YU-TP26 **AMERICAS**

BEST VALUE IN THE WORLD OF CUTTING TOOLS

YG

FOR TITANIUM, STAINLESS STEELS AND ALLOY STEELS :

TOUGH MATERIALS
TAKE IT ON WITH
TitaNox Power

INDUSTRY-LEADING SOLID CARBIDE END MILLS



HIGH-PERFORMANCE MACHINING MADE EASY:

- Variable Helix and Pitch
- 4 Flute and 5 Flute
- Square End, Chamfer and Radius
- Standard and Extended Lengths
- Inch and Metric Sizes

TitaNox-Power HPC

- NEW SIZE 5 Flute Heavy Cutting Solution
- NEW 7 Flute & 7 Flute Chip Breaker
- NEW 4 & 6 Flute High Feed End Mills

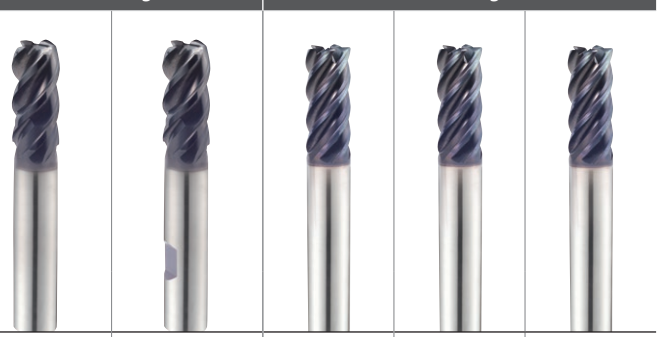
SOLID CARBIDE
TitaNox-Power
END MILLS

Please visit globalyg1.com/mat for material search

High Speed Machining for Exotic Materials: Titanium, Inconel and Stainless Steels

Recommended cutting conditions : p.32

◎ : Excellent ○ : Good

							Inch				
						SERIES	UGMG42	UGMG43	UGMH12	UGMG32	UGMG34
						SHANK	Plain	Weldon Flat	Plain		
						FLUTE	4		5		
						HELIX ANGLE	43° / 45° (MULTIPLE HELIX)		43°/44°/45° (MULTIPLE HELIX)		
						CUTTING EDGE SHAPE	CORNER RADIUS	CORNER RADIUS	SQUARE	SQUARE (CHAMFER)	CORNER RADIUS
						SIZE MIN	1/4	3/8	1/8	1/8	1/8
						SIZE MAX	1	1	1-1/4	1	1-1/4
						PAGE	10	11	12-13		
							DOUBLE CORE STANDARD LENGTH		STANDARD LENGTH		
							Y-Coating		Y-Coating		
											
ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment		HB	HRc					
P	1	Non-alloy steel	About 0.15% C	Annealed	125		○	○	○	○	○
	2		About 0.45% C	Annealed	190	13	○	○	○	○	○
	3		About 0.45% C	Quenched & Tempered	250	25	○	○	○	○	○
	4		About 0.75% C	Annealed	270	28	○	○	○	○	○
	5		About 0.75% C	Quenched & Tempered	300	32	○	○	○	○	○
	6	Low alloy steel		Annealed	180	10	○	○	○	○	○
	7			Quenched & Tempered	275	29	○	○	○	○	○
	8			Quenched & Tempered	300	32	○	○	○	○	○
	9			Quenched & Tempered	350	38	○	○	○	○	○
	10	High alloyed steel, and tool steel		Annealed	200	15	○	○	○	○	○
	11			Quenched & Tempered	325	35	○	○	○	○	○
M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15	◎	◎	◎	◎	◎
	13		Martensitic	Quenched & Tempered	240	23	◎	◎	◎	◎	◎
	14		Austenitic		180	10	◎	◎	◎	◎	◎
K	15	Grey cast iron	Pearlitic / ferritic		180	10	○	○	○	○	○
	16		Pearlitic (Martensitic)		260	26	○	○	○	○	○
	17	Nodular cast iron	Ferritic		160	3	○	○	○	○	○
	18		Pearlitic		250	25	○	○	○	○	○
	19	Malleable cast iron	Ferritic		130		○	○	○	○	○
	20		Pearlitic		230	21	○	○	○	○	○
N	21	Aluminum-wrought alloy	Not Curable		60						
	22		Curable	Hardened	100						
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75						
	24		≤ 12% Si, Curable	Hardened	90						
	25		> 12% Si, Not Curable		130						
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%		110						
	27		CuZn, CuSnZn (Brass)		90						
	28		CuSn, lead-free copper and electrolytic copper		100						
	29	Non Metallic Materials	Duroplastic, Fiber Reinforced Plastic								
	30		Rubber, Wood, etc.								
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15	○	○	○	○	○
	32			Cured	280	30	○	○	○	○	○
	33		Ni or Co Based	Annealed	250	25	○	○	○	○	○
	34			Cured	350	38	○	○	○	○	○
	35			Cast	320	34	○	○	○	○	○
	36	Titanium Alloys	Pure Titanium		400 Rm		◎	◎	◎	◎	◎
	37		Alpha + Beta Alloys	Hardened	1050 Rm		◎	◎	◎	◎	◎
H	38	Hardened steel		Hardened	550	55					
	39			Hardened	630	60					
	40	Chilled Cast Iron		Cast	400	42					
	41	Hardened Cast Iron		Hardened	550	55					

Inch		Metric		
UGMH06	UGMH07	GMG40	GMG24, GMG26	GMG28, GMG30
Plain		Plain	Plain	
5		4	5	
43°/44°/45° (MULTIPLE HELIX)		43° / 45° (MULTIPLE HELIX)	43°/44°/45° (MULTIPLE HELIX)	
SQUARE	CORNER RADIUS	CORNER RADIUS	SQUARE(CHAMFER)	CORNER RADIUS
1/8	1/8	6.0	6.0	6.0
1	1	25.0	25.0	25.0
14-15		16	17	
EXTENDED LENGTH		EXTENDED LENGTH	STANDARD LENGTH	
Y-Coating		Y-Coating	Y-Coating	
				
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
◎	◎	◎	◎	◎
◎	◎	◎	◎	◎
◎	◎	◎	◎	◎
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
◎	◎	◎	◎	◎
◎	◎	◎	◎	◎

GUIDE TO ICONS

Tool Material

CARBIDE — The tool is made of micrograin carbide

Helix Angle

20° | 38° | 43°/45° | 43°/44°/45°

No. of Flutes

4 | 5 | 6 | 7

Type of Shank

PLAIN — Plain shank

FLAT — Weldon Flat shank

Tool Ends:

Square | Chamfer (45°) | Radius (R)

Tool Ends:

Y Coating — YG-1 Y-Coating

AlTiN — Aluminum Titanium Nitride Coating

C Coating — YG-1 C-Coating

Cutting Conditions

SELECTION GUIDE

SOLID CARBIDE
TitaNox-Power HPC
END MILLS

Design for heavy cutting applications
Slotting & high efficiency milling

Please visit globalyg1.com/mat for material search

Recommended cutting conditions : p.38

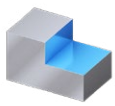
◎ : Excellent ○ : Good

							Inch				
						SERIES	EMI42	EMI43	HHK82	HHK83	HHK84
						SHANK	Plain		Plain		
						FLUTE	5		7		
						HELIX ANGLE	38°		38°		
						CUTTING EDGE SHAPE	SQUARE	CORNER RADIUS	SQUARE	CORNER RADIUS	CORNER RADIUS
						SIZE MIN	1/8	1/8	1/8	1/8	1/4
						SIZE MAX	1	1	1	1	1
						PAGE	20-23		24-25		26-27
							DOUBLE CORE STANDARD LENGTH		STANDARD LENGTH		CHIP BREAKER
							AlTiN		C-Coating		
							 NEW SIZE	 NEW SIZE	 NEW	 NEW	 NEW
ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment		HB	HRc					
P	1	Non-alloy steel	About 0.15% C	Annealed	125		○	○	○	○	○
	2		About 0.45% C	Annealed	190	13	○	○	○	○	○
	3		About 0.45% C	Quenched & Tempered	250	25	○	○	○	○	○
	4		About 0.75% C	Annealed	270	28	○	○	○	○	○
	5		About 0.75% C	Quenched & Tempered	300	32	○	○	○	○	○
	6	Low alloy steel		Annealed	180	10	○	○	○	○	○
	7			Quenched & Tempered	275	29	○	○	○	○	○
	8			Quenched & Tempered	300	32	○	○	○	○	○
	9			Quenched & Tempered	350	38	○	○	○	○	○
	10	High alloyed steel, and tool steel		Annealed	200	15	○	○	○	○	○
	11			Quenched & Tempered	325	35	○	○	○	○	○
M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15	◎	◎	◎	◎	◎
	13		Martensitic	Quenched & Tempered	240	23	◎	◎	◎	◎	◎
	14		Austenitic		180	10	◎	◎	◎	◎	◎
K	15	Grey cast iron	Pearlitic / ferritic		180	10	○	○	○	○	○
	16		Pearlitic (Martensitic)		260	26	○	○	○	○	○
	17	Nodular cast iron	Ferritic		160	3	○	○	○	○	○
	18		Pearlitic		250	25	○	○	○	○	○
	19	Malleable cast iron	Ferritic		130		○	○	○	○	○
	20		Pearlitic		230	21	○	○	○	○	○
N	21	Aluminum-wrought alloy	Not Curable		60						
	22		Curable	Hardened	100						
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75						
	24		≤ 12% Si, Curable	Hardened	90						
	25		> 12% Si, Not Curable		130						
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%		110						
	27		CuZn, CuSnZn (Brass)		90						
	28		CuSn, lead-free copper and electrolytic copper		100						
	29	Non Metallic Materials	Duroplastic, Fiber Reinforced Plastic								
	30		Rubber, Wood, etc.								
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15	◎	◎	◎	◎	◎
	32			Cured	280	30	◎	◎	◎	◎	◎
	33		Ni or Co Based	Annealed	250	25	◎	◎	◎	◎	◎
	34			Cured	350	38	◎	◎	◎	◎	◎
	35			Cast	320	34	◎	◎	◎	◎	◎
	36	Titanium Alloys	Pure Titanium		400 Rm		◎	◎	◎	◎	◎
	37		Alpha + Beta Alloys	Hardened	1050 Rm		◎	◎	◎	◎	◎
H	38	Hardened steel		Hardened	550	55					
	39			Hardened	630	60					
	40	Chilled Cast Iron		Cast	400	42					
	41	Hardened Cast Iron		Hardened	550	55					

Inch		Metric	
EML09	EML10	EML07	EML08
Plain		Plain	
4 & 6		4 & 6	
20°		20°	
CORNER RADIUS	CORNER RADIUS	CORNER RADIUS	CORNER RADIUS
5/32	5/32	4.0	4.0
1	1	25.0	25.0
28-29		30-31	
HIGH FEED	HIGH FEED / COOLANT HOLE	HIGH FEED	HIGH FEED / COOLANT HOLE
AlTiN		AlTiN	
			
◎	◎	◎	◎
◎	◎	◎	◎
◎	◎	◎	◎
◎	◎	◎	◎
◎	◎	◎	◎
◎	◎	◎	◎
◎	◎	◎	◎
◎	◎	◎	◎
◎	◎	◎	◎

RECOMMENDED CUTTING CONDITIONS – INCH

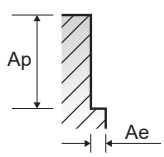
UGMG42, UGMG43 SERIES



4 FLUTES DOUBLE CORE - Side Cutting

RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	3/4	1
P	1-5	Non-alloy steel	0.4D	1.0D (0.7D)*	SFM (Vc)	525	525	525	525	525	525	525
					IPT (fz)	.0011	.0014	.0017	.0021	.0025	.0030	.0033
					RPM	8020	6420	5350	4010	3210	2670	2010
					IPM (FEED)	35	36	36	34	32	32	27
	6-8	Low alloy steel	0.4D	1.0D (0.7D)*	SFM (Vc)	525	525	525	525	525	525	525
					IPT (fz)	.0011	.0014	.0017	.0021	.0025	.0030	.0033
					RPM	8020	6420	5350	4010	3210	2670	2010
					IPM (FEED)	35	36	36	34	32	32	27
	9		0.4D	1.0D (0.7D)*	SFM (Vc)	490	490	490	490	490	490	490
					IPT (fz)	.0010	.0014	.0017	.0019	.0025	.0028	.0033
					RPM	7490	5990	4990	3740	2990	2500	1870
					IPM (FEED)	30	34	34	28	30	28	25
	10	High alloyed steel, and tool steel	0.4D	1.0D (0.7D)*	SFM (Vc)	490	490	490	490	490	490	490
					IPT (fz)	.0011	.0014	.0018	.0021	.0026	.0030	.0033
					RPM	7490	5990	4990	3740	2990	2500	1870
					IPM (FEED)	33	34	36	31	31	30	25
	11.1		0.4D	1.0D (0.7D)*	SFM (Vc)	490	490	490	490	490	490	490
					IPT (fz)	.0010	.0014	.0017	.0019	.0025	.0028	.0033
					RPM	7490	5990	4990	3740	2990	2500	1870
					IPM (FEED)	30	34	34	28	30	28	25
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.4D	1.0D (0.7D)	SFM (Vc)	510	510	510	510	510	510	510
					IPT (fz)	.0013	.0018	.0022	.0026	.0034	.0037	.0045
					RPM	7790	6230	5190	3900	3120	2600	1950
					IPM (FEED)	41	45	46	41	42	38	35
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.4D	1.0D (0.7D)*	SFM (Vc)	345	345	345	345	345	345	345
					IPT (fz)	.0010	.0013	.0016	.0019	.0024	.0028	.0032
					RPM	5270	4220	3510	2640	2110	1760	1320
					IPM (FEED)	21	22	22	20	20	20	17
	14.2	Stainless steel (SUS 630, PH 15-5)	0.4D	0.6D	SFM (Vc)	145	145	145	145	145	145	145
					IPT (fz)	.0006	.0008	.0010	.0013	.0016	.0018	.0021
					RPM	2220	1770	1480	1110	890	740	550
					IPM (FEED)	5	6	6	6	6	5	5
K	15-20	Grey cast iron	0.4D	1.0D (0.7D)*	SFM (Vc)	575	575	575	575	575	575	575
					IPT (fz)	.0008	.0011	.0014	.0017	.0021	.0024	.0028
					RPM	8790	7030	5860	4390	3510	2930	2200
					IPM (FEED)	28	31	33	30	29	28	25
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.3D	0.6D	SFM (Vc)	105	105	105	105	105	105	105
					IPT (fz)	.0008	.0010	.0013	.0015	.0019	.0022	.0026
					RPM	1600	1280	1070	800	640	530	400
					IPM (FEED)	5	5	6	5	5	5	4
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.4D	1.0D (0.7D)*	SFM (Vc)	230	230	230	230	230	230	230
					IPT (fz)	.0013	.0019	.0022	.0026	.0034	.0037	.0045
					RPM	3510	2810	2340	1760	1410	1170	880
					IPM (FEED)	18	21	21	18	19	17	16



NOTES:
- Maximum recommended depth shown
- Finish cuts typically require reduced feed rates and/or higher spindle speed, with radial width of 2% x D1 or less
- Feed to be reduced by approximately 50% if L.O.C. (length of cut) is over 3xD
- Reduce speed and feed recommendations for materials harder than listed
- Recommendations above are based on ideal conditions. Adjust parameters accordingly for smaller taper machining centers or less rigid conditions

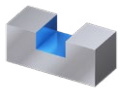
* (0.7D): UGMG42K998, UGMG42K999, UGMGK801
0.7D cutting depth for slotting and side cutting applications due to short double-core length

Please visit globalyg1.com/mat for material search

RECOMMENDED CUTTING CONDITIONS – INCH

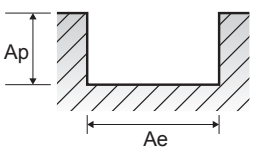
UGMG42, UGMG43 SERIES

4 FLUTES DOUBLE CORE - Slotting



RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	3/4	1
P	1-5	Non-alloy steel	1.0D	1.0D (0.7D)*	SFM (Vc)	410	410	410	410	410	410	410
					IPT (fz)	.0010	.0013	.0017	.0019	.0025	.0028	.0033
					RPM	6260	5010	4180	3130	2510	2090	1570
					IPM (FEED)	25	26	28	24	25	23	21
	6-8	Low alloy steel	1.0D	1.0D (0.7D)*	SFM (Vc)	410	410	410	410	410	410	410
					IPT (fz)	.0010	.0013	.0017	.0019	.0025	.0028	.0033
					RPM	6260	5010	4180	3130	2510	2090	1570
					IPM (FEED)	25	26	28	24	25	23	21
	9		1.0D	1.0D (0.7D)*	SFM (Vc)	395	395	395	395	395	395	395
					IPT (fz)	.0010	.0013	.0017	.0019	.0025	.0028	.0030
					RPM	6040	4830	4020	3020	2410	2010	1510
					IPM (FEED)	24	25	27	23	24	23	18
	10	High alloyed steel, and tool steel	1.0D	1.0D (0.7D)*	SFM (Vc)	410	410	410	410	410	410	410
					IPT (fz)	.0010	.0013	.0017	.0019	.0025	.0028	.0033
					RPM	6260	5010	4180	3130	2510	2090	1570
					IPM (FEED)	25	26	28	24	25	23	21
	11.1		1.0D	1.0D (0.7D)*	SFM (Vc)	395	395	395	395	395	395	395
					IPT (fz)	.0010	.0013	.0017	.0019	.0025	.0028	.0030
					RPM	6040	4830	4020	3020	2410	2010	1510
					IPM (FEED)	24	25	27	23	24	23	18
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	1.0D	1.0D (0.7D)	SFM (Vc)	410	410	410	410	410	410	410
					IPT (fz)	.0013	.0018	.0022	.0026	.0032	.0037	.0041
					RPM	6260	5010	4180	3130	2510	2090	1570
					IPM (FEED)	33	36	37	33	32	31	26
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	1.0D	1.0D (0.7D)*	SFM (Vc)	280	280	280	280	280	280	280
					IPT (fz)	.0010	.0013	.0016	.0019	.0024	.0028	.0032
					RPM	4280	3420	2850	2140	1710	1430	1070
					IPM (FEED)	17	18	18	16	16	16	14
	14.2	Stainless steel (SUS 630, PH 15-5)	1.0D	0.5D	SFM (Vc)	120	120	120	120	120	120	120
					IPT (fz)	.0006	.0008	.0010	.0013	.0016	.0018	.0021
					RPM	1830	1470	1220	920	730	610	460
					IPM (FEED)	4	5	5	5	5	4	4
K	15-20	Grey cast iron	1.0D	1.0D (0.7D)*	SFM (Vc)	460	460	460	460	460	460	460
					IPT (fz)	.0008	.0011	.0014	.0017	.0021	.0024	.0026
					RPM	7030	5620	4690	3510	2810	2340	1760
					IPM (FEED)	22	25	26	24	24	22	18
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	1.0D	0.4D	SFM (Vc)	80	80	80	80	80	80	80
					IPT (fz)	.0007	.0009	.0012	.0014	.0017	.0020	.0022
					RPM	1220	980	810	610	490	410	310
					IPM (FEED)	3	4	4	3	3	3	3
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	1.0D	1.0D (0.7D)*	SFM (Vc)	180	180	180	180	180	180	180
					IPT (fz)	.0013	.0018	.0022	.0026	.0034	.0037	.0041
					RPM	2750	2200	1830	1380	1100	920	690
					IPM (FEED)	14	16	16	14	15	14	11



NOTES:
- Maximum recommended depth shown
- Finish cuts typically require reduced feed rates and/or higher spindle speed, with radial width of 2% x D1 or less
- Feed to be reduced by approximately 50% if L.O.C.(length of cut) is over 3xD
- Reduce speed and feed recommendations for materials harder than listed
- Recommendations above are based on ideal conditions. Adjust parameters accordingly for smaller taper machining centers or less rigid conditions

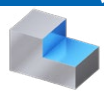
* (0.7D): UGMG42K998, UGMG42K999, UGMGK801
0.7D cutting depth for slotting and side cutting applications due to short double-core length

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RECOMMENDED CUTTING CONDITIONS – INCH

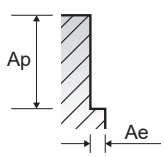
UGMH12, UGMG32, UGMG34, UGMH06, UGMH07 SERIES

5 FLUTES - Side Cutting



RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	3/16	1/4	5/16	3/8	1/2	9/16	5/8	11/16	3/4	1	1 1/4
P	1-5	Non-alloy steel	0.3D	1.5D	SFM (Vc)	470	470	470	470	470	470	470	470	470	470	470	470
					IPT (fz)	.0004	.0007	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040	.0046
					RPM	14360	9570	7180	5740	4790	3590	3190	2870	2610	2390	1800	1440
					IPM (FEED)	29	33	47	43	48	45	43	43	43	42	36	33
	6-8	Low alloy steel	0.3D	1.5D	SFM (Vc)	470	470	470	470	470	470	470	470	470	470	470	470
					IPT (fz)	.0004	.0007	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040	.0046
					RPM	14360	9570	7180	5740	4790	3590	3190	2870	2610	2390	1800	1440
					IPM (FEED)	29	33	47	43	48	45	43	43	43	42	36	33
	9		0.3D	1.5D	SFM (Vc)	330	330	330	330	330	330	330	330	330	330	330	330
					IPT (fz)	.0004	.0007	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040	.0046
					RPM	10080	6720	5040	4030	3360	2520	2240	2020	1830	1680	1260	1010
					IPM (FEED)	20	24	33	30	34	32	30	30	30	29	25	23
	10	High alloyed steel, and tool steel	0.3D	1.5D	SFM (Vc)	470	470	470	470	470	470	470	470	470	470	470	470
					IPT (fz)	.0004	.0007	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040	.0046
					RPM	14360	9570	7180	5740	4790	3590	3190	2870	2610	2390	1800	1440
					IPM (FEED)	29	33	47	43	48	45	43	43	43	42	36	33
	11.1		0.3D	1.5D	SFM (Vc)	330	330	330	330	330	330	330	330	330	330	330	330
					IPT (fz)	.0004	.0007	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040	.0046
					RPM	10080	6720	5040	4030	3360	2520	2240	2020	1830	1680	1260	1010
					IPM (FEED)	20	24	33	30	34	32	30	30	30	29	25	23
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.3D	1.5D	SFM (Vc)	385	385	385	385	385	385	385	385	385	385	385	385
					IPT (fz)	.0003	.0004	.0009	.0010	.0012	.0018	.0020	.0021	.0022	.0024	.0028	.0033
					RPM	11760	7840	5880	4710	3920	2940	2610	2350	2140	1960	1470	1180
					IPM (FEED)	18	16	26	24	24	26	26	25	24	24	21	19
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.3D	1.5D	SFM (Vc)	270	270	270	270	270	270	270	270	270	270	270	270
					IPT (fz)	.0004	.0005	.0012	.0013	.0015	.0025	.0026	.0027	.0028	.0030	.0035	.0041
					RPM	8250	5500	4130	3300	2750	2060	1830	1650	1500	1380	1030	830
					IPM (FEED)	17	14	25	21	21	26	24	22	21	21	18	17
	14.2	Stainless steel (SUS 630, PH 15-5)	0.3D	1.5D	SFM (Vc)	195	195	195	195	195	195	195	195	195	195	195	195
					IPT (fz)	.0004	.0005	.0012	.0013	.0015	.0025	.0026	.0027	.0028	.0030	.0035	.0041
					RPM	5960	3970	2980	2380	1990	1490	1320	1190	1080	990	740	600
					IPM (FEED)	12	10	18	15	15	19	17	16	15	15	13	12
K	15-20	Grey cast iron	0.3D	1.5D	SFM (Vc)	350	350	350	350	350	350	350	350	350	350	350	350
					IPT (fz)	.0006	.0008	.0017	.0019	.0025	.0031	.0034	.0038	.0041	.0044	.0050	.0057
					RPM	10700	7130	5350	4280	3570	2670	2380	2140	1940	1780	1340	1070
					IPM (FEED)	32	29	45	41	45	41	40	41	40	39	34	30
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.1D	1.5D	SFM (Vc)	100	100	100	100	100	100	100	100	100	100	100	100
					IPT (fz)	.0004	.0005	.0008	.0009	.0011	.0017	.0018	.0019	.0019	.0021	.0024	.0027
					RPM	3060	2040	1530	1220	1020	760	680	610	560	510	380	310
					IPM (FEED)	5	4	5	4	4	5	5	5	4	4	4	3
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.2D	1.5D	SFM (Vc)	225	225	225	225	225	225	225	225	225	225	225	225
					IPT (fz)	.0004	.0004	.0011	.0011	.0013	.0022	.0023	.0024	.0025	.0027	.0031	.0036
					RPM	6880	4580	3440	2750	2290	1720	1530	1380	1250	1150	860	690
					IPM (FEED)	14	9	19	15	15	19	18	17	16	16	13	12



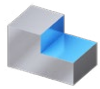
NOTES:
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RECOMMENDED CUTTING CONDITIONS – METRIC

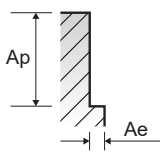
GMG40 SERIES

4 FLUTES DOUBLE CORE - Side Cutting



RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-4	Non-alloy steel	0.4D	1.0D	SFM (Vc)	525	525	525	525	525	525	525	525
					IPT (fz)	.0011	.0014	.0017	.0021	.0023	.0025	.0030	.0033
					RPM	8490	6370	5090	4240	3640	3180	2550	2040
					IPM (FEED)	37	36	35	36	33	32	31	27
	5		0.4D	1.0D	SFM (Vc)	490	490	490	490	490	490	490	490
					IPT (fz)	.0010	.0014	.0017	.0019	.0022	.0025	.0028	.0033
					RPM	7920	5940	4750	3960	3400	2970	2380	1900
					IPM (FEED)	32	33	32	30	30	30	27	25
	6-7	Low alloy steel	0.4D	1.0D	SFM (Vc)	525	525	525	525	525	525	525	525
					IPT (fz)	.0011	.0014	.0017	.0021	.0023	.0025	.0030	.0033
					RPM	8490	6370	5090	4240	3640	3180	2550	2040
					IPM (FEED)	37	36	35	36	33	32	31	27
	8-9		0.4D	1.0D	SFM (Vc)	490	490	490	490	490	490	490	490
					IPT (fz)	.0010	.0014	.0017	.0019	.0022	.0025	.0028	.0033
					RPM	7920	5940	4750	3960	3400	2970	2380	1900
					IPM (FEED)	32	33	32	30	30	30	27	25
	10-11.1	High alloyed steel, and tool steel	0.4D	1.0D	SFM (Vc)	490	490	490	490	490	490	490	490
					IPT (fz)	.0011	.0014	.0018	.0021	.0024	.0026	.0030	.0033
					RPM	7920	5940	4750	3960	3400	2970	2380	1900
					IPM (FEED)	35	33	34	33	33	31	29	25
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.4D	1.0D	SFM (Vc)	510	510	510	510	510	510	510	510
					IPT (fz)	.0013	.0018	.0022	.0026	.0030	.0034	.0037	.0045
					RPM	8250	6190	4950	4120	3530	3090	2470	1980
					IPM (FEED)	43	45	44	43	42	42	37	36
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.4D	1.0D	SFM (Vc)	345	345	345	345	345	345	345	345
					IPT (fz)	.0010	.0013	.0016	.0019	.0022	.0024	.0028	.0032
					RPM	5580	4180	3350	2790	2390	2090	1670	1340
					IPM (FEED)	22	22	21	21	21	20	19	17
	14.2	Stainless steel (SUS 630, PH 15-5)	0.4D	0.6D	SFM (Vc)	145	145	145	145	145	145	145	145
					IPT (fz)	.0006	.0008	.0010	.0013	.0014	.0016	.0018	.0021
					RPM	2340	1760	1410	1170	1000	880	700	560
					IPM (FEED)	6	6	6	6	6	6	5	5
K	15-20	Grey cast iron	0.4D	1.0D	SFM (Vc)	575	575	575	575	575	575	575	575
					IPT (fz)	.0008	.0011	.0014	.0017	.0019	.0021	.0024	.0028
					RPM	9300	6970	5580	4650	3980	3490	2790	2230
					IPM (FEED)	30	31	31	32	30	29	27	25
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.3D	0.6D	SFM (Vc)	105	105	105	105	105	105	105	105
					IPT (fz)	.0008	.0010	.0013	.0015	.0017	.0019	.0022	.0026
					RPM	1700	1270	1020	850	730	640	510	410
					IPM (FEED)	5	5	5	5	5	5	4	4
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.3D	0.6D	SFM (Vc)	230	230	230	230	230	230	230	230
					IPT (fz)	.0013	.0019	.0022	.0026	.0030	.0034	.0037	.0045
					RPM	3720	2790	2230	1860	1590	1390	1120	890
					IPM (FEED)	19	21	20	19	19	19	17	16



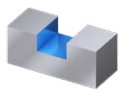
NOTES:
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RECOMMENDED CUTTING CONDITIONS – METRIC

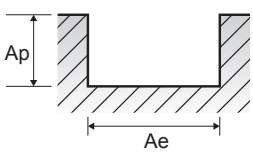
GMG40 SERIES

4 FLUTES DOUBLE CORE - Slotting



RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)							
						6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-4	Non-alloy steel	1.0D	1.0D	SFM (Vc)	410	410	410	410	410	410	410	410
					IPT (fz)	.0010	.0013	.0017	.0019	.0022	.0025	.0028	.0033
					RPM	6630	4970	3980	3310	2840	2490	1990	1590
					IPM (FEED)	27	26	27	25	25	25	22	21
	5		1.0D	1.0D	SFM (Vc)	395	395	395	395	395	395	395	395
					IPT (fz)	.0010	.0013	.0017	.0019	.0022	.0025	.0028	.0030
					RPM	6390	4790	3830	3190	2740	2400	1920	1530
					IPM (FEED)	26	25	26	24	24	24	22	18
	6-7	Low alloy steel	1.0D	1.0D	SFM (Vc)	410	410	410	410	410	410	410	410
					IPT (fz)	.0010	.0013	.0017	.0019	.0022	.0025	.0028	.0033
					RPM	6630	4970	3980	3310	2840	2490	1990	1590
					IPM (FEED)	27	26	27	25	25	25	22	21
	8-9		1.0D	1.0D	SFM (Vc)	395	395	395	395	395	395	395	395
					IPT (fz)	.0010	.0013	.0017	.0019	.0022	.0025	.0028	.0030
					RPM	6390	4790	3830	3190	2740	2400	1920	1530
					IPM (FEED)	26	25	26	24	24	24	22	18
	10-11.1	High alloyed steel, and tool steel	1.0D	1.0D	SFM (Vc)	395	395	395	395	395	395	395	395
					IPT (fz)	.0011	.0014	.0017	.0021	.0023	.0025	.0030	.0033
					RPM	6390	4790	3830	3190	2740	2400	1920	1530
					IPM (FEED)	28	27	26	27	25	24	23	20
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	1.0D	1.0D	SFM (Vc)	410	410	410	410	410	410	410	410
					IPT (fz)	.0013	.0018	.0022	.0026	.0029	.0032	.0037	.0041
					RPM	6630	4970	3980	3310	2840	2490	1990	1590
					IPM (FEED)	34	36	35	34	33	32	29	26
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	1.0D	1.0D	SFM (Vc)	280	280	280	280	280	280	280	280
					IPT (fz)	.0010	.0013	.0016	.0019	.0022	.0024	.0028	.0032
					RPM	4530	3400	2720	2260	1940	1700	1360	1090
					IPM (FEED)	18	18	17	17	17	16	15	14
	14.2	Stainless steel (SUS 630, PH 15-5)	1.0D	0.5D	SFM (Vc)	120	120	120	120	120	120	120	120
					IPT (fz)	.0006	.0008	.0010	.0013	.0014	.0016	.0018	.0021
					RPM	1940	1460	1160	970	830	730	580	470
					IPM (FEED)	5	5	5	5	5	5	4	4
K	15-20	Grey cast iron	1.0D	1.0D	SFM (Vc)	460	460	460	460	460	460	460	460
					IPT (fz)	.0008	.0011	.0014	.0017	.0019	.0021	.0024	.0026
					RPM	7440	5580	4460	3720	3190	2790	2230	1790
					IPM (FEED)	24	25	25	25	24	23	21	19
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	1.0D	0.4D	SFM (Vc)	80	80	80	80	80	80	80	80
					IPT (fz)	.0007	.0009	.0012	.0014	.0016	.0017	.0020	.0022
					RPM	1290	970	780	650	550	490	390	310
					IPM (FEED)	4	3	4	4	4	3	3	3
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	1.0D	1.0D	SFM (Vc)	180	180	180	180	180	180	180	180
					IPT (fz)	.0013	.0018	.0022	.0026	.0030	.0034	.0037	.0041
					RPM	2910	2180	1750	1460	1250	1090	870	700
					IPM (FEED)	15	16	15	15	15	15	13	11



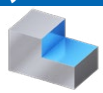
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RECOMMENDED CUTTING CONDITIONS – METRIC

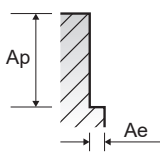
GMG24, GMG26, GMG28, GMG30 SERIES

5 FLUTES - Side Cutting



RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)								
						6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-4	Non-alloy steel	0.3D	1.5D	SFM (Vc)	475	475	475	475	475	475	475	475	475
					IPT (fz)	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040
					RPM	7680	5760	4610	3840	3290	2880	2560	2300	1840
					IPM (FEED)	50	43	46	48	44	43	42	40	37
	5		0.3D	1.5D	SFM (Vc)	330	330	330	330	330	330	330	330	330
					IPT (fz)	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040
					RPM	5340	4000	3200	2670	2290	2000	1780	1600	1280
					IPM (FEED)	35	30	32	33	31	30	29	28	26
	6-7	Low alloy steel	0.3D	1.5D	SFM (Vc)	475	475	475	475	475	475	475	475	475
					IPT (fz)	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040
					RPM	7680	5760	4610	3840	3290	2880	2560	2300	1840
					IPM (FEED)	50	43	46	48	44	43	42	40	37
	8-9		0.3D	1.5D	SFM (Vc)	330	330	330	330	330	330	330	330	330
					IPT (fz)	.0013	.0015	.0020	.0025	.0027	.0030	.0033	.0035	.0040
					RPM	5340	4000	3200	2670	2290	2000	1780	1600	1280
					IPM (FEED)	35	30	32	33	31	30	29	28	26
	10-11.1	High alloyed steel, and tool steel	0.3D	1.5D	SFM (Vc)	200	200	200	200	200	200	200	200	200
					IPT (fz)	.0009	.0011	.0014	.0017	.0019	.0021	.0023	.0024	.0028
					RPM	3230	2430	1940	1620	1390	1210	1080	970	780
					IPM (FEED)	15	13	14	14	13	13	12	12	11
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.3D	1.5D	SFM (Vc)	385	385	385	385	385	385	385	385	385
					IPT (fz)	.0009	.0010	.0012	.0018	.0020	.0021	.0022	.0024	.0028
					RPM	6230	4670	3740	3110	2670	2330	2080	1870	1490
					IPM (FEED)	28	23	22	28	27	24	23	22	21
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.3D	1.5D	SFM (Vc)	270	270	270	270	270	270	270	270	270
					IPT (fz)	.0012	.0013	.0015	.0025	.0026	.0027	.0028	.0030	.0035
					RPM	4370	3270	2620	2180	1870	1640	1460	1310	1050
					IPM (FEED)	26	21	20	27	24	22	20	20	18
	14.2	Stainless steel (SUS 630, PH 15-5)	0.3D	1.5D	SFM (Vc)	195	195	195	195	195	195	195	195	195
					IPT (fz)	.0012	.0013	.0015	.0025	.0026	.0027	.0028	.0030	.0035
					RPM	3150	2360	1890	1580	1350	1180	1050	950	760
					IPM (FEED)	19	15	14	20	18	16	15	14	13
K	15-20	Grey cast iron	0.3D	1.5D	SFM (Vc)	350	350	350	350	350	350	350	350	350
					IPT (fz)	.0017	.0019	.0025	.0031	.0034	.0038	.0041	.0044	.0050
					RPM	5660	4240	3400	2830	2430	2120	1890	1700	1360
					IPM (FEED)	48	40	43	44	41	40	39	37	34
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.1D	1.5D	SFM (Vc)	100	100	100	100	100	100	100	100	100
					IPT (fz)	.0008	.0009	.0011	.0017	.0018	.0019	.0019	.0021	.0024
					RPM	1620	1210	970	810	690	610	540	490	390
					IPM (FEED)	6	5	5	7	6	6	5	5	5
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.3D	1.5D	SFM (Vc)	225	225	225	225	225	225	225	225	225
					IPT (fz)	.0011	.0011	.0013	.0022	.0023	.0024	.0025	.0027	.0031
					RPM	3640	2730	2180	1820	1560	1360	1210	1090	870
					IPM (FEED)	20	15	14	20	18	16	15	15	13

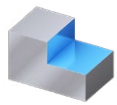


NOTES:
- Maximum recommended depth shown
- Finish cuts typically require reduced feed rates and/or higher spindle speed, with radial width of 2% x D1 or less
- Feed to be reduced by approximately 50% if L.O.C.(length of cut) is over 3xD
- Reduce speed and feed recommendations for materials harder than listed
- Recommendations above are based on ideal conditions. Adjust parameters accordingly for smaller taper machining centers or less rigid conditions

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RECOMMENDED CUTTING CONDITIONS – INCH

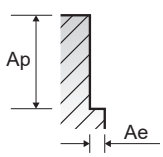
EMI42, EMI43 SERIES



5 FLUTES (TitaNox-Power HPC) - Heavy Side Cutting

RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
P	1-5	Non-alloy steel	0.5D	1.5D	SFM (Vc)	500	500	500	500	500	500	500	500	500	500	500	500
					IPT (fz)	.0009	.0011	.0013	.0014	.0016	.0018	.0022	.0027	.0031	.0037	.0043	.0049
					RPM	15280	12220	10190	8730	7640	6110	5090	4370	3820	3060	2550	1910
					IPM (FEED)	66	66	66	61	61	55	56	59	59	57	55	47
	6-8	Low alloy steel	0.5D	1.5D	SFM (Vc)	500	500	500	500	500	500	500	500	500	500	500	500
					IPT (fz)	.0009	.0011	.0013	.0014	.0016	.0018	.0022	.0027	.0031	.0037	.0043	.0049
					RPM	15280	12220	10190	8730	7640	6110	5090	4370	3820	3060	2550	1910
					IPM (FEED)	66	66	66	61	61	55	56	59	59	57	55	47
	9		0.5D	1.5D	SFM (Vc)	400	400	400	400	400	400	400	400	400	400	400	400
					IPT (fz)	.0005	.0007	.0008	.0011	.0012	.0014	.0017	.0021	.0024	.0028	.0033	.0038
					RPM	12220	9780	8150	6990	6110	4890	4070	3490	3060	2440	2040	1530
					IPM (FEED)	33	33	33	37	37	34	35	37	37	34	34	29
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM (Vc)	450	450	450	450	450	450	450	450	450	450	450	450
					IPT (fz)	.0009	.0011	.0013	.0014	.0016	.0018	.0022	.0027	.0031	.0037	.0043	.0049
					RPM	13750	11000	9170	7860	6880	5500	4580	3930	3440	2750	2290	1720
					IPM (FEED)	60	60	60	55	55	50	50	53	53	51	49	42
	11.1		0.5D	1.5D	SFM (Vc)	400	400	400	400	400	400	400	400	400	400	400	400
					IPT (fz)	.0005	.0007	.0008	.0011	.0012	.0014	.0017	.0021	.0024	.0028	.0033	.0038
					RPM	12220	9780	8150	6990	6110	4890	4070	3490	3060	2440	2040	1530
					IPM (FEED)	33	33	33	37	37	34	35	37	37	34	34	29
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.5D	1.5D	SFM (Vc)	250	250	250	250	250	250	250	250	250	250	250	250
					IPT (fz)	.0005	.0006	.0007	.0009	.0010	.0012	.0015	.0018	.0021	.0024	.0028	.0032
					RPM	7640	6110	5090	4370	3820	3060	2550	2180	1910	1530	1270	950
					IPM (FEED)	18	18	18	19	19	18	19	20	20	18	18	15
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.5D	1.5D	SFM (Vc)	300	300	300	300	300	300	300	300	300	300	300	300
					IPT (fz)	.0005	.0007	.0008	.0011	.0013	.0014	.0018	.0023	.0026	.0028	.0031	.0036
					RPM	9170	7330	6110	5240	4580	3670	3060	2620	2290	1830	1530	1150
					IPM (FEED)	24	24	24	30	30	26	28	30	30	26	24	21
	14.2	Stainless steel (SUS 630, PH 15-5)	0.5D	1.5D	SFM (Vc)	200	200	200	200	200	200	200	200	200	200	200	200
					IPT (fz)	.0005	.0006	.0007	.0009	.0010	.0011	.0014	.0018	.0021	.0022	.0025	.0029
					RPM	6110	4890	4070	3490	3060	2440	2040	1750	1530	1220	1020	760
					IPM (FEED)	14	14	14	15	15	13	14	16	16	13	13	11
K	15-20	Grey cast iron	0.5D	1.5D	SFM (Vc)	370	370	370	370	370	370	370	370	370	370	370	370
					IPT (fz)	.0007	.0008	.0010	.0012	.0014	.0016	.0019	.0023	.0026	.0032	.0037	.0042
					RPM	11310	9050	7540	6460	5650	4520	3770	3230	2830	2260	1880	1410
					IPM (FEED)	38	38	38	40	40	36	36	37	37	36	35	30
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.2D	1.5D	SFM (Vc)	90	90	90	90	90	90	90	90	90	90	90	90
					IPT (fz)	.0004	.0005	.0006	.0009	.0010	.0012	.0014	.0017	.0019	.0021	.0023	.0027
					RPM	2750	2200	1830	1570	1380	1100	920	790	690	550	460	340
					IPM (FEED)	6	6	5	7	7	7	6	7	7	6	5	5
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.5D	1.5D	SFM (Vc)	160	160	160	160	160	160	160	160	160	160	160	160
					IPT (fz)	.0004	.0005	.0006	.0009	.0010	.0012	.0014	.0017	.0019	.0021	.0023	.0027
					RPM	4890	3910	3260	2790	2440	1960	1630	1400	1220	980	810	610
					IPM (FEED)	10	10	10	12	12	12	11	12	12	10	9	8

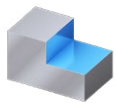


NOTES:
- Maximum recommended depth shown
- Finish cuts typically require reduced feed rates and/or higher spindle speed, with radial width of 2% x D1 or less
- Feed to be reduced by approximately 50% if L.O.C.(length of cut) is over 3xD
- Reduce speed and feed recommendations for materials harder than listed
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RECOMMENDED CUTTING CONDITIONS – INCH

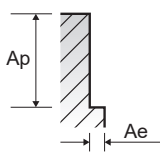
EMI42, EMI43 SERIES



5 FLUTES (TitaNox-Power HPC) - Side Cutting (Peel Milling)

RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
P	1-5	Non-alloy steel	0.08D	2.0D	SFM (Vc)	650	650	650	650	650	650	650	650	650	650	650	650
					IPT (fz)	.0012	.0015	.0018	.0019	.0022	.0026	.0031	.0038	.0043	.0051	.0060	.0068
					RPM	19860	15890	13240	11350	9930	7950	6620	5680	4970	3970	3310	2480
					IPM (FEED)	119	119	119	109	109	103	103	107	107	101	99	84
	6-8	Low alloy steel	0.08D	2.0D	SFM (Vc)	650	650	650	650	650	650	650	650	650	650	650	650
					IPT (fz)	.0012	.0015	.0018	.0019	.0022	.0026	.0031	.0038	.0043	.0051	.0060	.0068
					RPM	19860	15890	13240	11350	9930	7950	6620	5680	4970	3970	3310	2480
					IPM (FEED)	119	119	119	109	109	103	103	107	107	101	99	84
	9		0.08D	2.0D	SFM (Vc)	650	650	650	650	650	650	650	650	650	650	650	650
					IPT (fz)	.0007	.0009	.0011	.0015	.0017	.0020	.0024	.0029	.0033	.0040	.0046	.0053
					RPM	19860	15890	13240	11350	9930	7950	6620	5680	4970	3970	3310	2480
					IPM (FEED)	73	73	73	84	84	80	79	82	82	79	76	66
	10	High alloyed steel, and tool steel	0.08D	2.0D	SFM (Vc)	580	580	580	580	580	580	580	580	580	580	580	580
					IPT (fz)	.0012	.0015	.0018	.0019	.0022	.0026	.0031	.0038	.0043	.0051	.0060	.0068
					RPM	17720	14180	11820	10130	8860	7090	5910	5060	4430	3540	2950	2220
					IPM (FEED)	106	106	106	98	97	92	92	95	95	90	89	75
	11.1		0.08D	2.0D	SFM (Vc)	550	550	550	550	550	550	550	550	550	550	550	550
					IPT (fz)	.0007	.0009	.0011	.0015	.0017	.0020	.0024	.0029	.0033	.0040	.0046	.0053
					RPM	16810	13450	11200	9600	8400	6720	5600	4800	4200	3360	2800	2100
					IPM (FEED)	62	62	62	71	71	67	67	69	69	67	64	56
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.06D	2.0D	SFM (Vc)	350	350	350	350	350	350	350	350	350	350	350	350
					IPT (fz)	.0007	.0008	.0010	.0013	.0015	.0016	.0021	.0025	.0029	.0034	.0039	.0045
					RPM	10700	8560	7130	6110	5350	4280	3570	3060	2670	2140	1780	1340
					IPM (FEED)	36	36	36	40	40	34	37	39	39	36	35	30
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.06D	2.0D	SFM (Vc)	425	425	425	425	425	425	425	425	425	425	425	425
					IPT (fz)	.0007	.0009	.0011	.0016	.0018	.0019	.0025	.0032	.0036	.0039	.0044	.0051
					RPM	12990	10390	8660	7420	6490	5190	4330	3710	3250	2600	2160	1620
					IPM (FEED)	48	48	48	58	58	49	54	58	59	51	48	41
	14.2	Stainless steel (SUS 630, PH 15-5)	0.06D	2.0D	SFM (Vc)	300	300	300	300	300	300	300	300	300	300	300	300
					IPT (fz)	.0007	.0008	.0010	.0012	.0014	.0015	.0020	.0025	.0029	.0031	.0035	.0041
					RPM	9170	7330	6110	5240	4580	3670	3060	2620	2290	1830	1530	1150
					IPM (FEED)	31	31	31	32	32	28	31	33	33	28	27	24
K	15-20	Grey cast iron	0.07D	2.0D	SFM (Vc)	550	550	550	550	550	550	550	550	550	550	550	550
					IPT (fz)	.0009	.0012	.0014	.0018	.0020	.0022	.0027	.0032	.0037	.0045	.0052	.0059
					RPM	16810	13450	11200	9600	8400	6720	5600	4800	4200	3360	2800	2100
					IPM (FEED)	78	78	78	84	84	74	76	78	78	76	73	62
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.04D	2.0D	SFM (Vc)	120	120	120	120	120	120	120	120	120	120	120	120
					IPT (fz)	.0004	.0005	.0006	.0009	.0010	.0012	.0014	.0017	.0019	.0021	.0023	.0027
					RPM	3670	2930	2440	2100	1830	1470	1220	1050	920	730	610	460
					IPM (FEED)	7	7	7	9	9	9	9	9	9	8	7	6
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.05D	2.0D	SFM (Vc)	300	300	300	300	300	300	300	300	300	300	300	300
					IPT (fz)	.0004	.0005	.0006	.0009	.0010	.0012	.0014	.0017	.0019	.0021	.0023	.0027
					RPM	9170	7330	6110	5240	4580	3670	3060	2620	2290	1830	1530	1150
					IPM (FEED)	18	18	18	23	23	22	21	22	22	19	18	16



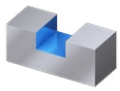
NOTES:
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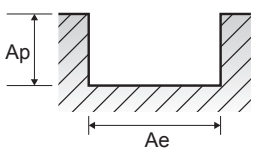
EMI42, EMI43 SERIES

5 FLUTES (TitaNox-Power HPC) - Slotting



RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
P	1-5	Non-alloy steel	1.0D	1.0D	SFM (Vc)	275	275	275	275	275	275	275	275	275	275	275	275
					IPT (fz)	.0007	.0008	.0010	.0011	.0013	.0015	.0018	.0021	.0024	.0029	.0034	.0039
					RPM	8400	6720	5600	4800	4200	3360	2800	2400	2100	1680	1400	1050
					IPM (FEED)	28	28	28	27	27	25	25	25	25	24	24	20
	6-8	Low alloy steel	1.0D	1.0D	SFM (Vc)	275	275	275	275	275	275	275	275	275	275	275	275
					IPT (fz)	.0007	.0008	.0010	.0011	.0013	.0015	.0018	.0021	.0024	.0029	.0034	.0039
					RPM	8400	6720	5600	4800	4200	3360	2800	2400	2100	1680	1400	1050
					IPM (FEED)	28	28	28	27	27	25	25	25	25	24	24	20
	9		1.0D	1.0D	SFM (Vc)	275	275	275	275	275	275	275	275	275	275	275	275
					IPT (fz)	.0004	.0005	.0006	.0009	.0010	.0011	.0014	.0017	.0019	.0023	.0026	.0030
					RPM	8400	6720	5600	4800	4200	3360	2800	2400	2100	1680	1400	1050
					IPM (FEED)	17	17	17	21	21	18	20	20	20	19	18	16
	10	High alloyed steel, and tool steel	1.0D	0.75D	SFM (Vc)	230	230	230	230	230	230	230	230	230	230	230	230
					IPT (fz)	.0007	.0008	.0010	.0011	.0013	.0015	.0018	.0021	.0024	.0029	.0034	.0039
					RPM	7030	5620	4690	4020	3510	2810	2340	2010	1760	1410	1170	880
					IPM (FEED)	23	23	23	23	23	21	21	21	21	20	20	17
	11.1		1.0D	0.75D	SFM (Vc)	250	250	250	250	250	250	250	250	250	250	250	250
					IPT (fz)	.0004	.0005	.0006	.0009	.0010	.0011	.0014	.0017	.0019	.0023	.0026	.0030
					RPM	7640	6110	5090	4370	3820	3060	2550	2180	1910	1530	1270	950
					IPM (FEED)	15	15	15	19	19	17	18	18	18	18	17	14
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	1.0D	0.5D	SFM (Vc)	225	225	225	225	225	225	225	225	225	225	225	225
					IPT (fz)	.0004	.0005	.0006	.0007	.0008	.0009	.0012	.0015	.0017	.0019	.0022	.0026
					RPM	6880	5500	4580	3930	3440	2750	2290	1960	1720	1380	1150	860
					IPM (FEED)	14	14	14	14	14	12	14	15	15	13	13	11
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	1.0D	0.5D	SFM (Vc)	250	250	250	250	250	250	250	250	250	250	250	250
					IPT (fz)	.0004	.0005	.0006	.0009	.0010	.0011	.0014	.0018	.0021	.0023	.0025	.0029
					RPM	7640	6110	5090	4370	3820	3060	2550	2180	1910	1530	1270	950
					IPM (FEED)	15	15	15	19	19	17	18	20	20	18	16	14
	14.2	Stainless steel (SUS 630, PH 15-5)	1.0D	0.5D	SFM (Vc)	200	200	200	200	200	200	200	200	200	200	200	200
					IPT (fz)	.0004	.0005	.0006	.0007	.0008	.0009	.0011	.0015	.0017	.0018	.0020	.0023
					RPM	6110	4890	4070	3490	3060	2440	2040	1750	1530	1220	1020	760
					IPM (FEED)	12	12	12	12	12	11	11	13	13	11	10	9
K	15-20	Grey cast iron	1.0D	1.0D	SFM (Vc)	260	260	260	260	260	260	260	260	260	260	260	260
					IPT (fz)	.0005	.0007	.0008	.0010	.0011	.0013	.0015	.0018	.0021	.0026	.0030	.0034
					RPM	7950	6360	5300	4540	3970	3180	2650	2270	1990	1590	1320	990
					IPM (FEED)	21	21	21	22	22	21	20	21	21	21	20	17
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	1.0D	0.4D	SFM (Vc)	64	64	64	64	64	64	64	64	64	64	64	64
					IPT (fz)	.0003	.0004	.0005	.0007	.0008	.0010	.0011	.0013	.0015	.0017	.0019	.0021
					RPM	1960	1560	1300	1120	980	780	650	560	490	390	330	240
					IPM (FEED)	3	3	3	4	4	4	4	4	4	3	3	3
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	1.0D	0.5D	SFM (Vc)	160	160	160	160	160	160	160	160	160	160	160	160
					IPT (fz)	.0003	.0004	.0005	.0007	.0008	.0010	.0011	.0013	.0015	.0017	.0019	.0021
					RPM	4890	3910	3260	2790	2440	1960	1630	1400	1220	980	810	610
					IPM (FEED)	8	8	8	10	10	10	9	9	9	8	8	6

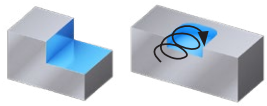


NOTES:
- Maximum recommended depth shown
- Finish cuts typically require reduced feed rates and/or higher spindle speed, with radial width of 2% x D1 or less
- Feed to be reduced by approximately 50% if L.O.C. (length of cut) is over 3xD
- Reduce speed and feed recommendations for materials harder than listed
- Recommendations above are based on ideal conditions. Adjust parameters accordingly for smaller taper machining centers or less rigid conditions

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RECOMMENDED CUTTING CONDITIONS – INCH

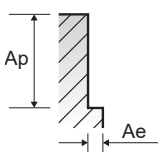
HHK82, HHK83, HHK84 SERIES



7 FLUTES (TitaNox-Power HPC) - Side Cutting & Trochoidal Milling

RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)								
						1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
P	1-4	Non-alloy steel	0.05D	3D	SFM (Vc)	1050	1050	1050	1050	1050	1050	1050	1050	1050
					IPT (fz)	.0015	.0023	.0030	.0051	.0063	.0075	.0088	.0098	.0100
					RPM	32090	21390	16040	12840	10700	8020	6420	5350	4010
					IPM (FEED)	337	344	333	455	470	420	395	367	281
	5	Non-alloy steel	0.05D	3D	SFM (Vc)	710	710	710	710	710	710	710	710	710
					IPT (fz)	.0011	.0017	.0022	.0037	.0046	.0055	.0065	.0073	.0076
					RPM	21700	14470	10850	8680	7230	5420	4340	3620	2710
					IPM (FEED)	167	167	167	227	234	209	197	184	144
	6-7	Low alloy steel	0.05D	3D	SFM (Vc)	1050	1050	1050	1050	1050	1050	1050	1050	1050
					IPT (fz)	.0015	.0023	.0030	.0051	.0063	.0075	.0088	.0098	.0100
					RPM	32090	21390	16040	12840	10700	8020	6420	5350	4010
					IPM (FEED)	337	344	333	455	470	420	395	367	281
	8-9		0.05D	3D	SFM (Vc)	710	710	710	710	710	710	710	710	710
					IPT (fz)	.0011	.0017	.0022	.0037	.0046	.0055	.0065	.0073	.0076
					RPM	21700	14470	10850	8680	7230	5420	4340	3620	2710
					IPM (FEED)	167	167	167	227	234	209	197	184	144
	10-11	High alloyed steel, and tool steel	0.05D	3D	SFM (Vc)	350	350	350	350	350	350	350	350	350
					IPT (fz)	.0009	.0013	.0018	.0031	.0039	.0045	.0053	.0059	.0063
					RPM	10700	7130	5350	4280	3570	2670	2140	1780	1340
					IPM (FEED)	66	66	66	92	96	84	79	74	59
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.05D	3D	SFM (Vc)	750	750	750	750	750	750	750	750	750
					IPT (fz)	.0010	.0016	.0021	.0036	.0045	.0054	.0064	.0070	.0073
					RPM	22920	15280	11460	9170	7640	5730	4580	3820	2870
					IPM (FEED)	168	168	168	233	241	216	205	188	146
	14.1	Stainless steel (SUS 316,316, X5CrNiMo 17 12 2)	0.05D	3D	SFM (Vc)	510	510	510	510	510	510	510	510	510
					IPT (fz)	.0009	.0013	.0018	.0003	.0039	.0045	.0053	.0059	.0062
					RPM	15590	10390	7790	6230	5200	3900	3120	2600	1950
					IPM (FEED)	96	96	96	13	140	123	115	108	84
	14.2	Stainless steel (SUS 630, PH 15-5)	0.05D	3D	SFM (Vc)	470	470	470	470	470	470	470	470	470
					IPT (fz)	.0009	.0013	.0018	.0031	.0039	.0045	.0053	.0059	.0062
					RPM	14360	9580	7180	5750	4790	3590	2870	2390	1800
					IPM (FEED)	88	89	88	124	129	113	106	99	78
K	15-20	Grey cast iron	0.05D	3D	SFM (Vc)	790	790	790	790	790	790	790	790	790
					IPT (fz)	.0018	.0026	.0035	.0061	.0075	.0090	.0105	.0117	.0121
					RPM	24140	16090	12070	9660	8050	6040	4830	4020	3020
					IPM (FEED)	297	297	297	409	421	381	353	328	256
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.05D	3D	SFM (Vc)	120	120	120	120	120	120	120	120	120
					IPT (fz)	.0007	.0011	.0014	.0024	.0031	.0035	.0042	.0048	.0050
					RPM	3670	2440	1830	1470	1220	920	730	610	460
					IPM (FEED)	18	18	18	25	26	23	21	21	16
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.05D	3D	SFM (Vc)	410	410	410	410	410	410	410	410	410
					IPT (fz)	.0007	.0011	.0014	.0024	.0031	.0036	.0042	.0050	.0051
					RPM	12530	8350	6260	5010	4180	3130	2510	2090	1570
					IPM (FEED)	63	63	63	85	90	80	73	72	56

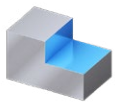


NOTES:
- Feed to be reduced by approximately 50% if L.O.C. (Length Of Cut) is over 3xD
- If product's Length of Cut(L.O.C) is below 2D, it must be applied L.O.C x 90%

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RECOMMENDED CUTTING CONDITIONS – INCH

EML09, EML10 SERIES



4&6 FLUTES (TitaNox-Power HPC- HIGH FEED) - Side Cutting

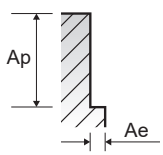
RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)								
						5/32	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.3D	0.04D	SFM (Vc)	490	490	490	490	490	490	490	490	490
					IPT (fz)	.0063	.0075	.0100	.0125	.0150	.0200	.0250	.0300	.0400
					RPM	11980	9980	7490	5990	4990	3740	2990	2500	1870
					IPM (FEED)	300	299	449	449	449	449	449	450	449
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.3D	0.04D	SFM (Vc)	490	490	490	490	490	490	490	490	490
					IPT (fz)	.0063	.0075	.0100	.0125	.0150	.0200	.0250	.0300	.0400
					RPM	11980	9980	7490	5990	4990	3740	2990	2500	1870
					IPM (FEED)	300	299	449	449	449	449	449	450	449
	14.2	Stainless steel (SUS 630, PH 15-5)	0.3D	0.04D	SFM (Vc)	375	375	375	375	375	375	375	375	375
					IPT (fz)	.0063	.0075	.0100	.0125	.0150	.0200	.0250	.0300	.0400
					RPM	9170	7640	5730	4580	3820	2870	2290	1910	1430
					IPM (FEED)	229	229	344	344	344	344	344	344	343
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.3D	0.025D	SFM (Vc)	120	120	120	120	120	120	120	120	120
					IPT (fz)	.0037	.0045	.0058	.0074	.0090	.0117	.0148	.0180	.0240
					RPM	2930	2440	1830	1470	1220	920	730	610	460
					IPM (FEED)	43	44	64	65	66	64	65	66	66
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.3D	0.025D	SFM (Vc)	445	445	445	445	445	445	445	445	445
					IPT (fz)	.0055	.0068	.0083	.0109	.0135	.0175	.0219	.0263	.0352
					RPM	10880	9070	6800	5440	4530	3400	2720	2270	1700
					IPM (FEED)	238	245	340	357	367	357	357	358	359

EML07, EML08 SERIES

4&6 FLUTES (TitaNox-Power HPC- HIGH FEED) - Side Cutting

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)								
						4	5	6	8	10	12	16	20	25
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.3D	0.04D	SFM (Vc)	490	490	490	490	490	490	490	490	490
					IPT (fz)	.0063	.0079	.0094	.0126	.0157	.0189	.0252	.0315	.0394
					RPM	11890	9510	7920	5940	4750	3960	2970	2380	1900
					IPM (FEED)	301	301	451	451	451	451	451	451	451
	14.1	Stainless steel (SUS 316, 316, X5CrNiMo 17 12 2)	0.3D	0.04D	SFM (Vc)	490	490	490	490	490	490	490	490	490
					IPT (fz)	.0063	.0079	.0094	.0126	.0157	.0189	.0252	.0315	.0394
					RPM	11890	9510	7920	5940	4750	3960	2970	2380	1900
					IPM (FEED)	301	301	451	451	451	451	451	451	451
	14.2	Stainless steel (SUS 630, PH 15-5)	0.3D	0.04D	SFM (Vc)	375	375	375	375	375	375	375	375	375
					IPT (fz)	.0063	.0079	.0094	.0126	.0157	.0189	.0252	.0315	.0394
					RPM	9100	7280	6060	4550	3640	3030	2270	1820	1460
					IPM (FEED)	231	231	346	346	346	346	346	346	346
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.3D	0.025D	SFM (Vc)	120	120	120	120	120	120	120	120	120
					IPT (fz)	.0037	.0047	.0055	.0075	.0094	.0110	.0150	.0189	.0236
					RPM	2910	2330	1940	1460	1160	970	730	580	470
					IPM (FEED)	44	45	65	66	67	65	66	67	67
	36-37	Titanium Alloys (HB 400 Rm, HB 1050Rm TiAl6V4, 3.7165)	0.3D	0.025D	SFM (Vc)	445	445	445	445	445	445	445	445	445
					IPT (fz)	.0055	.0071	.0079	.0110	.0142	.0165	.0220	.0276	.0346
					RPM	10790	8640	7200	5400	4320	3600	2700	2160	1730
					IPM (FEED)	237	244	338	355	365	355	355	355	357



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