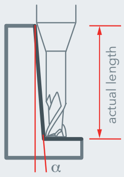




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

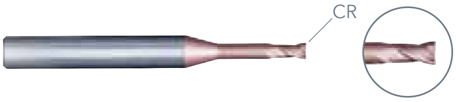
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
0.2	0/-0.020	0.02	+/-0.010	4	0.3	0.5	0.16	50	2	0.57	0.59	0.6	0.62	0.66	UH21200202005	h
0.2	0/-0.020	0.02	+/-0.010	4	0.3	1	0.16	50	2	1.09	1.12	1.16	1.19	1.26	UH2120020201	h
0.2	0/-0.020	0.02	+/-0.010	4	0.3	1.5	0.16	50	2	1.60	1.65	1.71	1.76	1.86	UH21200202015	h
0.3	0/-0.020	0.03	+/-0.010	4	0.4	1	0.26	50	2	1.09	1.12	1.15	1.19	1.26	UH21200300301	h
0.3	0/-0.020	0.03	+/-0.010	4	0.4	2	0.26	50	2	2.12	2.19	2.26	2.32	2.46	UH21200300302	h
0.3	0/-0.020	0.03	+/-0.010	4	0.4	3	0.26	50	2	3.15	3.25	3.36	3.46	3.66	UH21200300303	h
0.4	0/-0.020	0.03	+/-0.010	4	0.6	2	0.37	50	2	2.12	2.19	2.26	2.32	2.46	UH21200400302	h
0.4	0/-0.020	0.03	+/-0.010	4	0.6	3	0.37	50	2	3.15	3.25	3.36	3.46	3.66	UH21200400303	h
0.4	0/-0.020	0.03	+/-0.010	4	0.6	4	0.37	50	2	4.19	4.32	4.46	4.59	4.86	UH21200400304	h
0.4	0/-0.020	0.03	+/-0.010	4	0.6	5	0.37	50	2	5.22	5.39	5.56	5.73	6.07	UH21200400305	h
0.5	0/-0.020	0.05	+/-0.010	4	0.7	2	0.45	50	2	2.16	2.23	2.29	2.36	2.50	UH21200500502	h
0.5	0/-0.020	0.05	+/-0.010	4	0.7	4	0.45	50	2	4.22	4.36	4.50	4.63	4.90	UH21200500504	h
0.5	0/-0.020	0.05	+/-0.010	4	0.7	6	0.45	50	2	6.29	6.49	6.70	6.90	7.31	UH21200500506	h
0.5	0/-0.020	0.05	+/-0.010	4	0.7	8	0.45	50	2	8.36	8.63	8.90	9.17	9.71	UH21200500508	h
0.6	0/-0.020	0.05	+/-0.010	4	0.9	2	0.55	50	2	2.16	2.23	2.29	2.36	2.50	UH21200600502	h
0.6	0/-0.020	0.05	+/-0.010	4	0.9	4	0.55	50	2	4.22	4.36	4.50	4.63	4.90	UH21200600504	h
0.6	0/-0.020	0.05	+/-0.010	4	0.9	6	0.55	50	2	6.29	6.49	6.70	6.90	7.31	UH21200600506	h
0.6	0/-0.020	0.05	+/-0.010	4	0.9	8	0.55	50	2	8.36	8.63	8.90	9.17	9.71	UH21200600508	h
0.6	0/-0.020	0.05	+/-0.010	4	0.9	10	0.55	50	2	10.43	10.76	11.10	11.44	12.12	UH21200600510	h
0.7	0/-0.020	0.08	+/-0.010	4	1.0	2	0.65	50	2	2.16	2.22	2.29	2.36	2.49	UH21200700802	h
0.7	0/-0.020	0.08	+/-0.010	4	1.0	4	0.65	50	2	4.22	4.36	4.49	4.63	4.90	UH21200700804	h
0.7	0/-0.020	0.08	+/-0.010	4	1.0	6	0.65	50	2	6.29	6.49	6.69	6.90	7.30	UH21200700806	h
0.7	0/-0.020	0.08	+/-0.010	4	1.0	8	0.65	50	2	8.36	8.63	8.90	9.17	9.71	UH21200700808	h
0.7	0/-0.020	0.08	+/-0.010	4	1.0	10	0.65	50	2	10.42	10.76	11.10	11.44	12.11	UH21200700810	h
0.8	0/-0.020	0.08	+/-0.010	4	1.2	4	0.75	50	2	4.22	4.36	4.49	4.63	4.90	UH21200800804	h
0.8	0/-0.020	0.08	+/-0.010	4	1.2	6	0.75	50	2	6.29	6.49	6.69	6.90	7.30	UH21200800806	h
0.8	0/-0.020	0.08	+/-0.010	4	1.2	8	0.75	50	2	8.36	8.63	8.90	9.17	9.71	UH21200800808	h
0.8	0/-0.020	0.08	+/-0.010	4	1.2	10	0.75	50	2	10.42	10.76	11.10	11.44	12.11	UH21200800810	h
0.8	0/-0.020	0.08	+/-0.010	4	1.2	12	0.75	50	2	12.49	12.90	13.30	13.7	14.51	UH21200800812	h
0.9	0/-0.020	0.08	+/-0.010	4	1.4	6	0.85	50	2	6.29	6.49	6.69	6.90	7.30	UH21200900806	h
0.9	0/-0.020	0.08	+/-0.010	4	1.4	8	0.85	50	2	8.36	8.63	8.90	9.17	9.71	UH21200900808	h
0.9	0/-0.020	0.08	+/-0.010	4	1.4	10	0.85	50	2	10.42	10.76	11.10	11.44	12.11	UH21200900810	h
0.9	0/-0.020	0.08	+/-0.010	4	1.4	15	0.85	50	2	15.59	16.1	16.60	17.11	18.12	UH21200900815	h
1.0	0/-0.020	0.10	+/-0.010	4	1.5	6	0.95	50	2	6.39	6.59	6.80	7.00	7.41	UH2120100106	h
1.0	0/-0.020	0.10	+/-0.010	4	1.5	8	0.95	50	2	8.45	8.73	9.00	9.27	9.81	UH2120100108	h
1.0	0/-0.020	0.10	+/-0.010	4	1.5	10	0.95	50	2	10.52	10.86	11.20	11.54	12.22	UH2120100110	h
1.0	0/-0.020	0.10	+/-0.010	4	1.5	12	0.95	50	2	12.59	12.99	13.40	13.81	14.62	UH2120100112	h
1.0	0/-0.020	0.10	+/-0.010	4	1.5	14	0.95	50	2	14.66	15.13	15.60	16.08	17.03	UH2120100114	h
1.0	0/-0.020	0.10	+/-0.010	4	1.5	16	0.95	50	2	16.72	17.26	17.80	18.35	19.43	UH2120100116	h

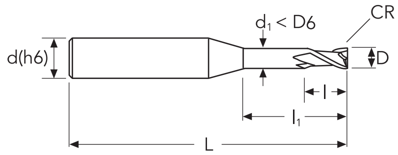
h stock standard f non-standard stock m stock exhaustion

UH212

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | RADIUS | Z2

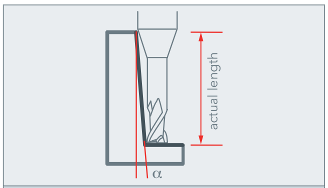




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1.2	0/-0.020	0.10	+/-0.010	4	1.8	6	1.15	50	2	6.39	6.59	6.80	7.00	7.41	UH2120120106	h
1.2	0/-0.020	0.10	+/-0.010	4	1.8	8	1.15	50	2	8.45	8.73	9.00	9.27	9.81	UH2120120108	h
1.2	0/-0.020	0.10	+/-0.010	4	1.8	10	1.15	50	2	10.52	10.86	11.20	11.54	12.22	UH2120120110	h
1.2	0/-0.020	0.10	+/-0.010	4	1.8	12	1.15	50	2	12.59	12.99	13.40	13.81	14.62	UH2120120112	h
1.4	0/-0.020	0.15	+/-0.010	4	2.1	6	1.35	50	2	6.38	6.59	6.79	6.99	7.40	UH21201401506	h
1.4	0/-0.020	0.15	+/-0.010	4	2.1	8	1.35	50	2	8.45	8.72	8.99	9.26	9.80	UH21201401508	h
1.4	0/-0.020	0.15	+/-0.010	4	2.1	10	1.35	50	2	10.52	10.86	11.19	11.53	12.21	UH21201401510	h
1.4	0/-0.020	0.15	+/-0.010	4	2.1	12	1.35	50	2	12.59	12.99	13.40	13.80	14.61	UH21201401512	h
1.4	0/-0.020	0.15	+/-0.010	4	2.1	14	1.35	50	2	14.65	15.13	15.60	16.07	17.02	UH21201401514	h
1.4	0/-0.020	0.15	+/-0.010	4	2.1	16	1.35	50	2	16.72	17.26	17.80	18.34	19.42	UH21201401516	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	6	1.45	50	2	6.38	6.59	6.79	6.99	7.40	UH21201501506	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	8	1.45	50	2	8.45	8.72	8.99	9.26	9.80	UH21201501508	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	10	1.45	50	2	10.52	10.86	11.19	11.53	12.21	UH21201501510	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	12	1.45	50	2	12.59	12.99	13.40	13.80	14.61	UH21201501512	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	14	1.45	50	2	14.65	15.13	15.60	16.07	17.02	UH21201501514	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	16	1.45	50	2	16.72	17.26	17.80	18.34	19.42	UH21201501516	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	18	1.45	60	2	18.79	19.39	20.00	20.61	21.82	UH21201501518	h
1.5	0/-0.020	0.15	+/-0.010	4	2.3	20	1.45	60	2	20.86	21.53	22.20	22.88	24.23	UH21201501520	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	6	1.55	50	2	6.38	6.59	6.79	6.99	7.40	UH21201601506	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	8	1.55	50	2	8.45	8.72	8.99	9.26	9.80	UH21201601508	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	10	1.55	50	2	10.52	10.86	11.19	11.53	12.21	UH21201601510	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	12	1.55	50	2	12.59	12.99	13.40	13.80	14.61	UH21201601512	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	14	1.55	50	2	14.65	15.13	15.60	16.07	17.02	UH21201601514	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	16	1.55	50	2	16.72	17.26	17.80	18.34	19.42	UH21201601516	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	18	1.55	60	2	18.79	19.39	20.00	20.61	21.82	UH21201601518	h
1.6	0/-0.020	0.15	+/-0.010	4	2.4	20	1.55	60	2	20.86	21.53	22.20	22.88	24.23	UH21201601520	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	6	1.75	50	2	6.38	6.58	6.79	6.99	7.39	UH2120180206	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	8	1.75	50	2	8.45	8.72	8.99	9.26	9.79	UH2120180208	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	10	1.75	50	2	10.52	10.85	11.19	11.52	12.20	UH2120180210	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	12	1.75	50	2	12.58	12.99	13.39	13.79	14.60	UH2120180212	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	14	1.75	50	2	14.65	15.12	15.59	16.06	17.01	UH2120180214	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	16	1.75	50	2	16.72	17.26	17.79	18.33	19.41	UH2120180216	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	18	1.75	60	2	18.79	19.39	20.00	20.6	21.81	UH2120180218	h
1.8	0/-0.020	0.20	+/-0.010	4	2.7	20	1.75	60	2	20.85	21.53	22.20	22.87	24.22	UH2120180220	h
2	0/-0.020	0.20	+/-0.010	4	3	6	1.95	50	2	6.38	6.58	6.79	6.99	7.39	UH2120200206	h
2	0/-0.020	0.20	+/-0.010	4	3	8	1.95	50	2	8.45	8.72	8.99	9.26	9.79	UH2120200208	h
2	0/-0.020	0.20	+/-0.010	4	3	10	1.95	50	2	10.52	10.85	11.19	11.52	12.20	UH2120200210	h
2	0/-0.020	0.20	+/-0.010	4	3	12	1.95	50	2	12.58	12.99	13.39	13.79	14.60	UH2120200212	h
2	0/-0.020	0.20	+/-0.010	4	3	14	1.95	50	2	14.65	15.12	15.59	16.06	17.01	UH2120200214	h

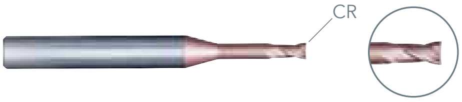
h stock standard f non-standard stock m stock exhaustion

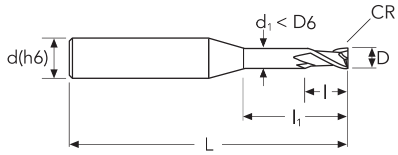
OSAWA

UH212

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | RADIUS | Z2





P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

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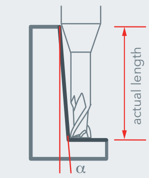


actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
2	0/-0.020	0.20	+/-0.010	4	3	16	1.95	50	2	16.72	17.26	17.79	18.33	19.41	UH2120200216	h
2	0/-0.020	0.20	+/-0.010	4	3	18	1.95	60	2	18.79	19.39	20.00	20.60	21.81	UH2120200218	h
2	0/-0.020	0.20	+/-0.010	4	3	20	1.95	60	2	20.85	21.53	22.20	22.87	-	UH2120200220	h
2	0/-0.020	0.20	+/-0.010	4	3	25	1.95	75	2	26.02	26.86	27.70	28.54	-	UH2120200225	h
2	0/-0.020	0.20	+/-0.010	4	3	30	1.95	75	2	31.19	32.20	33.21	-	-	UH2120200230	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	8	2.40	50	2	8.45	8.71	8.98	9.24	9.77	UH2120250308	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	10	2.40	50	2	10.51	10.85	11.18	11.51	12.18	UH2120250310	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	12	2.40	50	2	12.58	12.98	13.38	13.78	14.58	UH2120250312	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	14	2.40	50	2	14.65	15.12	15.58	16.05	-	UH2120250314	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	16	2.40	50	2	16.72	17.25	17.78	18.32	-	UH2120250316	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	18	2.40	60	2	18.78	19.38	19.99	20.59	-	UH2120250318	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	20	2.40	60	2	20.85	21.52	22.19	22.86	-	UH2120250320	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	25	2.40	60	2	26.02	26.86	27.69	-	-	UH2120250325	h
2.5	0/-0.020	0.30	+/-0.010	4	3.7	30	2.40	75	2	31.19	32.19	-	-	-	UH2120250330	h
3	0/-0.025	0.30	+/-0.010	6	4.5	8	2.85	50	2	8.64	8.91	9.18	9.45	10.00	UH2120300308	h
3	0/-0.025	0.30	+/-0.010	6	4.5	10	2.85	50	2	10.71	11.04	11.38	11.72	12.40	UH2120300310	h
3	0/-0.025	0.30	+/-0.010	6	4.5	12	2.85	50	2	12.77	13.18	13.59	13.99	14.80	UH2120300312	h
3	0/-0.025	0.30	+/-0.010	6	4.5	14	2.85	50	2	14.84	15.31	15.79	16.26	17.21	UH2120300314	h
3	0/-0.025	0.30	+/-0.010	6	4.5	16	2.85	60	2	16.91	17.45	17.99	18.53	19.61	UH2120300316	h
3	0/-0.025	0.30	+/-0.010	6	4.5	18	2.85	60	2	18.98	19.58	20.19	20.80	22.02	UH2120300318	h
3	0/-0.025	0.30	+/-0.010	6	4.5	20	2.85	60	2	21.04	21.72	22.39	23.07	24.42	UH2120300320	h
3	0/-0.025	0.30	+/-0.010	6	4.5	25	2.85	75	2	26.21	27.05	27.90	28.74	30.43	UH2120300325	h
4	0/-0.025	0.40	+/-0.010	6	4.5	10	3.85	60	2	10.90	11.24	11.58	11.92	12.60	UH2120400410	h
4	0/-0.025	0.40	+/-0.010	6	4.5	15	3.85	60	2	16.06	16.57	17.08	17.59	18.61	UH2120400415	h
4	0/-0.025	0.40	+/-0.010	6	4.5	20	3.85	60	2	21.23	21.91	22.59	23.27	-	UH2120400420	h
4	0/-0.025	0.40	+/-0.010	6	4.5	25	3.85	75	2	26.40	27.25	28.09	28.94	-	UH2120400425	h
4	0/-0.025	0.40	+/-0.010	6	4.5	30	3.85	75	2	31.57	32.58	33.60	-	-	UH2120400430	h
4	0/-0.025	0.40	+/-0.010	6	4.5	40	3.85	75	2	41.90	43.25	-	-	-	UH2120400440	h

h stock standard f non-standard stock m stock exhaustion

UH212

SQUARE RIB

Material Group ISO 513			P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm			< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**80-120**			**60-100**			**50-70**			**30-50**		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.2	**≤ 6D**	**0.01**	40000	0.003	240	40000	0.003	220	40000	0.002	190	40000	0.002	170
	≤ 8D	**0.01**	40000	0.003	200	40000	0.002	180	40000	0.002	165	40000	0.002	145
	≤ 10D	**0.01**	40000	0.002	170	40000	0.002	150	40000	0.002	135	40000	0.001	120
	≤ 12D	**0.01**	40000	0.002	130	40000	0.001	120	40000	0.001	105	40000	0.001	90
0.3	**≤ 6D**	**0.02**	40000	0.004	320	40000	0.004	290	40000	0.003	255	40000	0.003	225
	≤ 8D	**0.01**	40000	0.003	270	40000	0.003	240	40000	0.003	220	38200	0.002	180
	≤ 10D	**0.01**	40000	0.003	220	40000	0.003	200	40000	0.002	180	34000	0.002	135
	≤ 12D	**0.01**	40000	0.002	180	40000	0.002	160	40000	0.002	140	29700	0.002	90
0.4	**≤ 6D**	**0.02**	40000	0.006	480	40000	0.005	430	40000	0.005	385	31800	0.004	265
	≤ 8D	**0.02**	40000	0.005	410	40000	0.005	370	40000	0.004	325	28700	0.004	205
	≤ 10D	**0.01**	40000	0.004	340	40000	0.004	300	38200	0.003	255	25500	0.003	150
	≤ 12D	**0.01**	40000	0.003	260	40000	0.003	240	33400	0.003	175	22300	0.002	105
0.5	**≤ 6D**	**0.03**	40000	0.007	560	40000	0.006	500	38200	0.006	430	25500	0.005	250
	≤ 8D	**0.02**	40000	0.006	480	40000	0.005	430	34400	0.005	325	22900	0.004	190
	≤ 10D	**0.02**	40000	0.005	390	40000	0.004	350	30600	0.004	240	20400	0.003	140
	≤ 12D	**0.01**	35000	0.004	270	35700	0.003	250	26800	0.003	165	17800	0.003	95
0.6	**≤ 6D**	**0.03**	40000	0.008	640	40000	0.007	580	31800	0.006	405	21200	0.006	235
	≤ 8D	**0.03**	40000	0.007	540	38200	0.006	470	28700	0.005	310	19100	0.005	180
	≤ 10D	**0.02**	40000	0.006	450	34000	0.005	340	25500	0.004	230	17000	0.004	135
	≤ 12D	**0.02**	37200	0.004	330	29700	0.004	240	22300	0.004	155	14900	0.003	90
0.8	**≤ 6D**	**0.04**	39800	0.010	800	31840	0.009	570	23880	0.008	380	15920	0.007	225
	≤ 8D	**0.03**	35800	0.009	610	28640	0.008	440	21480	0.007	290	14320	0.006	170
	≤ 10D	**0.03**	31800	0.007	450	25440	0.006	320	19080	0.006	215	12720	0.005	125
	≤ 12D	**0.02**	27900	0.006	310	22320	0.005	220	16740	0.004	145	11160	0.004	85
1	**≤ 6D**	**0.05**	31800	0.012	760	25440	0.011	550	19080	0.010	365	12720	0.008	215
	≤ 8D	**0.04**	28700	0.010	590	22960	0.009	420	17220	0.008	280	11480	0.007	165
	≤ 10D	**0.04**	25500	0.008	430	20400	0.008	310	15300	0.007	205	10200	0.006	120
	≤ 12D	**0.03**	22300	0.007	290	17840	0.006	210	13380	0.005	140	8920	0.005	80
1.2	**≤ 6D**	**0.06**	26500	0.022	1170	21200	0.020	840	15900	0.018	560	10600	0.015	325
	≤ 8D	**0.05**	23900	0.019	890	19120	0.017	640	14340	0.015	430	9560	0.013	250
	≤ 10D	**0.04**	21200	0.015	650	16960	0.014	470	12720	0.012	315	8480	0.011	185
	≤ 12D	**0.03**	18600	0.012	450	14880	0.011	320	11160	0.010	215	7440	0.008	125
1.4	**≤ 6D**	**0.07**	22700	0.024	1090	18160	0.022	780	13620	0.019	525	9080	0.017	305
	≤ 8D	**0.06**	20500	0.020	840	16400	0.018	600	12300	0.016	400	8200	0.014	235
	≤ 10D	**0.05**	18200	0.017	610	14560	0.015	440	10920	0.013	295	7280	0.012	170
	≤ 12D	**0.04**	15900	0.013	420	12720	0.012	300	9540	0.011	200	6360	0.009	120
	≤ 15D	**0.03**	13600	0.011	290	10880	0.010	210	8160	0.009	140	5440	0.008	80
	> 15D	**0.02**	11400	0.007	160	9120	0.006	120	6840	0.006	80	4560	0.005	45
1.5	**≤ 6D**	**0.08**	21200	0.025	1060	16960	0.023	760	12720	0.020	510	8480	0.018	295
	≤ 8D	**0.06**	19100	0.021	810	15280	0.019	580	11460	0.017	390	7640	0.015	225
	≤ 10D	**0.05**	17000	0.018	590	13600	0.016	430	10200	0.014	285	6800	0.012	165
	≤ 12D	**0.04**	14900	0.014	410	11920	0.012	300	8940	0.011	195	5960	0.010	115
	≤ 15D	**0.03**	12700	0.011	290	10160	0.010	210	7620	0.009	135	5080	0.008	80
	> 15D	**0.02**	10600	0.008	160	8480	0.007	110	6360	0.006	75	4240	0.005	45
1.6	**≤ 6D**	**0.08**	19900	0.026	1030	15920	0.023	750	11940	0.021	495	7960	0.018	290
	≤ 8D	**0.07**	17900	0.022	790	14320	0.020	570	10740	0.018	380	7160	0.015	220
	≤ 10D	**0.06**	15900	0.018	580	12720	0.016	420	9540	0.015	280	6360	0.013	160
	≤ 12D	**0.04**	13900	0.014	400	11120	0.013	290	8340	0.011	190	5560	0.010	110
	≤ 15D	**0.04**	11900	0.012	280	9520	0.011	200	7140	0.009	135	4760	0.008	80
	> 15D	**0.02**	10000	0.008	160	8000	0.007	110	6000	0.006	75	4000	0.005	45

CUTTING PARAMETERS

UH212

Material Group ISO 513			P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm			< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**80-120**			**60-100**			**50-70**			**30-50**		
D (mm)	l1 (mm)	ap (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1.8	**≤ 6D**	**0.09**	17700	0.028	990	14160	0.025	710	10620	0.022	475	7080	0.020	280
	≤ 8D	**0.08**	15900	0.024	760	12720	0.021	540	9540	0.019	365	6360	0.017	210
	≤ 10D	**0.06**	14200	0.020	560	11360	0.018	400	8520	0.016	265	5680	0.014	155
	≤ 12D	**0.05**	12400	0.015	380	9920	0.014	270	7440	0.012	185	4960	0.011	105
	≤ 15D	**0.04**	10600	0.013	270	8480	0.011	190	6360	0.010	130	4240	0.009	75
	> 15D	**0.03**	8800	0.008	150	7040	0.008	110	5280	0.007	70	3520	0.006	40
2	**≤ 6D**	**0.10**	15900	0.030	950	12720	0.027	690	9540	0.024	460	6360	0.021	265
	≤ 8D	**0.09**	14300	0.026	730	11440	0.023	530	8580	0.020	350	5720	0.018	205
	≤ 10D	**0.07**	12700	0.021	530	10160	0.019	380	7620	0.017	255	5080	0.015	150
	≤ 12D	**0.06**	11100	0.017	370	8880	0.015	260	6660	0.013	175	4440	0.012	105
	≤ 15D	**0.05**	9600	0.014	260	7680	0.012	190	5760	0.011	125	3840	0.009	75
	> 15D	**0.03**	9600	0.009	170	7680	0.008	120	5760	0.007	85	3840	0.006	50
2.5	**≤ 6D**	**0.13**	12700	0.035	890	10160	0.032	640	7620	0.028	425	5080	0.025	250
	≤ 8D	**0.11**	11500	0.030	680	9200	0.027	490	6900	0.024	330	4600	0.021	190
	≤ 10D	**0.09**	10200	0.025	500	8160	0.022	360	6120	0.020	240	4080	0.017	140
	≤ 12D	**0.07**	8900	0.019	340	7120	0.017	250	5340	0.015	165	3560	0.013	95
	≤ 15D	**0.06**	7600	0.016	240	6080	0.014	170	4560	0.013	115	3040	0.011	65
	> 15D	**0.04**	7600	0.011	160	6080	0.009	110	4560	0.008	75	3040	0.007	45
3	**≤ 6D**	**0.15**	10600	0.040	850	8480	0.036	610	6360	0.032	405	4240	0.028	235
	≤ 8D	**0.13**	9600	0.034	650	7680	0.031	470	5760	0.027	315	3840	0.024	185
	≤ 10D	**0.11**	8500	0.028	480	6800	0.025	340	5100	0.022	230	3400	0.020	135
	≤ 12D	**0.08**	7400	0.022	330	5920	0.020	230	4440	0.018	155	2960	0.015	90
	≤ 15D	**0.07**	6400	0.018	230	5120	0.016	170	3840	0.014	110	2560	0.013	65
	> 15D	**0.05**	6400	0.012	150	5120	0.011	110	3840	0.010	75	2560	0.008	45
4	**≤ 6D**	**0.20**	8000	0.050	800	6400	0.045	580	4800	0.040	385	3200	0.035	225
	≤ 8D	**0.17**	7200	0.043	610	5760	0.038	440	4320	0.034	295	2880	0.030	170
	≤ 10D	**0.14**	6400	0.035	450	5120	0.032	320	3840	0.028	215	2560	0.025	125
	≤ 12D	**0.11**	5600	0.028	310	4480	0.025	220	3360	0.022	150	2240	0.019	85
	≤ 15D	**0.09**	4800	0.023	220	3840	0.020	160	2880	0.018	105	1920	0.016	60
	> 15D	**0.06**	4800	0.015	140	3840	0.014	100	2880	0.012	70	1920	0.011	40

SQUARE RIB

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHCS2

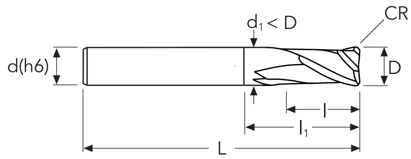
cylindrical shank, 2F, reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | RADIUS | Z2

P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SLOTTING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
1	0/-0.012	0.10	+/-0.010	4	2	3	0.95	50	2	UHCS2010	h
1.5	0/-0.012	0.10	+/-0.010	4	2.5	4	1.45	50	2	UHCS2015	h
2	0/-0.012	0.10	+/-0.010	4	3	6	1.95	50	2	UHCS2020	h
3	0/-0.012	0.10	+/-0.010	6	4.5	8	2.85	55	2	UHCS2030	h
4	0/-0.012	0.10	+/-0.010	6	6	10	3.85	55	2	UHCS2040	h
5	0/-0.012	0.20	+/-0.010	6	6	11	4.85	50	2	UHCS2050	h
6	0/-0.012	0.20	+/-0.010	6	9	15	5.85	60	2	UHCS2060	h
8	0/-0.015	0.20	+/-0.015	8	12	20	7.70	70	2	UHCS2080	h
10	0/-0.015	0.20	+/-0.015	10	15	25	9.70	70	2	UHCS2100	h
12	0/-0.015	0.30	+/-0.015	12	18	30	11.70	80	2	UHCS2120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UHCS2

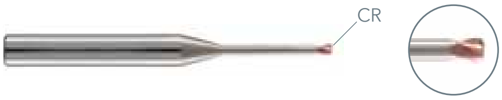
SLOTTING

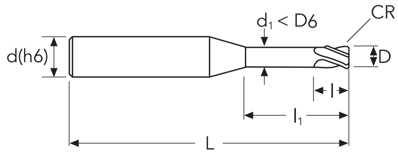
Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**0.3D x D**			**0.2D x D**			**0.2D x D**			**0.1D x D**		
Vc (m/min)	**80-120**			**60-100**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	30000	0.007	420	25480	0.006	320	19110	0.006	215	12740	0.005	125
2	15920	0.012	380	12740	0.011	280	9550	0.010	185	6370	0.008	105
3	10620	0.017	360	8490	0.015	260	6370	0.014	175	4250	0.012	100
4	7960	0.023	370	6370	0.021	260	4780	0.018	175	3180	0.016	100
5	6370	0.030	380	5100	0.027	280	3820	0.024	185	2550	0.021	105
6	5310	0.038	400	4250	0.034	290	3180	0.030	195	2120	0.027	115
8	3980	0.050	400	3180	0.045	290	2390	0.040	190	1590	0.035	110
10	3180	0.065	410	2550	0.059	300	1910	0.052	200	1270	0.046	115
12	2650	0.080	420	2120	0.072	310	1590	0.064	205	1060	0.056	120

UHF4LN

cylindrical shank, 4F Unequal Pitch,
extended and reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 25° | RADIUS | Z4 UP

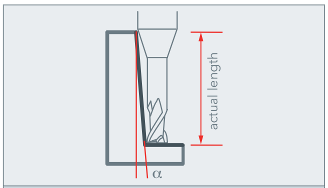




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

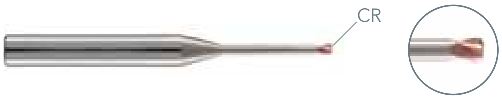
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1	0/-0.020	0.10	+/-0.010	4	1	4	0.90	50	4	4.32	4.46	4.62	4.78	5.13	UHF4LN0100104	h
1	0/-0.020	0.10	+/-0.010	4	1	6	0.90	50	4	6.39	6.60	6.83	7.08	7.60	UHF4LN0100106	h
1	0/-0.020	0.10	+/-0.010	4	1	8	0.90	50	4	8.45	8.74	9.05	9.37	10.07	UHF4LN0100108	h
1	0/-0.020	0.10	+/-0.010	4	1	10	0.90	50	4	10.52	10.88	11.26	11.66	12.53	UHF4LN0100110	h
1	0/-0.020	0.10	+/-0.010	4	1	12	0.90	50	4	12.59	13.02	13.48	13.96	15.00	UHF4LN0100112	h
1	0/-0.020	0.10	+/-0.010	4	1	14	0.90	50	4	14.66	15.16	15.69	16.25	17.47	UHF4LN0100114	h
1	0/-0.020	0.10	+/-0.010	4	1	16	0.90	50	4	16.72	17.30	17.91	18.55	19.94	UHF4LN0100116	h
1	0/-0.020	0.10	+/-0.010	4	1	20	0.90	75	4	20.86	21.57	22.33	23.14	24.87	UHF4LN0100120	h
1	0/-0.020	0.20	+/-0.010	4	1	4	0.90	50	4	4.32	4.46	4.61	4.77	5.11	UHF4LN0100204	h
1	0/-0.020	0.20	+/-0.010	4	1	6	0.90	50	4	6.38	6.60	6.82	7.06	7.57	UHF4LN0100206	h
1	0/-0.020	0.20	+/-0.010	4	1	8	0.90	50	4	8.45	8.73	9.04	9.35	10.04	UHF4LN0100208	h
1	0/-0.020	0.20	+/-0.010	4	1	10	0.90	50	4	10.52	10.87	11.25	11.65	12.51	UHF4LN0100210	h
1	0/-0.020	0.20	+/-0.010	4	1	12	0.90	50	4	12.58	13.01	13.47	13.94	14.98	UHF4LN0100212	h
1	0/-0.020	0.20	+/-0.010	4	1	14	0.90	50	4	14.65	15.15	15.68	16.24	17.45	UHF4LN0100214	h
1	0/-0.020	0.20	+/-0.010	4	1	16	0.90	50	4	16.72	17.29	17.89	18.53	19.91	UHF4LN0100216	h
1	0/-0.020	0.20	+/-0.010	4	1	20	0.90	60	4	20.85	21.57	22.32	23.12	24.85	UHF4LN0100220	h
1	0/-0.020	0.30	+/-0.010	4	1	6	0.90	50	4	6.38	6.59	6.81	7.05	7.55	UHF4LN0100306	h
1	0/-0.020	0.30	+/-0.010	4	1	10	0.90	50	4	10.51	10.87	11.24	11.63	12.49	UHF4LN0100310	h
1	0/-0.020	0.30	+/-0.010	4	1	16	0.90	50	4	16.72	17.28	17.88	18.52	19.89	UHF4LN0100316	h
1	0/-0.020	0.30	+/-0.010	4	1	20	0.90	60	4	20.85	21.56	22.31	23.11	24.82	UHF4LN0100320	h
1.5	0/-0.020	0.10	+/-0.010	4	1.5	6	1.40	50	4	6.39	6.60	6.83	7.08	7.60	UHF4LN0150106	h
1.5	0/-0.020	0.10	+/-0.010	4	1.5	8	1.40	50	4	8.45	8.74	9.05	9.37	10.07	UHF4LN0150108	h
1.5	0/-0.020	0.10	+/-0.010	4	1.5	12	1.40	50	4	12.59	13.02	13.48	13.96	15.00	UHF4LN0150112	h
1.5	0/-0.020	0.10	+/-0.010	4	1.5	16	1.40	50	4	16.72	17.3	17.91	18.55	19.94	UHF4LN0150116	h
1.5	0/-0.020	0.10	+/-0.010	4	1.5	20	1.40	60	4	20.86	21.57	22.33	23.14	-	UHF4LN0150120	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	6	1.40	50	4	6.38	6.60	6.82	7.06	7.57	UHF4LN0150206	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	8	1.40	50	4	8.45	8.73	9.04	9.35	10.04	UHF4LN0150208	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	10	1.40	50	4	10.52	10.87	11.25	11.65	12.51	UHF4LN0150210	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	12	1.40	50	4	12.58	13.01	13.47	13.94	14.98	UHF4LN0150212	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	14	1.40	50	4	14.65	15.15	15.68	16.24	17.45	UHF4LN0150214	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	16	1.40	50	4	16.72	17.29	17.89	18.53	19.91	UHF4LN0150216	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	18	1.40	60	4	18.79	19.43	20.11	20.83	22.38	UHF4LN0150218	h
1.5	0/-0.020	0.20	+/-0.010	4	1.5	20	1.40	60	4	20.85	21.57	22.32	23.12	-	UHF4LN0150220	h
1.5	0/-0.020	0.30	+/-0.010	4	1.5	8	1.40	50	4	8.45	8.73	9.03	9.34	10.02	UHF4LN0150308	h
1.5	0/-0.020	0.30	+/-0.010	4	1.5	16	1.40	50	4	16.72	17.28	17.88	18.52	19.89	UHF4LN0150316	h
1.5	0/-0.020	0.30	+/-0.010	4	1.5	20	1.40	60	4	20.85	21.56	22.31	23.11	-	UHF4LN0150320	h
2	0/-0.020	0.20	+/-0.010	4	2	6	1.90	50	4	6.38	6.60	6.82	7.06	7.57	UHF4LN0200206	h
2	0/-0.020	0.20	+/-0.010	4	2	8	1.90	50	4	8.45	8.73	9.04	9.35	10.04	UHF4LN0200208	h
2	0/-0.020	0.20	+/-0.010	4	2	10	1.90	50	4	10.52	10.87	11.25	11.65	12.51	UHF4LN0200210	h

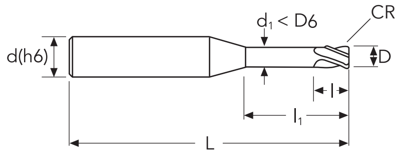
h stock standard f non-standard stock m stock exhaustion

UHF4LN

cylindrical shank, 4F Unequal Pitch,
extended and reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 25° | RADIUS | Z4 UP

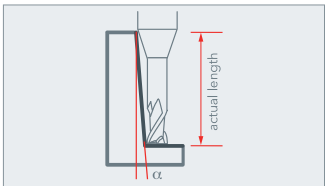




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

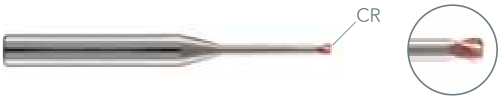
D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
2	0/-0.020	0.20	+/-0.010	4	2	12	1.90	50	4	12.58	13.01	13.47	13.94	14.98	UHF4LN0200212	h
2	0/-0.020	0.20	+/-0.010	4	2	14	1.90	50	4	14.65	15.15	15.68	16.24	17.45	UHF4LN0200214	h
2	0/-0.020	0.20	+/-0.010	4	2	16	1.90	50	4	16.72	17.29	17.89	18.53	-	UHF4LN0200216	h
2	0/-0.020	0.20	+/-0.010	4	2	18	1.90	60	4	18.79	19.43	20.11	20.83	-	UHF4LN0200218	h
2	0/-0.020	0.20	+/-0.010	4	2	20	1.90	60	4	20.85	21.57	22.32	23.12	-	UHF4LN0200220	h
2	0/-0.020	0.20	+/-0.010	4	2	25	1.90	75	4	26.02	26.91	27.86	-	-	UHF4LN0200225	h
2	0/-0.020	0.20	+/-0.010	4	2	30	1.90	75	4	31.19	32.26	33.40	-	-	UHF4LN0200230	h
2	0/-0.020	0.30	+/-0.010	4	2	8	1.90	50	4	8.45	8.73	9.03	9.34	10.02	UHF4LN0200308	h
2	0/-0.020	0.30	+/-0.010	4	2	16	1.90	50	4	16.72	17.28	17.88	18.52	-	UHF4LN0200316	h
2	0/-0.020	0.30	+/-0.010	4	2	20	1.90	60	4	20.85	21.56	22.31	23.11	-	UHF4LN0200320	h
2	0/-0.020	0.50	+/-0.010	4	2	6	1.90	50	4	6.37	6.58	6.79	7.02	7.50	UHF4LN0200506	h
2	0/-0.020	0.50	+/-0.010	4	2	8	1.90	50	4	8.44	8.71	9.00	9.31	9.97	UHF4LN0200508	h
2	0/-0.020	0.50	+/-0.010	4	2	12	1.90	50	4	12.57	12.99	13.43	13.9	14.91	UHF4LN0200512	h
2	0/-0.020	0.50	+/-0.010	4	2	16	1.90	50	4	16.71	17.27	17.86	18.49	-	UHF4LN0200516	h
2	0/-0.020	0.50	+/-0.010	4	2	20	1.90	60	4	20.84	21.55	22.29	23.08	-	UHF4LN0200520	h
2	0/-0.020	0.50	+/-0.010	4	2	25	1.90	75	4	26.01	26.89	27.83	28.82	-	UHF4LN0200525	h
2	0/-0.020	0.50	+/-0.010	4	2	30	1.90	75	4	31.18	32.24	33.36	-	-	UHF4LN0200530	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	8	2.40	50	4	8.45	8.73	9.03	9.34	10.02	UHF4LN0250308	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	10	2.40	50	4	10.51	10.87	11.24	11.63	12.49	UHF4LN0250310	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	12	2.40	50	4	12.58	13.01	13.45	13.93	-	UHF4LN0250312	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	14	2.40	50	4	14.65	15.14	15.67	16.22	-	UHF4LN0250314	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	16	2.40	50	4	16.72	17.28	17.88	18.52	-	UHF4LN0250316	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	18	2.40	60	4	18.78	19.42	20.10	20.81	-	UHF4LN0250318	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	20	2.40	60	4	20.85	21.56	22.31	-	-	UHF4LN0250320	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	25	2.40	60	4	26.02	26.91	27.85	-	-	UHF4LN0250325	h
2.5	0/-0.020	0.30	+/-0.010	4	2.5	30	2.40	75	4	31.19	32.25	-	-	-	UHF4LN0250330	h
2.5	0/-0.020	0.50	+/-0.010	4	2.5	8	2.40	50	4	8.44	8.71	9.00	9.31	9.97	UHF4LN0250508	h
2.5	0/-0.020	0.50	+/-0.010	4	2.5	12	2.40	50	4	12.57	12.99	13.43	13.90	-	UHF4LN0250512	h
2.5	0/-0.020	0.50	+/-0.010	4	2.5	16	2.40	50	4	16.71	17.27	17.86	18.49	-	UHF4LN0250516	h
2.5	0/-0.020	0.50	+/-0.010	4	2.5	20	2.40	60	4	20.84	21.55	22.29	-	-	UHF4LN0250520	h
2.5	0/-0.020	0.50	+/-0.010	4	2.5	25	2.40	60	4	26.01	26.89	27.83	-	-	UHF4LN0250525	h
2.5	0/-0.020	0.50	+/-0.010	4	2.5	30	2.40	75	4	31.18	32.24	-	-	-	UHF4LN0250530	h
3	0/-0.025	0.20	+/-0.010	6	3	8	2.80	50	4	8.64	8.93	9.24	9.57	10.27	UHF4LN0300208	h
3	0/-0.025	0.20	+/-0.010	6	3	10	2.80	50	4	10.71	11.07	11.46	11.86	12.73	UHF4LN0300210	h
3	0/-0.025	0.20	+/-0.010	6	3	12	2.80	50	4	12.78	13.21	13.67	14.16	15.20	UHF4LN0300212	h
3	0/-0.025	0.20	+/-0.010	6	3	14	2.80	50	4	14.84	15.35	15.89	16.45	17.67	UHF4LN0300214	h
3	0/-0.025	0.20	+/-0.010	6	3	16	2.80	60	4	16.91	17.49	18.10	18.74	20.14	UHF4LN0300216	h
3	0/-0.025	0.20	+/-0.010	6	3	18	2.80	60	4	18.98	19.63	20.31	21.04	22.60	UHF4LN0300218	h
3	0/-0.025	0.20	+/-0.010	6	3	20	2.80	60	4	21.05	21.77	22.53	23.33	25.07	UHF4LN0300220	h

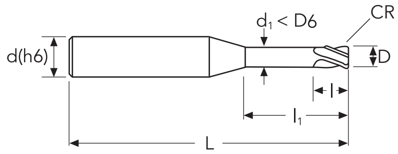
h stock standard f non-standard stock m stock exhaustion

UHF4LN

cylindrical shank, 4F Unequal Pitch,
extended and reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 25° | RADIUS | Z4 UP

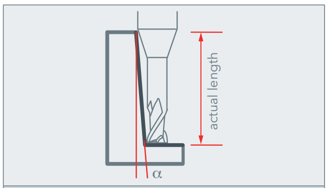




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SQUARE RIB



actual length according to α angle

D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
3	0/-0.025	0.20	+/-0.010	6	3	25	2.80	75	4	26.21	27.11	28.07	29.07	-	UHF4LN0300225	h
3	0/-0.025	0.30	+/-0.010	6	3	8	2.80	50	4	8.64	8.93	9.23	9.55	10.24	UHF4LN0300308	h
3	0/-0.025	0.30	+/-0.010	6	3	10	2.80	50	4	10.71	11.07	11.45	11.85	12.71	UHF4LN0300310	h
3	0/-0.025	0.30	+/-0.010	6	3	12	2.80	50	4	12.77	13.20	13.66	14.14	15.18	UHF4LN0300312	h
3	0/-0.025	0.30	+/-0.010	6	3	14	2.80	50	4	14.84	15.34	15.87	16.44	17.64	UHF4LN0300314	h
3	0/-0.025	0.30	+/-0.010	6	3	16	2.80	60	4	16.91	17.48	18.09	18.73	20.11	UHF4LN0300316	h
3	0/-0.025	0.30	+/-0.010	6	3	18	2.80	60	4	18.98	19.62	20.30	21.02	22.58	UHF4LN0300318	h
3	0/-0.025	0.30	+/-0.010	6	3	20	2.80	60	4	21.04	21.76	22.52	23.32	25.05	UHF4LN0300320	h
3	0/-0.025	0.30	+/-0.010	6	3	30	2.80	75	4	31.38	32.45	33.59	34.79	-	UHF4LN0300330	h
3	0/-0.025	0.50	+/-0.010	6	3	8	2.80	50	4	8.63	8.91	9.21	9.52	10.20	UHF4LN0300508	h
3	0/-0.025	0.50	+/-0.010	6	3	10	2.80	50	4	10.7	11.05	11.42	11.82	12.66	UHF4LN0300510	h
3	0/-0.025	0.50	+/-0.010	6	3	12	2.80	50	4	12.77	13.19	13.64	14.11	15.13	UHF4LN0300512	h
3	0/-0.025	0.50	+/-0.010	6	3	14	2.80	50	4	14.83	15.33	15.85	16.41	17.60	UHF4LN0300514	h
3	0/-0.025	0.50	+/-0.010	6	3	16	2.80	60	4	16.9	17.47	18.07	18.70	20.07	UHF4LN0300516	h
3	0/-0.025	0.50	+/-0.010	6	3	18	2.80	60	4	18.97	19.61	20.28	20.99	22.53	UHF4LN0300518	h
3	0/-0.025	0.50	+/-0.010	6	3	20	2.80	60	4	21.04	21.75	22.50	23.29	25.00	UHF4LN0300520	h
3	0/-0.025	0.50	+/-0.010	6	3	30	2.80	75	4	31.37	32.44	33.57	34.76	-	UHF4LN0300530	h
4	0/-0.025	0.30	+/-0.010	6	4	10	3.70	60	4	10.90	11.26	11.65	12.06	12.93	UHF4LN0400310	h
4	0/-0.025	0.30	+/-0.010	6	4	15	3.70	60	4	16.07	16.61	17.19	17.79	19.10	UHF4LN0400315	h
4	0/-0.025	0.30	+/-0.010	6	4	20	3.70	60	4	21.24	21.96	22.72	23.53	-	UHF4LN0400320	h
4	0/-0.025	0.30	+/-0.010	6	4	25	3.70	75	4	26.4	27.31	28.26	-	-	UHF4LN0400325	h
4	0/-0.025	0.30	+/-0.010	6	4	32	3.70	75	4	33.64	34.79	36.01	-	-	UHF4LN0400332	h
4	0/-0.025	0.30	+/-0.010	6	4	40	3.70	75	4	41.91	43.35	-	-	-	UHF4LN0400340	h
4	0/-0.025	0.50	+/-0.010	6	4	10	3.70	60	4	10.89	11.25	11.63	12.03	12.89	UHF4LN0400510	h
4	0/-0.025	0.50	+/-0.010	6	4	15	3.70	60	4	16.06	16.60	17.17	17.76	19.06	UHF4LN0400515	h
4	0/-0.025	0.50	+/-0.010	6	4	20	3.70	60	4	21.23	21.94	22.7	23.50	-	UHF4LN0400520	h
4	0/-0.025	0.50	+/-0.010	6	4	25	3.70	75	4	26.4	27.29	28.24	-	-	UHF4LN0400525	h
4	0/-0.025	0.50	+/-0.010	6	4	32	3.70	75	4	33.63	34.78	35.99	-	-	UHF4LN0400532	h
4	0/-0.025	0.50	+/-0.010	6	4	40	3.70	75	4	41.9	43.33	-	-	-	UHF4LN0400540	h

h stock standard f non-standard stock m stock exhaustion

UHF4LN

Material Group ISO 513			P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm			< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae			**ap x D**			**ap x D**			**ap x D**			**ap x D**		
Vc (m/min)			**80-120**			**60-100**			**50-70**			**30-50**		
D (mm)	l1 (mm)	ae (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**≤ 6D**	**0.05**	31800	0.010	1300	25440	0.009	930	19080	0.008	625	12720	0.007	365
	≤ 8D	**0.04**	28700	0.009	1000	22960	0.008	720	17220	0.007	480	11480	0.006	280
	≤ 10D	**0.04**	25500	0.007	730	20400	0.006	520	15300	0.006	350	10200	0.005	205
	≤ 12D	**0.03**	22300	0.006	500	17840	0.005	360	13380	0.004	240	8920	0.004	140
1.5	**≤ 6D**	**0.08**	21200	0.021	1800	16960	0.019	1300	12720	0.017	865	8480	0.015	505
	≤ 8D	**0.06**	19100	0.018	1380	15280	0.016	990	11460	0.014	660	7640	0.013	385
	≤ 10D	**0.05**	17000	0.015	1010	13600	0.013	730	10200	0.012	485	6800	0.010	285
	≤ 12D	**0.04**	14900	0.012	700	11920	0.011	500	8940	0.009	335	5960	0.008	195
	≤ 15D	**0.03**	12700	0.010	490	10160	0.009	350	7620	0.008	235	5080	0.007	135
	> 15D	**0.02**	10600	0.006	270	8480	0.006	190	6360	0.005	130	4240	0.004	75
2	**≤ 6D**	**0.10**	15900	0.026	1620	12720	0.023	1170	9540	0.020	780	6360	0.018	455
	≤ 8D	**0.09**	14300	0.022	1240	11440	0.020	890	8580	0.017	595	5720	0.015	345
	≤ 10D	**0.07**	12700	0.018	910	10160	0.016	650	7620	0.014	435	5080	0.012	255
	≤ 12D	**0.06**	11100	0.014	620	8880	0.013	450	6660	0.011	300	4440	0.010	175
	≤ 15D	**0.05**	9600	0.011	440	7680	0.010	320	5760	0.009	210	3840	0.008	125
	> 15D	**0.03**	9600	0.008	290	7680	0.007	210	5760	0.006	140	3840	0.005	80
2.5	**≤ 6D**	**0.13**	12700	0.030	1510	10160	0.027	1090	7620	0.024	725	5080	0.021	425
	≤ 8D	**0.11**	11500	0.025	1160	9200	0.023	840	6900	0.020	560	4600	0.018	325
	≤ 10D	**0.09**	10200	0.021	850	8160	0.019	610	6120	0.017	410	4080	0.015	240
	≤ 12D	**0.07**	8900	0.016	580	7120	0.015	420	5340	0.013	280	3560	0.011	165
	≤ 15D	**0.06**	7600	0.013	410	6080	0.012	290	4560	0.011	195	3040	0.009	115
	> 15D	**0.04**	7600	0.009	270	6080	0.008	200	4560	0.007	130	3040	0.006	75
3	**≤ 6D**	**0.15**	10600	0.034	1440	8480	0.031	1040	6360	0.027	690	4240	0.024	405
	≤ 8D	**0.13**	9600	0.029	1110	7680	0.026	800	5760	0.023	535	3840	0.020	310
	≤ 10D	**0.11**	8500	0.024	810	6800	0.021	580	5100	0.019	390	3400	0.017	225
	≤ 12D	**0.08**	7400	0.019	550	5920	0.017	400	4440	0.015	265	2960	0.013	155
	≤ 15D	**0.07**	6400	0.015	390	5120	0.014	280	3840	0.012	190	2560	0.011	110
	> 15D	**0.05**	6400	0.010	260	5120	0.009	190	3840	0.008	125	2560	0.007	75
4	**≤ 6D**	**0.20**	8000	0.043	1360	6400	0.038	980	4800	0.034	655	3200	0.030	380
	≤ 8D	**0.17**	7200	0.036	1040	5760	0.033	750	4320	0.029	500	2880	0.025	290
	≤ 10D	**0.14**	6400	0.030	760	5120	0.027	550	3840	0.024	365	2560	0.021	215
	≤ 12D	**0.11**	5600	0.023	520	4480	0.021	380	3360	0.019	250	2240	0.016	145
	≤ 15D	**0.09**	4800	0.019	370	3840	0.017	260	2880	0.015	175	1920	0.013	105
	> 15D	**0.06**	4800	0.013	240	3840	0.011	180	2880	0.010	120	1920	0.009	70

SQUARE RIB

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHF4

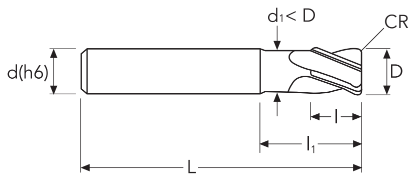
cylindrical shank, 4F corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 25° | RADIUS | Z4

P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
2	0/-0.030	0.50	+/-0.020	6	1	6	1.95	70	4	UHF405020	h
3	0/-0.030	0.50	+/-0.020	6	1.2	8	2.85	70	4	UHF405030	h
4	0/-0.030	0.50	+/-0.020	6	1.5	10	3.85	70	4	UHF405040	h
5	0/-0.030	0.50	+/-0.020	6	2	10	4.85	70	4	UHF405050	h
6	0/-0.030	0.50	+/-0.020	6	2.5	12	5.85	90	4	UHF405060	h
6	0/-0.030	1.00	+/-0.020	6	2.5	12	5.85	90	4	UHF410060	h
8	0/-0.030	1.00	+/-0.020	8	3.5	16	7.7	100	4	UHF410080	h
10	0/-0.030	1.00	+/-0.020	10	4	20	9.7	100	4	UHF410100	h
8	0/-0.030	2.00	+/-0.020	8	3.5	16	7.7	100	4	UHF420080	h
10	0/-0.030	2.00	+/-0.020	10	4	20	9.7	100	4	UHF420100	h
12	0/-0.030	2.00	+/-0.020	12	5	25	11.7	110	4	UHF420120	h
12	0/-0.030	3.00	+/-0.020	12	5	25	11.7	110	4	UHF430120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UHF4

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**0.03D x 0.4D**			**0.03D x 0.3D**			**0.02D x 0.3D**			**0.02D x 0.3D**		
Vc (m/min)	**110-150**			**90-130**			**60-100**			**50-70**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	20700	0.033	2710	17520	0.029	2070	12740	0.026	1335	9550	0.023	875
3	13800	0.050	2730	11680	0.045	2080	8490	0.040	1345	6370	0.035	885
4	10350	0.068	2790	8760	0.061	2130	6370	0.054	1375	4780	0.047	905
5	8280	0.086	2830	7010	0.077	2160	5100	0.068	1395	3820	0.060	915
6	6900	0.104	2860	5840	0.093	2180	4250	0.083	1410	3180	0.072	920
8	5180	0.122	2520	4380	0.109	1920	3180	0.097	1235	2390	0.085	815
10	4140	0.140	2310	3500	0.126	1760	2550	0.112	1140	1910	0.098	745
12	3450	0.158	2170	2920	0.142	1660	2120	0.126	1070	1590	0.110	700

ap x ae	D2 - D3	45 HRC	45 - 55 HRC	55 - 60 HRC	60 - 65 HRC
ap x ae	**D2 - D3**	0.02D x 0.3D	0.02D x 0.25D	0.01D x 0.02D	0.01D x 0.02D

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHCS4

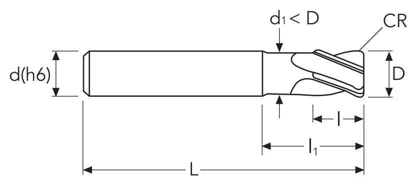
cylindrical shank, 4F, reduced neck, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | RADIUS | Z4

P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
1	0/-0.012	0.10	+/-0.010	4	2	3	0.95	50	4	UHCS4010	h
1.5	0/-0.012	0.10	+/-0.010	4	2.5	4	1.45	50	4	UHCS4015	h
2	0/-0.012	0.10	+/-0.010	4	3	6	1.95	50	4	UHCS4020	h
3	0/-0.012	0.10	+/-0.010	6	4	8	2.85	55	4	UHCS4030	h
4	0/-0.012	0.10	+/-0.010	6	6	10	3.85	55	4	UHCS4040	h
5	0/-0.012	0.20	+/-0.010	6	6	11	4.85	50	4	UHCS4050	h
6	0/-0.012	0.20	+/-0.010	6	9	15	5.85	60	4	UHCS4060	h
8	0/-0.015	0.20	+/-0.015	8	12	20	7.70	70	4	UHCS4080	h
10	0/-0.015	0.20	+/-0.015	10	15	25	9.70	70	4	UHCS4100	h
12	0/-0.015	0.30	+/-0.015	12	18	30	11.70	80	4	UHCS4120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UHCS4

SIDE MILLING

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**0.3D x D**			**0.2D x D**			**0.2D x D**			**0.1D x D**		
Vc (m/min)	**90-130**			**60-100**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	30000	0.010	1200	25480	0.009	920	19110	0.008	610	12740	0.007	355
2	17520	0.020	1400	12740	0.018	920	9550	0.016	610	6370	0.014	355
3	11680	0.030	1400	8490	0.027	920	6370	0.024	610	4250	0.021	355
4	8760	0.040	1400	6370	0.036	920	4780	0.032	610	3180	0.028	355
5	7010	0.045	1260	5100	0.041	830	3820	0.036	550	2550	0.032	320
6	5840	0.050	1170	4250	0.045	770	3180	0.040	510	2120	0.035	295
8	4380	0.065	1140	3180	0.059	740	2390	0.052	495	1590	0.046	290
10	3500	0.085	1190	2550	0.077	780	1910	0.068	520	1270	0.060	300
12	2920	0.100	1170	2120	0.090	760	1590	0.080	510	1060	0.070	295

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UH410

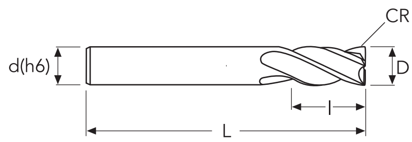
cylindrical shank, 4F, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | RADIUS | Z4

P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.020	0.20	+/-0.010	6	3		50	4	UH41001002	h
1.5	0/-0.020	0.20	+/-0.010	6	4.5		50	4	UH41001502	h
2	0/-0.020	0.30	+/-0.010	6	6.5		50	4	UH41002003	h
2.5	0/-0.020	0.30	+/-0.010	6	6.5		50	4	UH41002503	h
2.5	0/-0.020	0.50	+/-0.010	6	6.5		50	4	UH41002505	h
3	0/-0.025	0.20	+/-0.010	6	9		50	4	UH41003002	h
3	0/-0.025	0.30	+/-0.010	6	9		50	4	UH41003003	h
3	0/-0.025	0.50	+/-0.010	6	9		50	4	UH41003005	h
4	0/-0.025	0.30	+/-0.010	6	12		50	4	UH41004003	h
4	0/-0.025	0.50	+/-0.010	6	12		50	4	UH41004005	h
4	0/-0.025	1.00	+/-0.010	6	12		50	4	UH41004010	h
5	0/-0.025	0.30	+/-0.010	6	15		50	4	UH41005003	h
5	0/-0.025	0.50	+/-0.010	6	15		50	4	UH41005005	h
5	0/-0.025	1.00	+/-0.010	6	15		50	4	UH41005010	h
6	0/-0.025	0.30	+/-0.010	6	16		50	4	UH41006003	h
6	0/-0.025	0.50	+/-0.010	6	16		50	4	UH41006005	h
6	0/-0.025	1.00	+/-0.010	6	16		50	4	UH41006010	h
8	0/-0.030	0.30	+/-0.010	8	20		64	4	UH41008003	h
8	0/-0.030	0.50	+/-0.010	8	20		64	4	UH41008005	h
8	0/-0.030	1.00	+/-0.010	8	20		64	4	UH41008010	h
8	0/-0.030	1.50	+/-0.010	8	20		64	4	UH41008015	h
8	0/-0.030	2.00	+/-0.010	8	20		64	4	UH41008020	h
10	0/-0.030	0.30	+/-0.010	10	22		70	4	UH41010003	h
10	0/-0.030	0.50	+/-0.010	10	22		70	4	UH41010005	h
10	0/-0.030	1.00	+/-0.010	10	22		70	4	UH41010010	h
10	0/-0.030	1.50	+/-0.010	10	22		70	4	UH41010015	h
10	0/-0.030	2.00	+/-0.010	10	22		70	4	UH41010020	h
12	0/-0.030	0.30	+/-0.010	12	25		75	4	UH41012003	h
12	0/-0.030	0.50	+/-0.010	12	25		75	4	UH41012005	h
12	0/-0.030	1.00	+/-0.010	12	25		75	4	UH41012010	h
12	0/-0.030	1.50	+/-0.010	12	25		75	4	UH41012015	h
12	0/-0.030	2.00	+/-0.010	12	25		75	4	UH41012020	h
12	0/-0.030	3.00	+/-0.010	12	25		75	4	UH41012030	h
14	0/-0.030	0.50	+/-0.010	14	32		90	4	UH41014005	h
14	0/-0.030	1.00	+/-0.010	14	32		90	4	UH41014010	h
14	0/-0.030	2.00	+/-0.010	14	32		90	4	UH41014020	f
16	0/-0.030	0.30	+/-0.010	16	32		90	4	UH41016003	f
16	0/-0.030	0.50	+/-0.010	16	32		90	4	UH41016005	h
16	0/-0.030	1.00	+/-0.010	16	32		90	4	UH41016010	h

h stock standard   f non-standard stock   m stock exhaustion

UH410

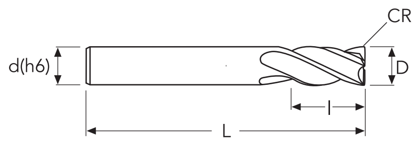
cylindrical shank, 4F, corner radius

OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | RADIUS | Z4

P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
16	0/-0.030	1.50	+/-0.010	16	32		90	4	UH41016015	f
16	0/-0.030	2.00	+/-0.010	16	32		90	4	UH41016020	h
16	0/-0.030	3.00	+/-0.010	16	32		90	4	UH41016030	f
18	0/-0.030	0.50	+/-0.010	18	38		100	4	UH41018005	f
18	0/-0.030	1.00	+/-0.010	18	38		100	4	UH41018010	h
18	0/-0.030	2.00	+/-0.010	18	38		100	4	UH41018020	f
20	0/-0.030	0.30	+/-0.010	20	38		100	4	UH41020003	f
20	0/-0.030	0.50	+/-0.010	20	38		100	4	UH41020005	h
20	0/-0.030	1.00	+/-0.010	20	38		100	4	UH41020010	h
20	0/-0.030	1.50	+/-0.010	20	38		100	4	UH41020015	f
20	0/-0.030	2.00	+/-0.010	20	38		100	4	UH41020020	h
20	0/-0.030	3.00	+/-0.010	20	38		100	4	UH41020030	f

h stock standard   f non-standard stock   m stock exhaustion

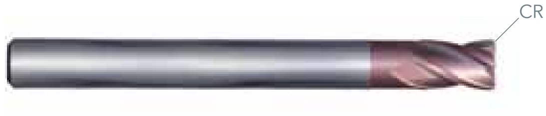
UH410

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**D x 0.05D**			**D x 0.05D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**90-130**			**60-100**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	35030	0.010	1400	25480	0.009	920	19110	0.008	575	12740	0.007	330
2	17520	0.018	1260	12740	0.016	830	9550	0.014	550	6370	0.013	320
3	11680	0.027	1260	8490	0.024	830	6370	0.022	550	4250	0.019	320
4	8760	0.036	1260	6370	0.032	830	4780	0.029	550	3180	0.025	320
5	7010	0.041	1140	5100	0.036	740	3820	0.032	495	2550	0.028	290
6	5840	0.045	1050	4250	0.041	690	3180	0.036	460	2120	0.032	265
8	4380	0.059	1020	3180	0.053	670	2390	0.047	445	1590	0.041	260
10	3500	0.077	1070	2550	0.069	700	1910	0.061	470	1270	0.054	270
12	2920	0.090	1050	2120	0.081	690	1590	0.072	460	1060	0.063	265
14	2500	0.102	1020	1820	0.092	670	1360	0.082	445	910	0.071	260
16	2190	0.114	1000	1590	0.103	650	1190	0.091	435	800	0.080	255
18	1950	0.126	980	1420	0.113	640	1060	0.101	425	710	0.088	250
20	1750	0.138	970	1270	0.124	630	960	0.110	425	640	0.097	245

UH411

cylindrical shank, 4F, reduced neck, corner radius, long

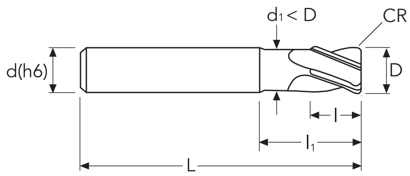
OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | RADIUS | Z4



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
3	0/-0.012	0.30	+/-0.010	6	4	12	2.85	55	4	UH4110300312	h
3	0/-0.012	0.30	+/-0.010	6	4	20	2.85	60	4	UH4110300320	h
3	0/-0.012	0.50	+/-0.010	6	4	10	2.85	55	4	UH4110300510	h
3	0/-0.012	0.50	+/-0.010	6	4	20	2.85	60	4	UH4110300520	h
4	0/-0.012	0.30	+/-0.010	6	6	12	3.85	55	4	UH4110400312	h
4	0/-0.012	0.30	+/-0.010	6	6	20	3.85	60	4	UH4110400320	h
4	0/-0.012	0.50	+/-0.010	6	6	12	3.85	55	4	UH4110400512	h
4	0/-0.012	0.50	+/-0.010	6	6	20	3.85	60	4	UH4110400520	h
4	0/-0.012	1.00	+/-0.010	6	6	12	3.85	55	4	UH4110401012	h
6	0/-0.012	0.50	+/-0.010	6	9	15	5.85	60	4	UH4110600520	h
6	0/-0.012	1.00	+/-0.010	6	9	15	5.85	60	4	UH4110601020	h
8	0/-0.015	0.50	+/-0.015	8	12	20	7.70	70	4	UH4110800525	h
8	0/-0.015	1.00	+/-0.015	8	12	20	7.70	70	4	UH4110801025	h
8	0/-0.015	2.00	+/-0.015	8	12	20	7.70	70	4	UH4110802025	h
10	0/-0.015	0.50	+/-0.015	10	15	25	9.70	70	4	UH4111000532	h
10	0/-0.015	1.00	+/-0.015	10	15	25	9.70	70	4	UH4111001032	h
10	0/-0.015	2.00	+/-0.015	10	15	25	9.70	70	4	UH4111002032	h
12	0/-0.015	0.50	+/-0.015	12	18	30	11.70	80	4	UH4111200538	h
12	0/-0.015	1.00	+/-0.015	12	18	30	11.70	80	4	UH4111201038	h
12	0/-0.015	2.00	+/-0.015	12	18	30	11.70	80	4	UH4111202038	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UH411

SIDE MILLING

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**D x 0.05D**			**D x 0.05D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**90-130**			**60-100**			**50-70**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	11680	0.027	1260	8490	0.024	830	6370	0.022	550	4250	0.019	320
4	8760	0.036	1260	6370	0.032	830	4780	0.029	550	3180	0.025	320
5	7010	0.041	1140	5100	0.036	740	3820	0.032	495	2550	0.028	290
6	5840	0.045	1050	4250	0.041	690	3180	0.036	460	2120	0.032	265
8	4380	0.059	1020	3180	0.053	670	2390	0.047	445	1590	0.041	260
10	3500	0.077	1070	2550	0.069	700	1910	0.061	470	1270	0.054	270
12	2920	0.090	1050	2120	0.081	690	1590	0.072	460	1060	0.063	265

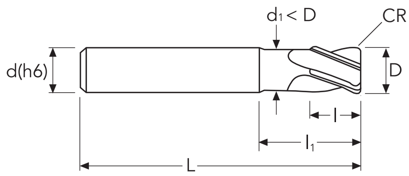
UH412

cylindrical shank, 4F, reduced neck, corner radius, long

P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
2	0/-0.020	0.30	+/-0.010	6	4	30	1.90	75	4	UH4120200330	h
2	0/-0.020	0.30	+/-0.010	6	4	60	1.90	100	4	UH4120200360	h
3	0/-0.025	0.30	+/-0.010	6	5	30	2.80	75	4	UH4120300330	h
3	0/-0.025	0.30	+/-0.010	6	5	60	2.80	100	4	UH4120300360	h
3	0/-0.025	0.50	+/-0.010	6	5	30	2.80	75	4	UH4120300530	h
3	0/-0.025	0.50	+/-0.010	6	5	60	2.80	100	4	UH4120300560	h
4	0/-0.025	0.30	+/-0.010	6	8	32	3.70	75	4	UH4120400332	h
4	0/-0.025	0.30	+/-0.010	6	8	60	3.70	100	4	UH4120400360	h
4	0/-0.025	0.50	+/-0.010	6	8	32	3.70	75	4	UH4120400532	h
4	0/-0.025	0.50	+/-0.010	6	8	60	3.70	100	4	UH4120400560	h
6	0/-0.025	0.50	+/-0.010	6	9	20	5.85	90	4	UH4120600520	h
6	0/-0.025	1.00	+/-0.010	6	9	20	5.85	90	4	UH4120601020	h
8	0/-0.025	0.50	+/-0.015	8	12	25	7.70	100	4	UH4120800525	h
8	0/-0.025	1.00	+/-0.015	8	12	25	7.70	100	4	UH4120801025	h
10	0/-0.025	0.50	+/-0.015	10	15	32	9.70	100	4	UH4121000532	h
10	0/-0.025	1.00	+/-0.015	10	15	32	9.70	100	4	UH4121001032	h
10	0/-0.025	2.00	+/-0.015	10	15	32	9.70	100	4	UH4121002032	h
12	0/-0.025	0.50	+/-0.015	12	18	38	11.70	110	4	UH4121200538	h
12	0/-0.025	1.00	+/-0.015	12	18	38	11.70	110	4	UH4121201038	h
12	0/-0.025	2.00	+/-0.015	12	18	38	11.70	110	4	UH4121202038	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

CUTTING PARAMETERS

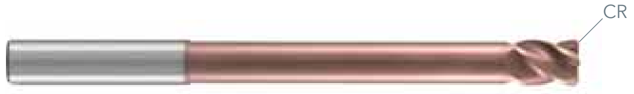
UH412

SIDE MILLING	Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
	Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
	ap x ae	**D x 0.05D**			**D x 0.05D**			**D x 0.05D**			**D x 0.05D**		
	Vc (m/min)	**80-120**			**60-100**			**50-70**			**30-50**		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	2	15920	0.016	1030	12740	0.015	740	9550	0.013	495	6370	0.011	290
	3	10620	0.024	1030	8490	0.022	740	6370	0.019	495	4250	0.017	290
	4	7960	0.032	1030	6370	0.029	740	4780	0.026	495	3180	0.023	290
	5	6370	0.036	930	5100	0.033	670	3820	0.029	445	2550	0.026	260
	6	5310	0.041	860	4250	0.036	620	3180	0.032	410	2120	0.028	240
	8	3980	0.053	840	3180	0.047	600	2390	0.042	405	1590	0.037	235
	10	3180	0.069	880	2550	0.062	630	1910	0.055	420	1270	0.048	245
	12	2650	0.081	860	2120	0.073	620	1590	0.065	410	1060	0.057	240

UH413

cylindrical shank, 4F, reduced neck, corner radius, long

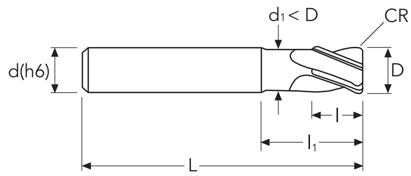
OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | RADIUS | Z4



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
6	0/-0.025	0.30	+/-0.010	6	10	60	5.50	125	4	UH4130600360	h
6	0/-0.025	0.50	+/-0.010	6	10	60	5.50	125	4	UH4130600560	h
6	0/-0.025	1.00	+/-0.010	6	10	60	5.50	125	4	UH4130601060	h
8	0/-0.030	0.30	+/-0.010	8	12	60	7.40	125	4	UH4130800360	h
8	0/-0.030	0.50	+/-0.010	8	12	60	7.40	125	4	UH4130800560	h
8	0/-0.030	1.00	+/-0.010	8	12	60	7.40	125	4	UH4130801060	h
8	0/-0.030	2.00	+/-0.010	8	12	60	7.40	125	4	UH4130802060	h
10	0/-0.030	0.30	+/-0.010	10	14	85	9.20	125	4	UH4131000385	h
10	0/-0.030	0.50	+/-0.010	10	14	85	9.20	125	4	UH4131000585	h
10	0/-0.030	1.00	+/-0.010	10	14	85	9.20	125	4	UH4131001085	h
10	0/-0.030	2.00	+/-0.010	10	14	85	9.20	125	4	UH4131002085	h
12	0/-0.030	0.50	+/-0.010	12	16	110	11.00	150	4	UH41312005110	h
12	0/-0.030	1.00	+/-0.010	12	16	110	11.00	150	4	UH41312010110	h
12	0/-0.030	2.00	+/-0.010	12	16	110	11.00	150	4	UH41312020110	h
16	0/-0.030	0.50	+/-0.010	16	22	110	15.00	150	4	UH41316005110	h
16	0/-0.030	1.00	+/-0.010	16	22	110	15.00	150	4	UH41316010110	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UH413

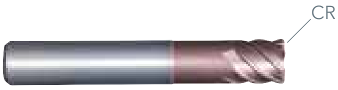
Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**D x 0.05D**			**D x 0.05D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**70-110**			**60-80**			**40-60**			**30-50**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	4780	0.041	770	3720	0.036	540	2650	0.032	345	2120	0.028	240
8	3580	0.053	750	2790	0.047	530	1990	0.042	335	1590	0.037	235
10	2870	0.069	790	2230	0.062	550	1590	0.055	350	1270	0.048	245
12	2390	0.081	770	1860	0.073	540	1330	0.065	345	1060	0.057	240
16	1790	0.095	680	1390	0.086	480	1000	0.076	305	800	0.067	215

OSAWA

UH610R

OSAWA NORM | UH | NMG UH RED | <70 HRC | 45° | RADIUS | Z6

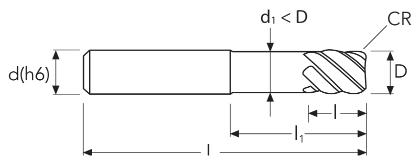
cylindrical shank, multi flute, reduced neck, corner radius



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
6	0/-0.030	0.50	+/-0.015	6	6	15	5.50	50	6	UH610R05060	h
8	0/-0.030	0.50	+/-0.015	8	8	25	7.40	60	6	UH610R05080	h
10	0/-0.030	1.00	+/-0.015	10	10	30	9.20	70	6	UH610R10100	h
12	0/-0.030	1.00	+/-0.015	12	12	30	11.00	75	6	UH610R10120	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

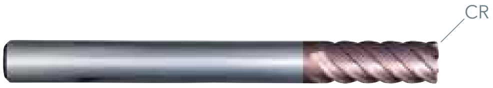
UH610R

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**D x 0.1D**			**D x 0.05D**			**D x 0.05D**			**D x 0.05D**		
Vc (m/min)	**140-180**			**100-140**			**70-110**			**60-80**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	8490	0.018	920	6370	0.016	620	4780	0.014	410	3720	0.013	280
8	6370	0.028	1050	4780	0.025	710	3580	0.022	470	2790	0.019	320
10	5100	0.034	1030	3820	0.030	690	2870	0.027	460	2230	0.024	310
12	4250	0.041	1040	3180	0.037	700	2390	0.033	470	1860	0.029	320

UH611R

cylindrical shank, multi flute, long, corner radius

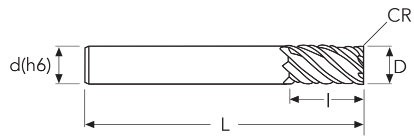
OSAWA NORM | UH | NMG UH RED | <70 HRC | 45° | RADIUS | Z6



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

SIDE MILLING



D	D Tol.	CR	CR Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/-0.030	0.50	+/-0.015	6	15		90	6	UH611R05060	h
8	0/-0.030	0.50	+/-0.015	8	20		100	6	UH611R05080	h
10	0/-0.030	0.50	+/-0.015	10	25		100	6	UH611R05100	h
10	0/-0.030	1.00	+/-0.015	10	25		100	6	UH611R10100	h
12	0/-0.030	0.50	+/-0.015	12	30		110	6	UH611R05120	h
12	0/-0.030	1.00	+/-0.015	12	30		110	6	UH611R10120	h
16	0/-0.030	1.00	+/-0.015	16	32		130	6	UH611R10160	h
20	0/-0.030	1.00	+/-0.015	20	38		140	6	UH611R10200	h
20	0/-0.030	2.00	+/-0.015	20	38		140	6	UH611R20200	h

h stock standard f non-standard stock m stock exhaustion

UH611R

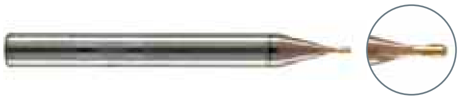
SIDE MILLING

Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm	< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae	**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**			**1.5D x 0.05D**		
Vc (m/min)	**110-150**			**90-130**			**60-80**			**40-60**		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	6900	0.015	630	5840	0.014	480	3720	0.012	270	2650	0.011	170
8	5180	0.023	730	4380	0.021	550	2790	0.019	310	1990	0.016	200
10	4140	0.029	710	3500	0.026	540	2230	0.023	310	1590	0.020	190
12	3450	0.035	720	2920	0.031	550	1860	0.028	310	1330	0.024	190
14	2960	0.041	720	2500	0.037	550	1590	0.033	310	1140	0.029	200
16	2590	0.048	740	2190	0.043	570	1390	0.038	320	1000	0.034	200
18	2300	0.056	770	1950	0.050	590	1240	0.045	330	880	0.039	210
20	2070	0.066	820	1750	0.060	630	1110	0.053	350	800	0.046	220

UHMB204

cylindrical shank, 2 flutes ball nose, miniature

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

COPYING

D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.2	0/-0.020	0.10	0/-0.020	4	0.2		50	2	UHMB200204	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3		50	2	UHMB200304	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4		50	2	UHMB200404	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4		50	2	UHMB200504	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5		50	2	UHMB200604	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6		50	2	UHMB200804	h

h stock standard f non-standard stock m stock exhaustion

UHMB204

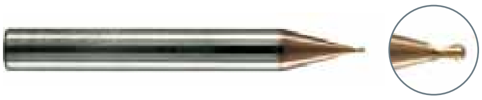
COPYING	Material Group ISO 513	P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm		< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae		**0.05D x 0.1D**			**0.05D x 0.1D**			**0.05D x 0.1D**			**0.05D x 0.1D**		
Vc (m/min)		**80-120**			**60-100**			**50-70**			**30-50**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.1	**0.04**	40000	0.004	320	40000	0.004	290	40000	0.003	255	40000	0.003	225
0.2	**0.09**	40000	0.006	480	40000	0.005	430	40000	0.005	385	40000	0.004	335
0.3	**0.13**	40000	0.008	640	40000	0.007	580	40000	0.006	510	40000	0.006	450
0.4	**0.17**	40000	0.010	800	40000	0.009	720	40000	0.008	640	31850	0.007	445
0.5	**0.22**	40000	0.012	960	40000	0.011	860	38220	0.010	735	25480	0.008	430
0.6	**0.26**	40000	0.015	1200	40000	0.014	1080	31850	0.012	765	21230	0.011	445
0.7	**0.31**	40000	0.018	1440	36400	0.016	1180	27300	0.014	785	18200	0.013	460
0.8	**0.35**	39810	0.020	1590	31850	0.018	1150	23890	0.016	765	15920	0.014	445
0.9	**0.39**	35390	0.023	1630	28310	0.021	1170	21230	0.018	780	14150	0.016	455

α	α	n (rpm)	Vf (mm/min)
	15°	x 1.1	x 1.1

UHMB206

cylindrical shank, 2 flutes ball nose, miniature, 6 mm. shank

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

COPYING

D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
0.4	0/-0.020	0.20	0/-0.020	6	0.4		50	2	UHMB200406	h
0.5	0/-0.020	0.25	0/-0.020	6	0.5		50	2	UHMB200506	h
0.6	0/-0.020	0.30	0/-0.020	6	0.6		50	2	UHMB200606	h
0.8	0/-0.020	0.40	0/-0.020	6	0.8		50	2	UHMB200806	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UHMB206

Material Group ISO 513		P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3			
Hardness/Rm		< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC			
ap x ae		**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**			
Vc (m/min)		**80-120**			**60-100**			**50-70**			**30-50**			
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
0.4	**0.17**	40000	0.010	800	40000	0.009	720	40000	0.008	640	31850	0.007	445	
0.5	**0.22**	40000	0.012	960	40000	0.011	860	38220	0.010	735	25480	0.008	430	
0.6	**0.26**	40000	0.015	1200	40000	0.014	1080	31850	0.012	765	21230	0.011	445	
0.8	**0.35**	39810	0.020	1590	31850	0.018	1150	23890	0.016	765	15920	0.014	445	

COPYING

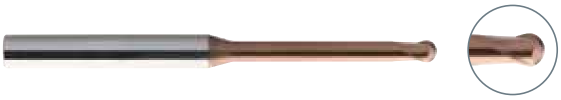
α	n (rpm)	Vf (mm/min)
15°	x 1.1	x 1.1

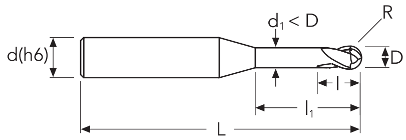
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL

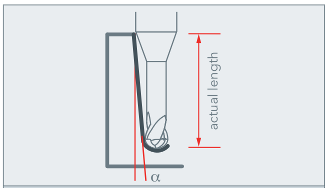




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

ROUND RIB



actual length according to α angle

D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
0.2	0/-0.020	0.10	0/-0.020	4	0.2	0.5	0.15	50	2	0.57	0.58	0.60	0.62	0.66	UHLNB2002005	h
0.2	0/-0.020	0.10	0/-0.020	4	0.2	1	0.15	50	2	1.08	1.12	1.15	1.19	1.27	UHLNB200201	h
0.2	0/-0.020	0.10	0/-0.020	4	0.2	1.5	0.15	50	2	1.60	1.65	1.71	1.76	1.89	UHLNB2002015	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3	1	0.25	50	2	1.08	1.11	1.15	1.18	1.26	UHLNB200301	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3	2	0.25	50	2	2.12	2.18	2.25	2.33	2.49	UHLNB200302	h
0.3	0/-0.020	0.15	0/-0.020	4	0.3	3	0.25	50	2	3.15	3.25	3.36	3.48	3.73	UHLNB200303	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	1	0.35	50	2	1.08	1.11	1.14	1.18	1.25	UHLNB200401	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	2	0.35	50	2	2.11	2.18	2.25	2.32	2.48	UHLNB200402	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	3	0.35	50	2	3.15	3.25	3.36	3.47	3.72	UHLNB200403	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	4	0.35	50	2	4.18	4.32	4.46	4.62	4.95	UHLNB200404	h
0.4	0/-0.020	0.20	0/-0.020	4	0.4	5	0.35	50	2	5.21	5.39	5.57	5.77	6.18	UHLNB200405	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	2	0.45	50	2	2.15	2.22	2.29	2.36	2.52	UHLNB200502	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	3	0.45	50	2	3.18	3.29	3.39	3.51	3.75	UHLNB200503	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	4	0.45	50	2	4.22	4.35	4.50	4.65	4.98	UHLNB200504	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	5	0.45	50	2	5.25	5.42	5.61	5.80	6.22	UHLNB200505	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	6	0.45	50	2	6.28	6.49	6.71	6.95	7.45	UHLNB200506	h
0.5	0/-0.020	0.25	0/-0.020	4	0.4	8	0.45	50	2	8.35	8.63	8.93	9.24	9.92	UHLNB200508	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	2	0.55	50	2	2.15	2.21	2.28	2.35	2.50	UHLNB200602	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	3	0.55	50	2	3.18	3.28	3.39	3.50	3.74	UHLNB200603	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	4	0.55	50	2	4.22	4.35	4.49	4.65	4.97	UHLNB200604	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	5	0.55	50	2	5.25	5.42	5.60	5.79	6.21	UHLNB200605	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	6	0.55	50	2	6.28	6.49	6.71	6.94	7.44	UHLNB200606	h
0.6	0/-0.020	0.30	0/-0.020	4	0.5	8	0.55	50	2	8.35	8.63	8.92	9.23	9.91	UHLNB200608	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	2	0.75	50	2	2.15	2.21	2.27	2.34	2.48	UHLNB200802	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	4	0.75	50	2	4.21	4.34	4.48	4.63	4.95	UHLNB200804	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	6	0.75	50	2	6.28	6.48	6.70	6.93	7.42	UHLNB200806	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	8	0.75	50	2	8.35	8.62	8.91	9.22	9.88	UHLNB200808	h
0.8	0/-0.020	0.40	0/-0.020	4	0.6	10	0.75	50	2	10.41	10.76	11.13	11.51	12.35	UHLNB200810	h
1	0/-0.020	0.50	0/-0.020	4	0.8	3	0.95	50	2	3.27	3.37	3.47	3.57	3.80	UHLNB201003	h
1	0/-0.020	0.50	0/-0.020	4	0.8	4	0.95	50	2	4.31	4.44	4.58	4.72	5.04	UHLNB201004	h
1	0/-0.020	0.50	0/-0.020	4	0.8	5	0.95	50	2	5.34	5.51	5.68	5.87	6.27	UHLNB201005	h
1	0/-0.020	0.50	0/-0.020	4	0.8	6	0.95	50	2	6.37	6.58	6.79	7.02	7.50	UHLNB201006	h
1	0/-0.020	0.50	0/-0.020	4	0.8	8	0.95	50	2	8.44	8.71	9.00	9.31	9.97	UHLNB201008	h
1	0/-0.020	0.50	0/-0.020	4	0.8	10	0.95	50	2	10.51	10.85	11.22	11.61	12.44	UHLNB201010	h
1	0/-0.020	0.50	0/-0.020	4	0.8	12	0.95	50	2	12.57	12.99	13.43	13.90	14.91	UHLNB201012	h
1	0/-0.020	0.50	0/-0.020	4	0.8	14	0.95	50	2	14.64	15.13	15.65	16.19	17.37	UHLNB201014	h
1	0/-0.020	0.50	0/-0.020	4	0.8	16	0.95	50	2	16.71	17.27	17.86	18.49	19.84	UHLNB201016	h
1	0/-0.020	0.50	0/-0.020	4	0.8	20	0.95	60	2	20.84	21.55	22.29	23.08	24.78	UHLNB201020	h
1.2	0/-0.020	0.60	0/-0.020	4	1	6	1.15	50	2	6.37	6.57	6.78	7.00	7.48	UHLNB201206	h

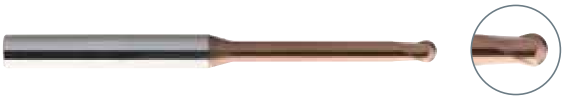
h stock standard f non-standard stock m stock exhaustion

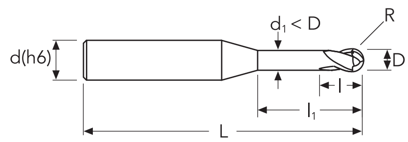
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL

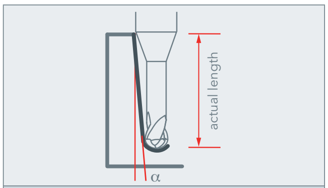




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

ROUND RIB



actual length according to α angle

D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
1.2	0/-0.020	0.60	0/-0.020	4	1	8	1.15	50	2	8.44	8.71	8.99	9.30	9.95	UHLNB201208	h
1.2	0/-0.020	0.60	0/-0.020	4	1	10	1.15	50	2	10.50	10.85	11.21	11.59	12.42	UHLNB201210	h
1.2	0/-0.020	0.60	0/-0.020	4	1	12	1.15	50	2	12.57	12.98	13.42	13.89	14.88	UHLNB201212	h
1.4	0/-0.020	0.70	0/-0.020	4	1.1	8	1.35	50	2	8.43	8.70	8.98	9.28	9.93	UHLNB201408	h
1.4	0/-0.020	0.70	0/-0.020	4	1.1	12	1.35	50	2	12.57	12.98	13.41	13.87	14.86	UHLNB201412	h
1.4	0/-0.020	0.70	0/-0.020	4	1.1	16	1.35	50	2	16.70	17.26	17.84	18.46	19.80	UHLNB201416	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	8	1.45	50	2	8.43	8.70	8.98	9.27	9.91	UHLNB201508	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	12	1.45	50	2	12.57	12.97	13.41	13.86	14.85	UHLNB201512	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	16	1.45	50	2	16.70	17.25	17.84	18.45	19.78	UHLNB201516	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	18	1.45	60	2	18.77	19.39	20.05	20.75	22.25	UHLNB201518	h
1.5	0/-0.020	0.75	0/-0.020	4	1.2	20	1.45	60	2	20.84	21.53	22.26	23.04	24.72	UHLNB201520	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	8	1.55	50	2	8.43	8.69	8.97	9.27	9.90	UHLNB201608	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	12	1.55	50	2	12.56	12.97	13.40	13.86	14.84	UHLNB201612	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	16	1.55	50	2	16.70	17.25	17.83	18.45	19.77	UHLNB201616	h
1.6	0/-0.020	0.80	0/-0.020	4	1.3	20	1.55	60	2	20.83	21.53	22.26	23.03	-	UHLNB201620	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	8	1.75	50	2	8.43	8.69	8.96	9.25	9.88	UHLNB201808	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	12	1.75	50	2	12.56	12.96	13.39	13.84	14.81	UHLNB201812	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	16	1.75	50	2	16.70	17.24	17.82	18.43	19.75	UHLNB201816	h
1.8	0/-0.020	0.90	0/-0.020	4	1.4	20	1.75	60	2	20.83	21.52	22.25	23.02	-	UHLNB201820	h
2	0/-0.020	1.00	0/-0.020	4	1.6	4	1.95	50	2	4.29	4.40	4.52	4.65	4.92	UHLNB202004	h
2	0/-0.020	1.00	0/-0.020	4	1.6	6	1.95	50	2	6.36	6.54	6.74	6.94	7.39	UHLNB202006	h
2	0/-0.020	1.00	0/-0.020	4	1.6	8	1.95	50	2	8.42	8.68	8.95	9.24	9.86	UHLNB202008	h
2	0/-0.020	1.00	0/-0.020	4	1.6	10	1.95	50	2	10.49	10.82	11.17	11.53	12.32	UHLNB202010	h
2	0/-0.020	1.00	0/-0.020	4	1.6	12	1.95	50	2	12.56	12.96	13.38	13.83	14.79	UHLNB202012	h
2	0/-0.020	1.00	0/-0.020	4	1.6	14	1.95	50	2	14.62	15.10	15.59	16.12	17.26	UHLNB202014	h
2	0/-0.020	1.00	0/-0.020	4	1.6	16	1.95	50	2	16.69	17.23	17.81	18.42	19.73	UHLNB202016	h
2	0/-0.020	1.00	0/-0.020	4	1.6	18	1.95	60	2	18.76	19.37	20.02	20.71	-	UHLNB202018	h
2	0/-0.020	1.00	0/-0.020	4	1.6	20	1.95	60	2	20.83	21.51	22.24	23.00	-	UHLNB202020	h
2	0/-0.020	1.00	0/-0.020	4	1.6	22	1.95	60	2	22.89	23.65	24.45	25.30	-	UHLNB202022	h
2	0/-0.020	1.00	0/-0.020	4	1.6	25	1.95	75	2	25.99	26.86	27.77	28.74	-	UHLNB202025	h
2	0/-0.020	1.00	0/-0.020	4	1.6	30	1.95	75	2	31.16	32.21	33.31	-	-	UHLNB202030	h
3	0/-0.025	1.50	0/-0.020	6	2.4	8	2.85	50	2	8.60	8.84	9.10	9.37	9.96	UHLNB203008	h
3	0/-0.025	1.50	0/-0.020	6	2.4	10	2.85	50	2	10.67	10.98	11.32	11.67	12.43	UHLNB203010	h
3	0/-0.025	1.50	0/-0.020	6	2.4	12	2.85	50	2	12.73	13.12	13.53	13.96	14.90	UHLNB203012	h
3	0/-0.025	1.50	0/-0.020	6	2.4	16	2.85	60	2	16.87	17.40	17.96	18.55	19.83	UHLNB203016	h
3	0/-0.025	1.50	0/-0.020	6	2.4	20	2.85	60	2	21.00	21.68	22.39	23.14	24.77	UHLNB203020	h
3	0/-0.025	1.50	0/-0.020	6	2.4	25	2.85	75	2	26.17	27.02	27.93	28.88	-	UHLNB203025	h
3	0/-0.025	1.50	0/-0.020	6	2.4	30	2.85	75	2	31.34	32.37	33.46	34.62	-	UHLNB203030	h
3	0/-0.025	1.50	0/-0.020	6	2.4	35	2.85	75	2	36.51	37.72	39.00	40.35	-	UHLNB203035	h

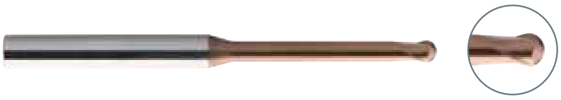
h stock standard f non-standard stock m stock exhaustion

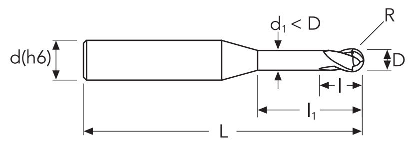
OSAWA

UHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL

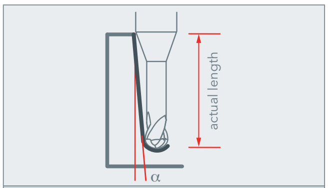




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

ROUND RIB



actual length according to α angle

D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
4	0/-0.025	2.00	0/-0.020	6	3.2	10	3.85	50	2	10.84	11.15	11.47	11.81	12.54	UHLNB204010	h
4	0/-0.025	2.00	0/-0.020	6	3.2	16	3.85	60	2	17.04	17.56	18.11	18.69	19.94	UHLNB204016	h
4	0/-0.025	2.00	0/-0.020	6	3.2	20	3.85	60	2	21.18	21.84	22.54	23.28	-	UHLNB204020	h
4	0/-0.025	2.00	0/-0.020	6	3.2	25	3.85	75	2	26.35	27.19	28.08	29.02	-	UHLNB204025	h
4	0/-0.025	2.00	0/-0.020	6	3.2	30	3.85	75	2	31.51	32.53	33.61	-	-	UHLNB204030	h
4	0/-0.025	2.00	0/-0.020	6	3.2	35	3.85	75	2	36.68	37.88	39.15	-	-	UHLNB204035	h
4	0/-0.025	2.00	0/-0.020	6	3.2	40	3.85	100	2	41.85	43.23	-	-	-	UHLNB204040	h
4	0/-0.025	2.00	0/-0.020	6	3.2	45	3.85	100	2	47.02	48.57	-	-	-	UHLNB204045	h
4	0/-0.025	2.00	0/-0.020	6	3.2	50	3.85	100	2	52.19	53.92	-	-	-	UHLNB204050	h

h stock standard f non-standard stock m stock exhaustion

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHLNB2

ROUND RIB

Material Group ISO 513				P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm				< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae				**ap x 0.2D**			**ap x 0.2D**			**ap x 0.2D**			**ap x 0.2D**		
Vc (m/min)				**140-160**			**110-130**			**80-100**			**50-70**		
D (mm)	l1 (mm)	ap (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.2	**≤ 6D**	**0.01**	**0.09**	40000	0.008	640	40000	0.007	580	40000	0.006	510	40000	0.006	450
	≤ 8D	**0.01**	**0.08**	40000	0.007	580	40000	0.006	470	40000	0.005	415	40000	0.005	365
	≤ 10D	**0.01**	**0.07**	40000	0.006	510	40000	0.005	370	40000	0.004	330	40000	0.004	285
0.3	**≤ 6D**	**0.02**	**0.13**	40000	0.010	800	40000	0.009	720	40000	0.008	640	40000	0.007	560
	≤ 8D	**0.01**	**0.12**	40000	0.009	720	40000	0.007	580	40000	0.006	520	40000	0.006	455
	≤ 10D	**0.01**	**0.11**	40000	0.008	640	40000	0.006	460	40000	0.005	410	40000	0.004	360
0.4	**≤ 6D**	**0.02**	**0.17**	40000	0.013	1040	40000	0.012	940	40000	0.010	830	40000	0.009	730
	≤ 8D	**0.02**	**0.16**	40000	0.012	940	40000	0.009	760	40000	0.008	675	40000	0.007	590
	≤ 10D	**0.01**	**0.15**	40000	0.010	830	40000	0.007	600	40000	0.007	530	38220	0.006	445
0.5	**≤ 6D**	**0.03**	**0.22**	40000	0.017	1360	40000	0.015	1220	40000	0.014	1090	38220	0.012	910
	≤ 8D	**0.02**	**0.20**	40000	0.015	1220	40000	0.012	990	40000	0.011	880	34390	0.010	665
	≤ 10D	**0.02**	**0.18**	40000	0.014	1090	40000	0.010	780	40000	0.009	695	30570	0.008	465
0.6	**≤ 6D**	**0.03**	**0.26**	40000	0.021	1680	40000	0.019	1510	40000	0.017	1345	31850	0.015	935
	≤ 8D	**0.03**	**0.24**	40000	0.019	1510	40000	0.015	1220	40000	0.014	1090	28660	0.012	685
	≤ 10D	**0.02**	**0.22**	40000	0.017	1340	40000	0.012	970	38220	0.011	820	25480	0.009	480
0.8	**≤ 6D**	**0.04**	**0.35**	40000	0.025	2000	40000	0.023	1800	35830	0.020	1435	23890	0.018	835
	≤ 8D	**0.03**	**0.32**	40000	0.023	1800	40000	0.018	1460	32250	0.016	1045	21500	0.014	610
	≤ 10D	**0.03**	**0.29**	40000	0.020	1600	38220	0.014	1100	28660	0.013	735	19110	0.011	430
1	**≤ 6D**	**0.05**	**0.44**	40000	0.030	2400	38220	0.027	2060	28660	0.024	1375	19110	0.021	805
	≤ 8D	**0.04**	**0.40**	40000	0.027	2160	34390	0.022	1500	25800	0.019	1005	17200	0.017	585
	≤ 10D	**0.04**	**0.37**	38220	0.024	1830	30570	0.017	1060	22930	0.015	705	15290	0.013	410
	≤ 12D	**0.03**	**0.33**	33440	0.021	1400	26750	0.013	710	20060	0.012	470	13380	0.010	275
	> 12D	**0.02**	**0.30**	28660	0.018	1030	22930	0.010	450	17200	0.009	295	11460	0.008	175
1.2	**≤ 6D**	**0.06**	**0.52**	39810	0.035	2790	31850	0.032	2010	23890	0.028	1340	15920	0.025	780
	≤ 8D	**0.05**	**0.48**	35830	0.032	2260	28660	0.026	1460	21500	0.023	975	14330	0.020	570
	≤ 10D	**0.04**	**0.44**	31850	0.028	1780	25480	0.020	1030	19110	0.018	685	12740	0.016	400
	≤ 12D	**0.03**	**0.39**	27870	0.025	1370	22290	0.015	690	16720	0.014	460	11150	0.012	270
	> 12D	**0.03**	**0.36**	23890	0.021	1000	19110	0.011	430	14330	0.010	290	9550	0.009	170
1.5	**≤ 6D**	**0.08**	**0.65**	31850	0.045	2870	25480	0.041	2060	19110	0.036	1375	12740	0.032	805
	≤ 8D	**0.06**	**0.61**	28660	0.041	2320	22930	0.033	1500	17200	0.029	1005	11460	0.026	585
	≤ 10D	**0.05**	**0.55**	25480	0.036	1830	20380	0.026	1060	15290	0.023	705	10190	0.020	410
	≤ 12D	**0.04**	**0.49**	22290	0.032	1400	17830	0.020	710	13380	0.018	470	8920	0.015	275
	> 12D	**0.03**	**0.44**	19110	0.027	1030	15290	0.015	450	11460	0.013	295	7640	0.011	175
2	**≤ 6D**	**0.10**	**0.87**	23890	0.060	2870	19110	0.054	2060	14330	0.048	1375	9550	0.042	800
	≤ 8D	**0.09**	**0.81**	21500	0.054	2320	17200	0.044	1500	12900	0.039	1005	8600	0.034	585
	≤ 10D	**0.07**	**0.74**	19110	0.048	1830	15290	0.035	1060	11460	0.031	705	7640	0.027	410
	≤ 12D	**0.06**	**0.65**	16720	0.042	1400	13380	0.026	710	10030	0.024	470	6690	0.021	275
	> 12D	**0.05**	**0.59**	14330	0.036	1030	11460	0.019	450	8600	0.017	295	5730	0.015	175
2.5	**≤ 6D**	**0.13**	**1.09**	19110	0.060	2290	15290	0.054	1650	11460	0.048	1100	7640	0.042	640
	≤ 8D	**0.11**	**1.01**	17200	0.054	1860	13760	0.044	1200	10320	0.039	800	6880	0.034	470
	≤ 10D	**0.09**	**0.92**	15290	0.048	1470	12230	0.035	850	9170	0.031	565	6110	0.027	330
	≤ 12D	**0.07**	**0.82**	13380	0.042	1120	10700	0.026	570	8030	0.024	380	5350	0.021	220
	> 12D	**0.06**	**0.74**	11460	0.036	830	9170	0.019	360	6880	0.017	240	4590	0.015	140
3	**≤ 6D**	**0.15**	**1.31**	15920	0.075	2390	12740	0.068	1720	9550	0.060	1145	6370	0.053	670
	≤ 8D	**0.13**	**1.21**	14330	0.068	1930	11460	0.055	1250	8600	0.049	835	5730	0.043	485
	≤ 10D	**0.11**	**1.10**	12740	0.060	1530	10190	0.043	880	7640	0.038	585	5100	0.034	345
	≤ 12D	**0.08**	**0.98**	11150	0.053	1170	8920	0.033	590	6690	0.029	395	4460	0.026	230
	> 12D	**0.07**	**0.89**	9550	0.045	860	7640	0.024	370	5730	0.022	250	3820	0.019	145

α	n (rpm)	Vf (mm/min)
45°	x 1.65	x 1.65
30°	x 1.30	x 1.30
15°	x 1.15	x 1.15

CUTTING PARAMETERS

UHLNB2

ROUND RIB															
Material Group ISO 513				P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm				< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae				**ap x 0.2D**			**ap x 0.2D**			**ap x 0.2D**			**ap x 0.2D**		
Vc				**140-160**			**110-130**			**80-100**			**50-70**		
D (mm)	l1 (mm)	ap (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
4	**≤ 6D**	**0.20**	**1.74**	11940	0.095	2270	9550	0.086	1630	7170	0.076	1090	4780	0.067	635
	≤ 8D	**0.17**	**1.61**	10750	0.086	1840	8600	0.069	1190	6450	0.062	795	4300	0.054	465
	≤ 10D	**0.14**	**1.47**	9550	0.076	1450	7640	0.055	840	5730	0.049	555	3820	0.043	325
	≤ 12D	**0.11**	**1.31**	8360	0.067	1110	6690	0.042	560	5020	0.037	375	3340	0.033	220
	> 12D	**0.09**	**1.19**	7170	0.057	820	5730	0.031	350	4300	0.027	235	2870	0.024	135

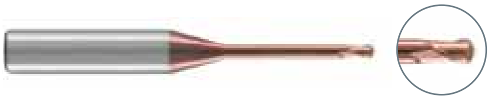
	α	n (rpm)	Vf (mm/min)
	45°	x 1.65	x 1.65
	30°	x 1.30	x 1.30
	15°	x 1.15	x 1.15

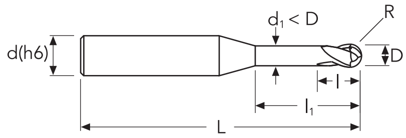
INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UHCRB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature, 6 mm. shank

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL

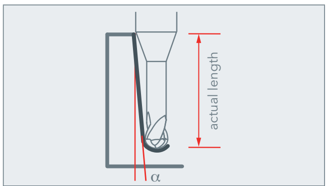




P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

ROUND RIB



actual length according to α angle

D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	30′	1°	1°30′	2°	3°	EDP No.	Stock
0.5	0/-0.012	0.25	+/-0.005	6	0.5	2	0.45	50	2	2.15	2.22	2.29	2.36	2.52	UHCRB20050156	h
0.5	0/-0.012	0.25	+/-0.005	6	0.5	4	0.45	50	2	4.22	4.35	4.50	4.65	4.98	UHCRB20050336	h
0.6	0/-0.012	0.30	+/-0.005	6	0.5	2	0.55	50	2	2.15	2.21	2.28	2.35	2.50	UHCRB20060206	h
0.6	0/-0.012	0.30	+/-0.005	6	0.5	4	0.55	50	2	4.22	4.35	4.49	4.65	4.97	UHCRB20060406	h
0.6	0/-0.012	0.30	+/-0.005	6	0.5	6	0.55	50	2	6.28	6.49	6.71	6.94	7.44	UHCRB20060606	h
0.8	0/-0.012	0.40	+/-0.005	6	0.8	2	0.75	50	2	2.15	2.21	2.27	2.34	2.48	UHCRB20080256	h
0.8	0/-0.012	0.40	+/-0.005	6	0.8	4	0.75	50	2	4.21	4.34	4.48	4.63	4.95	UHCRB20080406	h
0.8	0/-0.012	0.40	+/-0.005	6	0.8	6	0.75	50	2	6.28	6.48	6.70	6.93	7.42	UHCRB20080556	h
1	0/-0.012	0.50	+/-0.005	6	1	3	0.90	50	2	3.27	3.37	3.47	3.57	3.80	UHCRB20100336	h
1	0/-0.012	0.50	+/-0.005	6	1	6	0.90	50	2	6.37	6.58	6.79	7.02	7.50	UHCRB20100676	h
1	0/-0.012	0.50	+/-0.005	6	1	8	0.90	50	2	8.44	8.71	9.00	9.31	9.97	UHCRB20100806	h
1	0/-0.012	0.50	+/-0.005	6	1	10	0.90	50	2	10.51	10.85	11.22	11.61	12.44	UHCRB20101206	h
1.2	0/-0.012	0.60	+/-0.005	6	1.2	6	1.10	50	2	6.37	6.57	6.78	7.00	7.48	UHCRB20120606	h
1.2	0/-0.012	0.60	+/-0.005	6	1.2	8	1.10	50	2	8.44	8.71	8.99	9.30	9.95	UHCRB2012086	h
1.2	0/-0.012	0.60	+/-0.005	6	1.2	10	1.10	50	2	10.50	10.85	11.21	11.59	12.42	UHCRB20121006	h
1.5	0/-0.012	0.75	+/-0.005	6	1.5	4	1.40	50	2	4.30	4.42	4.55	4.68	4.98	UHCRB2015056	h
1.5	0/-0.012	0.75	+/-0.005	6	1.5	8	1.40	50	2	8.43	8.70	8.98	9.27	9.91	UHCRB20150806	h
1.5	0/-0.012	0.75	+/-0.005	6	1.5	10	1.40	50	2	10.50	10.84	11.19	11.57	12.38	UHCRB20150976	h
1.5	0/-0.012	0.75	+/-0.005	6	1.5	12	1.40	50	2	12.57	12.97	13.41	13.86	14.85	UHCRB2015156	h
1.5	0/-0.012	0.75	+/-0.005	6	1.5	16	1.40	50	2	16.70	17.25	17.84	18.45	19.78	UHCRB20151606	h
2	0/-0.012	1.00	+/-0.005	6	3	6	1.90	50	2	6.36	6.54	6.74	6.94	7.39	UHCRB2020066	h
2	0/-0.012	1.00	+/-0.005	6	3	8	1.90	50	2	8.42	8.68	8.95	9.24	9.86	UHCRB20200806	h
2	0/-0.012	1.00	+/-0.005	6	3	10	1.90	50	2	10.49	10.82	11.17	11.53	12.32	UHCRB20201006	h
2	0/-0.012	1.00	+/-0.005	6	3	12	1.90	50	2	12.56	12.96	13.38	13.83	14.79	UHCRB2020136	h
2	0/-0.012	1.00	+/-0.005	6	3	16	1.90	50	2	16.69	17.23	17.81	18.42	19.73	UHCRB20201606	h
2	0/-0.012	1.00	+/-0.005	6	3	20	1.90	50	2	20.83	21.51	22.24	23.00	24.66	UHCRB2020206	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UHCRB2

				P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Material Group ISO 513				P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm				< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae				**ap x 0.2D**			**ap x 0.2D**			**ap x 0.2D**			**ap x 0.2D**		
Vc (m/min)				**140-160**			**110-130**			**80-100**			**50-70**		
D (mm)	l1 (mm)	ap (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
0.5	**≤ 6D**	**0.03**	**0.22**	40000	0.020	1600	40000	0.018	1440	40000	0.016	1280	38220	0.014	1070
	≤ 8D	**0.02**	**0.20**	40000	0.018	1440	40000	0.015	1170	40000	0.013	1035	34390	0.011	780
	≤ 10D	**0.02**	**0.18**	40000	0.016	1280	40000	0.012	920	40000	0.010	820	30570	0.009	550
0.6	**≤ 6D**	**0.03**	**0.26**	40000	0.022	1760	40000	0.020	1580	40000	0.018	1410	31850	0.015	980
	≤ 8D	**0.03**	**0.24**	40000	0.020	1580	40000	0.016	1280	40000	0.014	1140	28660	0.012	715
	≤ 10D	**0.02**	**0.22**	40000	0.018	1410	40000	0.013	1010	38220	0.011	860	25480	0.010	500
0.8	**≤ 6D**	**0.04**	**0.35**	40000	0.025	2000	40000	0.023	1800	35830	0.020	1435	23890	0.018	835
	≤ 8D	**0.03**	**0.32**	40000	0.023	1800	40000	0.018	1460	32250	0.016	1045	21500	0.014	610
	≤ 10D	**0.03**	**0.29**	40000	0.020	1600	38220	0.014	1100	28660	0.013	735	19110	0.011	430
1	**≤ 6D**	**0.05**	**0.44**	40000	0.030	2400	38220	0.027	2060	28660	0.024	1375	19110	0.021	805
	≤ 8D	**0.04**	**0.40**	40000	0.027	2160	34390	0.022	1500	25800	0.019	1005	17200	0.017	585
	≤ 10D	**0.04**	**0.37**	38220	0.024	1830	30570	0.017	1060	19110	0.015	585	15290	0.013	410
	≤ 12D	**0.03**	**0.33**	33440	0.021	1400	26750	0.013	710	16720	0.012	395	13380	0.010	275
	> 12D	**0.02**	**0.30**	28660	0.018	1030	22930	0.010	450	14330	0.009	250	11460	0.008	175
1.2	**≤ 6D**	**0.06**	**0.52**	39810	0.035	2790	31850	0.032	2010	23890	0.028	1340	15920	0.025	780
	≤ 8D	**0.05**	**0.48**	35830	0.032	2260	28660	0.026	1460	21500	0.023	975	14330	0.020	570
	≤ 10D	**0.04**	**0.44**	31850	0.028	1780	25480	0.020	1030	19110	0.018	685	12740	0.016	400
	≤ 12D	**0.03**	**0.39**	27870	0.025	1370	22290	0.015	690	16720	0.014	460	11150	0.012	270
	> 12D	**0.03**	**0.36**	23890	0.021	1000	19110	0.011	430	14330	0.010	290	9550	0.009	170
1.5	**≤ 6D**	**0.08**	**0.65**	31850	0.045	2870	25480	0.041	2060	19110	0.036	1375	12740	0.032	805
	≤ 8D	**0.06**	**0.61**	28660	0.041	2320	22930	0.033	1500	17200	0.029	1005	11460	0.026	585
	≤ 10D	**0.05**	**0.55**	25480	0.036	1830	20380	0.026	1060	15290	0.023	705	10190	0.020	410
	≤ 12D	**0.04**	**0.49**	22290	0.032	1400	17830	0.020	710	13380	0.018	470	8920	0.015	275
	> 12D	**0.03**	**0.44**	19110	0.027	1030	15290	0.015	450	11460	0.013	295	7640	0.011	175
2	**≤ 6D**	**0.10**	**0.87**	23890	0.060	2870	19110	0.054	2060	14330	0.048	1375	9550	0.042	800
	≤ 8D	**0.09**	**0.81**	21500	0.054	2320	17200	0.044	1500	12900	0.039	1005	8600	0.034	585
	≤ 10D	**0.07**	**0.74**	19110	0.048	1830	15290	0.035	1060	11460	0.031	705	7640	0.027	410
	≤ 12D	**0.06**	**0.65**	16720	0.042	1400	13380	0.026	710	10030	0.024	470	6690	0.021	275
	> 12D	**0.05**	**0.59**	14330	0.036	1030	11460	0.019	450	8600	0.017	295	5730	0.015	175

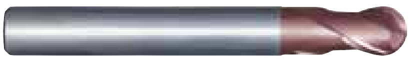
ROUND RIB

α	n (rpm)	Vf (mm/min)
45°	x 1.65	x 1.65
30°	x 1.30	x 1.30
15°	x 1.15	x 1.15

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

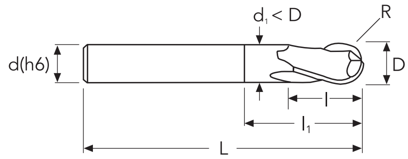
UHCSB2

cylindrical shank, 2 flutes ball nose



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable



D	D Tol.	R	R Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
1	0/-0.012	0.50	+/-0.005	6	1.5		40	2	UHCSB2010	h
1.5	0/-0.012	0.75	+/-0.005	6	2.5		40	2	UHCSB2015	h
2	0/-0.012	1.00	+/-0.005	6	3		40	2	UHCSB2020	h
2.5	0/-0.012	1.25	+/-0.005	6	3		50	2	UHCSB2025	h
3	0/-0.012	1.50	+/-0.005	6	4.5		50	2	UHCSB2030	h
4	0/-0.012	2.00	+/-0.005	6	6		50	2	UHCSB2040	h
5	0/-0.012	2.50	+/-0.005	6	7.5		50	2	UHCSB2050	h
6	0/-0.012	3.00	+/-0.010	6	9		50	2	UHCSB2060	h
8	0/-0.015	4.00	+/-0.010	8	12		50	2	UHCSB2080	h
10	0/-0.015	5.00	+/-0.010	10	15		60	2	UHCSB2100	h
12	0/-0.015	6.00	+/-0.010	12	18		60	2	UHCSB2120	h
14	0/-0.030	7.00	+/-0.020	14	32		90	2	UHCSB2140	h
16	0/-0.030	8.00	+/-0.020	16	32		90	2	UHCSB2160	h
18	0/-0.030	9.00	+/-0.020	18	38		100	2	UHCSB2180	h
20	0/-0.030	10.00	+/-0.020	20	38		100	2	UHCSB2200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UHCSB2

Material Group ISO 513		P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm		< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae		**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**		
Vc (m/min)		**140-180**			**100-140**			**80-100**			**60-80**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.44**	40000	0.009	720	38220	0.008	620	28660	0.007	410	22290	0.006	280
1.5	**0.65**	33970	0.012	820	25480	0.011	550	19110	0.010	370	14860	0.008	250
2	**0.87**	25480	0.012	610	19110	0.011	410	14330	0.010	280	11150	0.008	190
2.5	**1.09**	20380	0.015	610	15290	0.014	410	11460	0.012	280	8920	0.011	190
3	**1.31**	16990	0.018	610	12740	0.016	410	9550	0.014	280	7430	0.013	190
4	**1.74**	12740	0.025	640	9550	0.023	430	7170	0.020	290	5570	0.018	190
5	**2.18**	10190	0.032	650	7640	0.029	440	5730	0.026	290	4460	0.022	200
6	**2.62**	8490	0.038	650	6370	0.034	440	4780	0.030	290	3720	0.027	200
8	**3.49**	6370	0.048	610	4780	0.043	410	3580	0.038	270	2790	0.034	190
10	**4.36**	5100	0.057	580	3820	0.051	390	2870	0.046	260	2230	0.040	180
12	**5.23**	4250	0.067	570	3180	0.060	380	2390	0.054	260	1860	0.047	170
14	**6.10**	3640	0.08	580	2730	0.072	390	2050	0.064	260	1590	0.056	180
16	**6.97**	3180	0.095	600	2390	0.086	410	1790	0.076	270	1390	0.067	180
18	**7.85**	2830	0.108	610	2120	0.097	410	1590	0.086	270	1240	0.076	190
20	**8.72**	2550	0.108	550	1910	0.097	370	1430	0.086	250	1110	0.076	170

COPYING

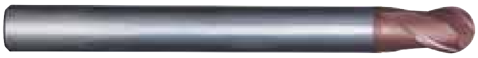
α	n (rpm)	Vf (mm/min)
15°	x 1.1	x 1.1

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UH250

cylindrical shank, 2 flutes ball nose, long reach and reduced neck

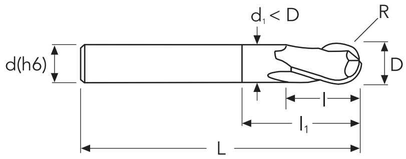
OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL



P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
1	0/-0.012	0.50	+/-0.005	4	1	2.2	0.95	50	2	UH250010	h
1.5	0/-0.012	0.75	+/-0.005	4	1.5	3	1.45	50	2	UH250015	h
2	0/-0.012	1.00	+/-0.005	6	2	4	1.95	50	2	UH250020	h
2.5	0/-0.012	1.25	+/-0.005	6	4	10	2.40	50	2	UH250025	h
3	0/-0.012	1.50	+/-0.005	6	3	6	2.85	60	2	UH250030	h
4	0/-0.012	2.00	+/-0.005	6	4	8	3.85	70	2	UH250040	h
5	0/-0.012	2.50	+/-0.005	6	5	10	4.85	80	2	UH250050	h
6	0/-0.012	3.00	+/-0.010	6	6	12	5.85	90	2	UH250060	h
8	0/-0.015	4.00	+/-0.010	8	8	16	7.70	100	2	UH250080	h
10	0/-0.015	5.00	+/-0.010	10	10	20	9.70	100	2	UH250100	h
12	0/-0.015	6.00	+/-0.010	12	12	24	11.70	110	2	UH250120	h
14	0/-0.030	7.00	0/-0.020	14	32	80	13.00	125	2	UH250140	h
16	0/-0.030	8.00	0/-0.020	16	32	80	15.00	125	2	UH250160	h
18	0/-0.030	9.00	0/-0.020	18	38	80	17.00	125	2	UH250180	h
20	0/-0.030	10.00	0/-0.020	20	38	80	19.00	125	2	UH250200	h

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

UH250

		P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Material Group ISO 513													
Hardness/Rm		< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae		**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**		
Vc (m/min)		**120-160**			**90-130**			**70-90**			**50-70**		
D (mm)	**D (eff.) (mm)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**	**n (rpm)**	**fn (mm/rev)**	**Vf (mm/min)**
1	**0.44**	30000	0.015	900	30000	0.014	810	25480	0.012	610	19110	0.011	400
2	**0.87**	22290	0.021	950	17520	0.019	670	12740	0.017	430	9550	0.015	280
3	**1.31**	14860	0.027	810	11680	0.024	570	8490	0.022	370	6370	0.019	240
4	**1.74**	11150	0.037	820	8760	0.033	580	6370	0.029	370	4780	0.026	240
5	**2.18**	8920	0.045	800	7010	0.041	570	5100	0.036	370	3820	0.032	240
6	**2.62**	7430	0.051	760	5840	0.046	540	4250	0.041	350	3180	0.036	230
8	**3.49**	5570	0.060	660	4380	0.054	470	3180	0.048	300	2390	0.042	200
10	**4.36**	4460	0.068	610	3500	0.061	430	2550	0.054	280	1910	0.048	180
12	**5.23**	3720	0.077	570	2920	0.069	400	2120	0.061	260	1590	0.054	170
14	**6.10**	3180	0.089	570	2500	0.080	400	1820	0.071	260	1360	0.062	170
16	**6.97**	2790	0.102	570	2190	0.092	400	1590	0.082	260	1190	0.071	170
18	**7.85**	2480	0.115	570	1950	0.103	400	1420	0.092	260	1060	0.080	170
20	**8.72**	2230	0.132	590	1750	0.119	420	1270	0.106	270	960	0.092	180

α 45°

COPYING	α	n (rpm)	Vf (mm/min)
	30°	x 0.8	x 0.8
	15°	x 0.7	x 0.7
	0°	x 0.6	x 0.6

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

UH253

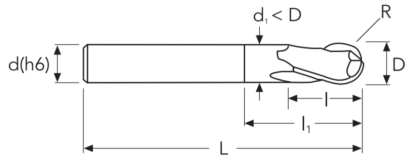
cylindrical shank, 2 flutes ball nose, extra-long reach and reduced neck

OSAWA NORM | UH | NMG UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL

P	M	K	N	S	H
☆		☆			★

★ 1st choice ☆ suitable

COPYING



D	D Tol.	R	R Tol.	d(h6)	l	l1	d1	L	z	EDP No.	Stock
1	0/-0.020	0.50	0/-0.020	6	3	7	0.90	75	2	UH25301075	h
1	0/-0.020	0.50	0/-0.020	6	3	10	0.90	100	2	UH253010100	h
1.5	0/-0.020	0.75	0/-0.020	6	3	10	1.40	75	2	UH25301575	h
1.5	0/-0.020	0.75	0/-0.020	6	3	15	1.40	100	2	UH253015100	h
2	0/-0.020	1.00	0/-0.020	6	4	14	1.90	75	2	UH25302075	h
2	0/-0.020	1.00	0/-0.020	6	4	20	1.90	100	2	UH253020100	h
2.5	0/-0.020	1.25	0/-0.020	6	4	18	2.40	75	2	UH25302575	h
3	0/-0.025	1.50	0/-0.020	6	5	21	2.80	75	2	UH25303075	h
3	0/-0.025	1.50	0/-0.020	6	5	30	2.80	100	2	UH253030100	h
4	0/-0.025	2.00	0/-0.020	6	8	28	3.70	75	2	UH25304075	h
4	0/-0.025	2.00	0/-0.020	6	8	40	3.70	100	2	UH253040100	h
5	0/-0.025	2.50	0/-0.020	6	9	50	4.60	100	2	UH253050100	h
6	0/-0.025	3.00	0/-0.020	6	10	60	5.50	100	2	UH253060100	h
6	0/-0.025	3.00	0/-0.020	6	10	60	5.50	150	2	UH253060150	h
8	0/-0.030	4.00	0/-0.020	8	12	60	7.40	100	2	UH253080100	h
8	0/-0.030	4.00	0/-0.020	8	12	80	7.40	150	2	UH253080150	h
10	0/-0.030	5.00	0/-0.020	10	14	85	9.20	125	2	UH253100125	h
10	0/-0.030	5.00	0/-0.020	10	14	100	9.20	150	2	UH253100150	h
12	0/-0.030	6.00	0/-0.020	12	16	85	11.00	125	2	UH253120125	h
12	0/-0.030	6.00	0/-0.020	12	16	110	11.00	150	2	UH253120150	h
14	0/-0.030	7.00	0/-0.020	14	32	110	13.00	150	2	UH253140150	h
14	0/-0.030	7.00	0/-0.020	14	32	150	13.00	200	2	UH253140200	h
16	0/-0.030	8.00	0/-0.020	16	32	110	15.00	150	2	UH253160150	h
16	0/-0.030	8.00	0/-0.020	16	32	150	15.00	200	2	UH253160200	h
20	0/-0.030	10.00	0/-0.020	20	38	110	19.00	150	2	UH253200150	h
20	0/-0.030	10.00	0/-0.020	20	38	150	19.00	200	2	UH253200200	h

h stock standard   f non-standard stock   m stock exhaustion

CUTTING PARAMETERS

UH253

Material Group ISO 513		P3 P4 P5 K2 K3			P6 K4 H1 H4 H5			H2			H3		
Hardness/Rm		< 45 HRC			45 - 55 HRC			55 - 60 HRC			60 - 65 HRC		
ap x ae		**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**			**0.05D x 0.2D**		
Vc (m/min)		**110-150**			**80-120**			**60-80**			**40-60**		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
1	**0.44**	30000	0.021	1280	30000	0.019	1150	22290	0.017	760	15920	0.015	470
2	**0.87**	20700	0.021	880	15920	0.019	610	11150	0.017	380	7960	0.015	240
3	**1.31**	13800	0.027	750	10620	0.024	520	7430	0.022	320	5310	0.019	200
4	**1.74**	10350	0.037	760	7960	0.033	520	5570	0.029	330	3980	0.026	200
5	**2.18**	8280	0.045	750	6370	0.041	520	4460	0.036	320	3180	0.032	200
6	**2.62**	6900	0.051	700	5310	0.046	490	3720	0.041	300	2650	0.036	190
8	**3.49**	5180	0.060	620	3980	0.054	430	2790	0.048	270	1990	0.042	170
10	**4.36**	4140	0.068	560	3180	0.061	390	2230	0.054	240	1590	0.048	150
12	**5.23**	3450	0.077	530	2650	0.069	360	1860	0.061	230	1330	0.054	140
14	**6.10**	2960	0.089	530	2270	0.080	360	1590	0.071	230	1140	0.062	140
16	**6.97**	2590	0.102	530	1990	0.092	370	1390	0.082	230	1000	0.071	140
18	**7.85**	2300	0.115	530	1770	0.103	370	1240	0.092	230	880	0.080	140
20	**8.72**	2070	0.132	550	1590	0.119	380	1110	0.106	230	800	0.092	150

α	n (rpm)	Vf (mm/min)
30°	x 0.8	x 0.8
15°	x 0.7	x 0.7
0°	x 0.6	x 0.6

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS