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

Take It On With TitaNox Power

HIGH-PERFORMANCE MACHINING MADE EASY.

- Titanium
- Stainless Steels
- Alloy Steels

If you've been looking for a superior carbide end mill that won't back down when the going gets tough, it's time you look at TitaNox-Power.

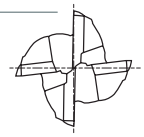
The TitaNox-Power line is built to take on titanium, stainless steels, alloy steels, and more. With a choice of 4- and 5 flute designs and extra-rigid high-speed performance, TitaNox-Power makes the perfect match for aerospace, power generation and medical applications.

TitaNox-Power - Nothing Cuts Better.

With more choices in high-performance carbide end mills, YG-1 is the undisputed leader in end mill offerings. And with the TitaNox-Power line, you have a full selection of extremely durable end mills built to take on the toughest materials in the business. From titanium to stainless steel and more - TitaNox-Power rules. In either 4 flute or 5 flute configurations you get:

- YG-1 advanced coating for better wear resistance
- Better thermal stability
- Optimized edge design provides excellent performance in heavy cutting applications
- Excellent performance in difficult-to-machine materials
- Perfect solution for aerospace, power generation and medical applications
- Premium grade substrate for longer tool life

TitaNox-Power
4 FLUTE DOUBLE CORE END MILLS

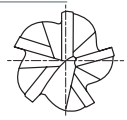


Let the Chips Fly.

For heavy cutting in slotting and profiling applications, our true double-core design provides faster chip evacuation and improved dimensional stability. Experience what a difference double-core design can make in your operation.

- Highly rigid double core adds stability and improves rigidity
- Unique 4 flute design provides excellent chip evacuation
- Variable flute design featuring multiple helix helps increase performance, reduce vibration and eliminate chatter

TitaNox-Power
5 FLUTE MULTIPLE HELIX END MILLS



Strong Performance — Right to the Finish.

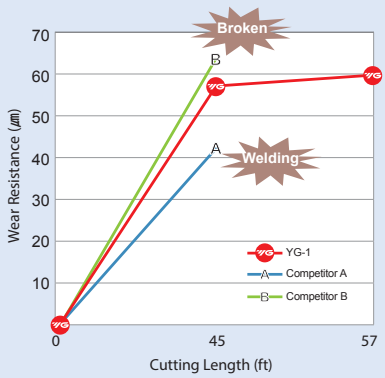
These new 5 flute end mills are built to handle high- speed machining with fine finishing ability.

- 5 flute multiple helix design for fast, fine finishing in tough materials
- Multiple-helix geometry delivers smooth cutting with reduced chatter
- The perfect choice for profiling, finishing, peel milling operations and more
- New HPC Solution for Heavy Cutting Applications

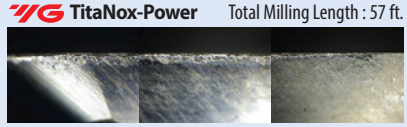
CASE STUDY

4 Flute Double Core End Mills vs. Competitors

Cutting Conditions	
Milling Method	Slotting
Work Material	- DIN : Ti6Al4V (Titanium) - WR : 3.7165.1
Size	Ø12(R1) x Ø12 x 26 x 80
RPM	1591 rev./min.
IPM	10 in./min.
Axial Depth	.470"
Coolant	Wet Cut
Overhang	1.41"
Machine	Machining Center



YG TitaNox-Power — Total Milling Length : 57 ft.

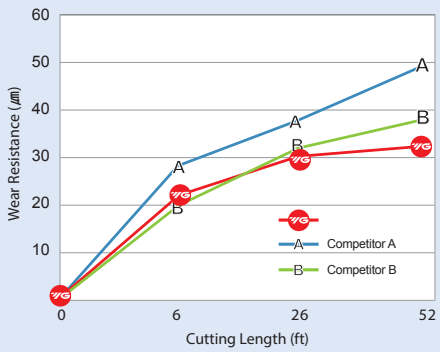


Competitor A — Total Milling Length : 53 ft.

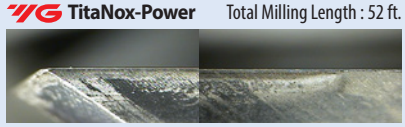
Competitor B — Total Milling Length : 53 ft.

5 Flute Multiple Helix End Mills vs. Competitors

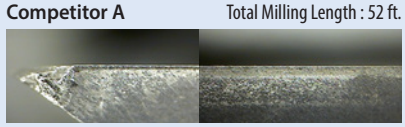
Cutting Conditions	
Milling Method	Down & Side Cutting
Work Material	- DIN : Ti6Al4V (Titanium) - WR : 3.7165.1
Size	Ø12 × Ø12 × 26 × 83
RPM	1591 rev./min.
IPM	15.669 in./min.
Axial Depth	.710"
Radial Depth	.141"
Coolant	Wet Cut
Machine	Machining Center



YG TitaNox-Power — Total Milling Length : 52 ft.



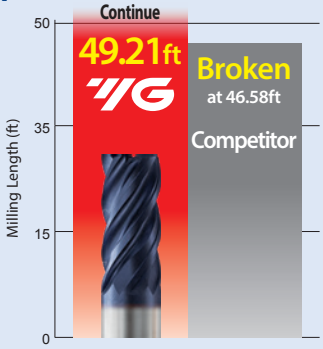
Competitor A — Total Milling Length : 52 ft.



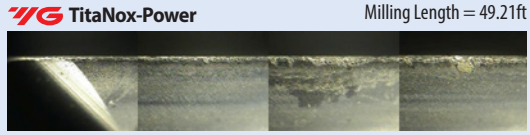
Competitor B — Total Milling Length : 52 ft.

5 Flute TitaNox-Power HPC vs. Competitor

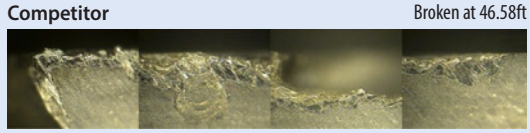
Cutting Conditions	
Milling Method	Side Cutting
Work Material	- DIN : Ti6Al4V (Titanium) - WR : 3.7165.1
Size	3/4(R.03")x3/4x1-1/2x4"
RPM	2000 rev./min.
IPM	30 in./min.
Milling Method	Axial : .075" / Radial : 1.5"
Coolant	Wet Cut
Machine	Machining Center



YG TitaNox-Power — Milling Length = 49.21ft

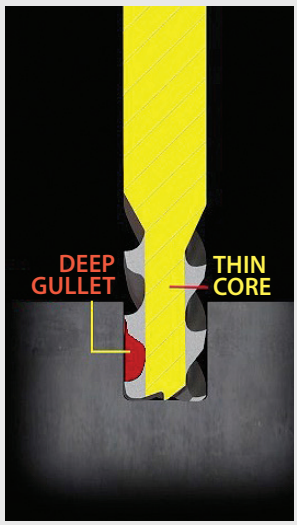


Competitor — Broken at 46.58ft

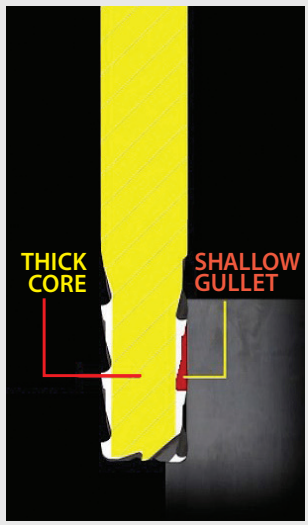


How Our 4-Flute Double-Core Design Can Cut It Where Others Can't.

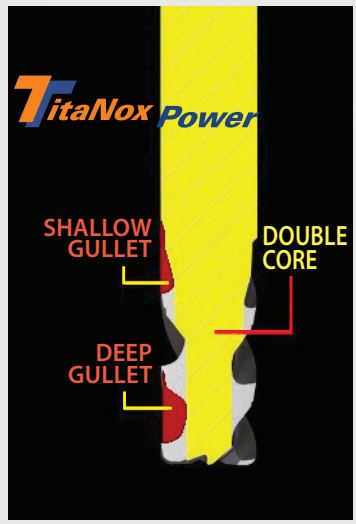
Whether in profiling or slotting conditions, the TitaNox-Power double-core design takes end milling titanium and other tough metals to a new level. With our super-rigid, heat resistant design featuring an innovative large gullet configuration, the TitaNox-Power can cut it where single-core designs can't. With outstanding chip evacuation and the added ability to maneuver in tough materials, the TitaNox-Power double-core end mills can combine heavy profiling and slotting in the same move – without vibration or chip packing.



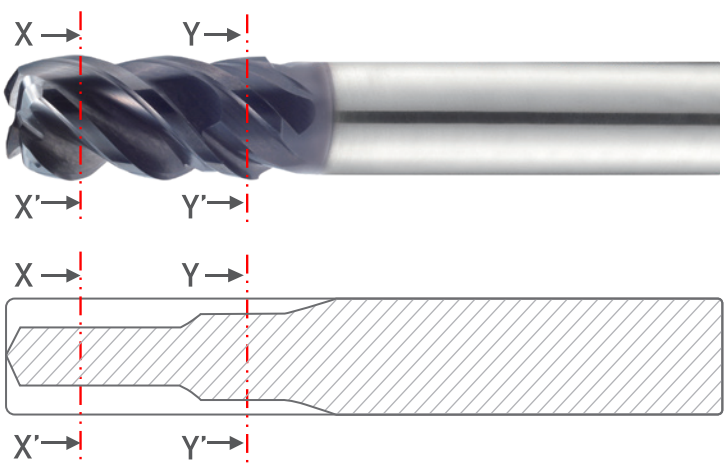
▲ Thin-core designs allow aggressive cutting at first, but are soon slowed down due to excessive vibration, and often break.

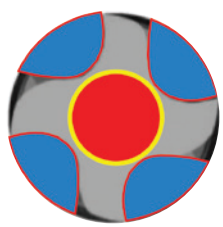


▲ Thick-core designs provide enhanced stability but don't deliver enough chip evacuation, which can often lead to catastrophic failure.

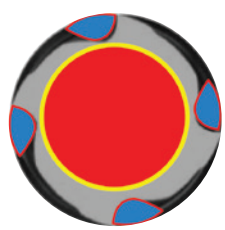


▲ The TitaNox-Power double-core design provides the best of both worlds – excellent chip evacuation combined with tool rigidity – to ensure stability, cut after cut. All this, plus quiet, vibration-free operation.





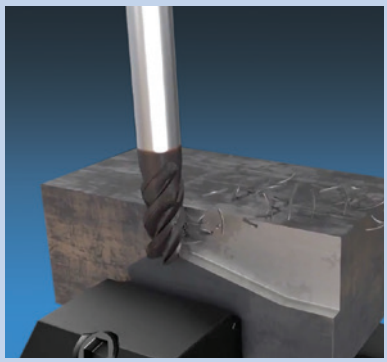
SECTION X-X'
Excellent chip evacuation



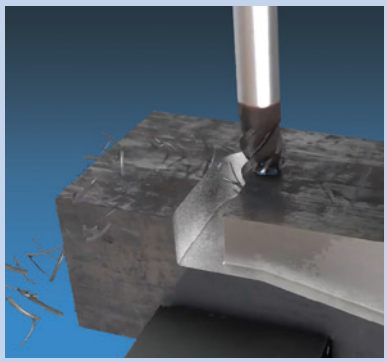
SECTION Y-Y'
Higher rigidity

▲ The illustration above detailed along the X-X' axis shows how the 4 flute design starts the cut with aggressive chip evacuation. The Y-Y' axis shows how the double core comes into play, providing perfect slotting operations through its extra-rigid double-core design.

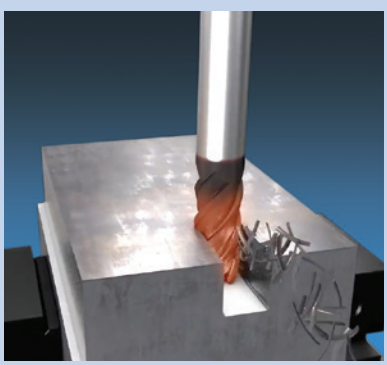
Super-Stable, Super-Performing, Super-Productive.



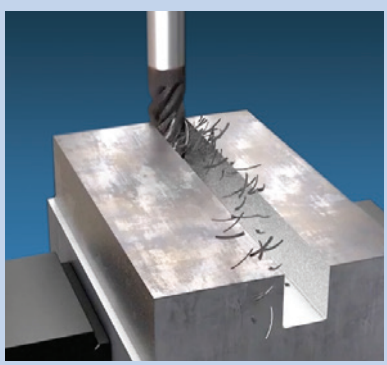
▲ For smooth, effortless profiling, the double-core design provides extremely stable cutting for increased productivity. No other end mill performs better in tough cutting conditions.



▲ Switch from profiling to slotting without excessive vibration without loading up. TitaNox-Power double-core design pushes productivity higher in tough-to-mill materials.



▲ Other 4 flute single-core tools can load up in heavy axial depths of cut and break, as shown in the illustration above.



▲ The TitaNox-Power super-rigid design and large gullet configuration provide excellent chip evacuation in titanium.

Our Advanced Coating cuts faster—and lasts longer.

Compared to other competitive coatings currently on the market, YG-1's new advanced coating brings you the best of both worlds—increased tool hardness and higher speed performance. It all adds up to increased productivity in tough materials, and longer tool life. But what really sets our advanced coating apart is how it makes the TitaNox-Power line the best value around in cutting tools — just another way YG-1 adds more value for less.

Customized End Mills!

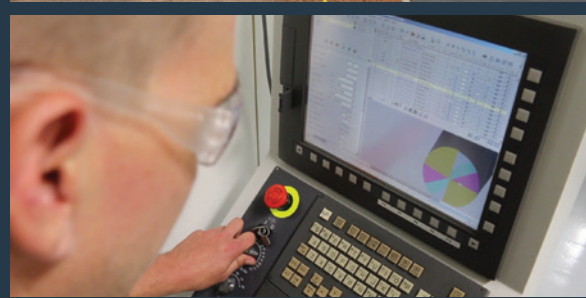
Now the best value in the world of cutting tools goes one better with the **YG-1 QuickTurn Special End Mill Program.**
Get customized solid carbide end mills for your specific application plus, quick response specials – LOC, radius and LBS, all with YG-1's advanced technology and the high-performance cutting-edge features of **V7 PLUS A** and **TitaNox-Power** end mills.

And since your order goes to our state-of-the art Tech Center in Charlotte, NC right here in the USA, it goes into production the same day.

We're known for bringing you the widest standard end mill offering in the industry.
With our new QuickTurn program, the possibilities are almost unlimited!

V7 PLUS A

TitaNox-Power



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	
				
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
○	○	○	○	○
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○	○	○	○	○
◎	◎	◎	◎	◎
◎	◎	◎	◎	◎

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		
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		400Rm		◎	◎	◎	◎	◎
	37		Alpha + Beta Alloys	Hardened	1050Rm		◎	◎	◎	◎	◎
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					

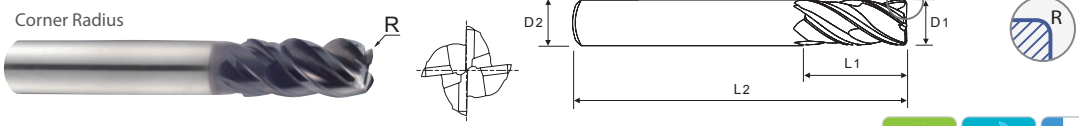
Inch		Metric	
EML09	**EML10**	**EML07**	**EML08**
Plain		**Plain**	
4 & 6		**4 & 6**	
20°		20°	
CORNER RADIUS	CORNER RADIUS	CORNER RADIUS	CORNER RADIUS
5/32	5/32	4.0	4.0
1	1	25.0	25.0
28-29		**30-31**	
HIGH FEED	HIGH FEED / COOLANT HOLE	HIGH FEED	HIGH FEED / COOLANT HOLE
AlTiN		AlTiN	
			
◎	◎	◎	◎
◎	◎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

HIGH PERFORMANCE SOLID CARBIDE END MILLS

4-FLUTE DOUBLE CORE STANDARD LENGTH (PLAIN SHANK)

SERIES
Corner Radius **UGMG42**

▶ Double core end mill has a unique flute design for excellent chip evacuation and higher rigidity.
▶ The double core adds stability and aids chip flow, reducing tool deflection, improving dimensional stability and workpiece accuracy.



CARBIDE | 4 | 43°/45° | PLAIN | Y Coating | p. 32-33

Unit : INCH

OD (D1)	SD (D2)	LOC (L1)	OAL (L2)	Corner Radius .010 EDP No.	.015 EDP No.	.030 EDP No.	.060 EDP No.	.090 EDP No.	.125 EDP No.	.190 EDP No.	.250 EDP No.
1/4	1/4	9/16	2-1/2	UGMG42802	UGMG42016	UGMG42901	UGMG42902	-	-	-	-
		3/4	2-1/2	-	-	UGMG42924	UGMG42925	-	-	-	-
		1	3	-	-	UGMG42S926*	UGMG42S927*	-	-	-	-
3/8	3/8	1/2	2-1/2	-	-	UGMG42K998	UGMG42K999	UGMG42K801	-	-	-
		7/8	2-1/2	-	-	UGMG42928	UGMG42929	UGMG42930	-	-	-
		13/16	2-1/2	UGMG42931	-	UGMG42905	UGMG42906	UGMG42907	-	-	-
		1	3	UGMG42932	UGMG42803	UGMG42933	UGMG42934	UGMG42935	-	-	-
		1-1/4	3	UGMG42S936*	UGMG42S804*	UGMG42S937*	UGMG42S938*	UGMG42S939*	-	-	-
1/2	1/2	1	3	UGMG42940		UGMG42908	UGMG42909	UGMG42910	UGMG42911	-	-
		1-1/4	3	UGMG42810	UGMG42811	UGMG42813	UGMG42815	UGMG42816	UGMG42817	-	-
		1-1/4	3-1/2	-	UGMG42805	UGMG42912	UGMG42941	UGMG42942	UGMG42943	-	-
		1-5/8	4	-	-	UGMG42S944*	UGMG42S945*	UGMG42S946*	UGMG42S947*	-	-
		2	4	-	-	UGMG42S806*	UGMG42S807*	UGMG42S808*	UGMG42S809*	-	-
5/8	5/8	1-1/4	3-1/2	-	-	UGMG42040	UGMG42913	UGMG42914	UGMG42915	-	-
		1-5/8	4	-	-	UGMG42948	UGMG42949	UGMG42950	UGMG42951	-	-
		2	4	-	-	UGMG42S952*	UGMG42S953*	UGMG42S954*	UGMG42S955*	-	-
		3-1/4	6	-	-	UGMG42S956*	UGMG42S957*	UGMG42S958*	UGMG42S959*	-	-
3/4	3/4	1-1/2	4	-	-	UGMG42048	UGMG42916	UGMG42917	UGMG42918	UGMG42919	UGMG42960
		1-7/8	4	-	-	UGMG42961	UGMG42962	UGMG42963	UGMG42964	UGMG42965	UGMG42966
		2-1/4	5	-	-	UGMG42967	UGMG42968	UGMG42969	UGMG42970	UGMG42971	UGMG42972
		3-1/4	6	-	-	UGMG42S973*	UGMG42S974*	UGMG42S975*	UGMG42S976*	UGMG42S977*	UGMG42S978*
1	1	2	5	-	-	UGMG42064	UGMG42920	UGMG42921	UGMG42922	UGMG42923	UGMG42979
		2-5/8	5	-	-	UGMG42980	UGMG42981	UGMG42982	UGMG42983	UGMG42984	UGMG42985
		3	6	-	-	UGMG42986	UGMG42987	UGMG42988	UGMG42989	UGMG42990	UGMG42991
		4-1/4	7	-	-	UGMG42S992*	UGMG42S993*	UGMG42S994*	UGMG42S995*	UGMG42S996*	UGMG42S997*

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

* Length of cut in excess of 3xD on 45° single-helix requires feed reduction of approximately 50%

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

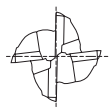
ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

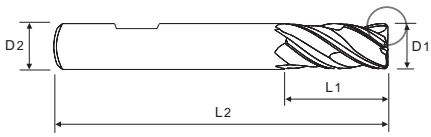
HIGH PERFORMANCE SOLID CARBIDE END MILLS

4-FLUTE DOUBLE CORE STANDARD LENGTH (WELDON FLAT SHANK)

SERIES
Corner Radius **UGMG43**

- Double core end mill has a unique flute design for excellent chip evacuation and higher rigidity.
- The double core adds stability and aids chip flow, reducing tool deflection, improving dimensional stability and workpiece accuracy.





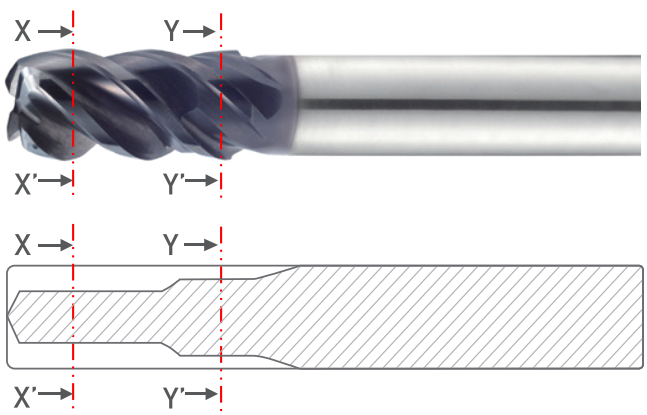
CARBIDE | 4 | 43°/45° | FLAT | Y Coating | p. 32-33

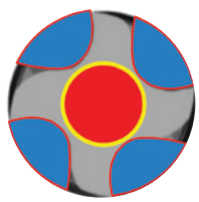
Unit : INCH

OD (D1)	SD (D2)	LOC (L1)	OAL (L2)	Corner Radius .010 EDP No.	.030 EDP No.	.060 EDP No.	.090 EDP No.	.125 EDP No.	.190 EDP No.
3/8	3/8	13/16	2-1/2	UGMG43024	UGMG43905	UGMG43906	UGMG43907	-	-
1/2	1/2	1	3	-	UGMG43908	UGMG43909	UGMG43910	UGMG43911	-
		1-1/4	3	-	UGMG43926	UGMG43927	UGMG43928	UGMG43929	-
		1-1/4	3-1/2	-	UGMG43912	UGMG43924	UGMG43930	UGMG43931	-
5/8	5/8	1-1/4	3-1/2	-	UGMG43040	UGMG43913	UGMG43914	UGMG43915	-
3/4	3/4	1-1/2	4	-	UGMG43048	UGMG43916	UGMG43917	UGMG43818	UGMG43919
1	1	2	5	-	UGMG43064	UGMG43920	UGMG43921	UGMG43922	UGMG43923

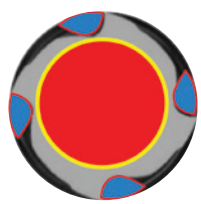
Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

2 STEP CORE





SECTION X-X'
Excellent chip evacuation



SECTION Y-Y'
Higher rigidity

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

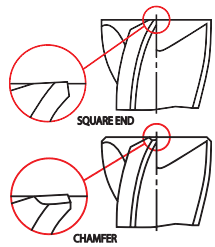
ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

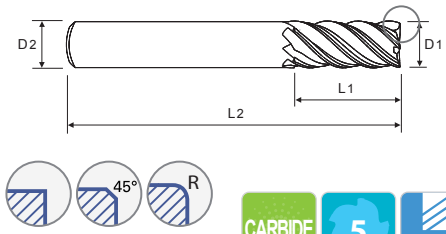
SERIES
Square UGMH12
Chamfer UGMG32
Corner Radius UGMG34

HIGH PERFORMANCE SOLID CARBIDE END MILLS
5-FLUTE STANDARD LENGTH (PLAIN SHANK)

- Suitable for Titanium, Titanium Alloys, Inconel and Stainless Steels.
- Optimized flute design for chip evacuation and rigidity when machining difficult-to-cut materials.
- Special roughing profile for machining Titanium and Titanium Alloys.
- Longer tool life with special coating.

Reinforced cutting edge





CARBIDE | 5 | 43°/44°/45° | PLAIN | C x 45° | Y Coating | p. 34

Unit : INCH

OD (D1)	SD (D2)	LOC (L1)	OAL (L2)	Square	Chamfer	Corner Radius .015	Corner Radius .030	Corner Radius .060	Corner Radius .090	Corner Radius .125
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1/8	1/8	1/4	1-1/2	UGMH12008	UGMG32008	UGMG34008	UGMG34950	-	-	-
		3/8	1-1/2	UGMH12901	UGMG32901	UGMG34901	UGMG34951	-	-	-
		1/2	2-1/2	UGMH12S902*	-	UGMG34S952*	UGMG34S953*	-	-	-
		3/4	2-1/2	UGMH12S903*	-	UGMG34S954*	UGMG34S955*	-	-	-
3/16	3/16	5/16	2	UGMH12012	UGMG32012	UGMG34012	UGMG34956	-	-	-
		9/16	2	UGMH12904	UGMG32902	UGMG34902	UGMG34957	-	-	-
		3/4	2-1/2	UGMH12S905*	-	UGMG34S958*	UGMG34S959*	-	-	-
1/4	1/4	3/8	2	UGMH12016	UGMG32016	UGMG34960	UGMG34016	UGMG34961	-	-
		1/2	2-1/2	UGMH12906	-	UGMG34962	UGMG34963	UGMG34964	-	-
		3/4	2-1/2	UGMH12907	UGMG32903	UGMG34903	UGMG34904	UGMG34905	-	-
		1	3	UGMH12S908*	-	UGMG34S965*	UGMG34S966*	UGMG34S967*	-	-
		1-1/4	3	UGMH12S909*	-	UGMG34S968*	UGMG34S969*	UGMG34S970*	-	-
5/16	5/16	7/16	2"	UGMH12020	UGMG32020	UGMG34971	UGMG34020	UGMG34972	-	-
		13/16	2-1/2	UGMH12910	UGMG32904	UGMG34906	UGMG34907	UGMG34908	-	-
		1	3	UGMH12S911*	-	UGMG34S973*	UGMG34S974*	UGMG34S975*	-	-
3/8	3/8	1/2	2-1/2	UGMH12024	UGMG32024	UGMG34976	UGMG34024	UGMG34909	UGMG34977	-
		1	3	UGMH12912	UGMG32905	UGMG34910	UGMG34911	UGMG34912	UGMG34978	-
		1-1/4	3	UGMH12S913*	-	UGMG34S979*	UGMG34S980*	UGMG34S981*	UGMG34S982*	-
		1-1/2	4	UGMH12S914*	-	UGMG34S983*	UGMG34S984*	UGMG34S985*	UGMG34S986*	-
1/2	1/2	5/8	2-1/2	UGMH12032	UGMG32032	UGMG34032	UGMG34913	UGMG34914	UGMG34987	UGMG34988
		1	3	UGMH12915	UGMG32906	UGMG34915	UGMG34916	UGMG34917	UGMG34918	UGMG34919
		1-1/4	3-1/2	UGMH12916	UGMG32907	UGMG34920	UGMG34921	UGMG34922	UGMG34923	UGMG34924
		1-5/8	4	UGMH12S917*	-	UGMG34S989*	UGMG34S990*	UGMG34S991*	UGMG34S992*	UGMG34S993*
		2	4	UGMH12S918*	-	UGMG34S994*	UGMG34S995*	UGMG34S996*	UGMG34S997*	UGMG34S998*

CHAMFER KEY
UGMG32

Mill Diameter (in.)	Chamfer Size
1/8	.004
3/16	.006
1/4	.007
5/16	.007
3/8	.011
1/2	.015
5/8	.015
3/4	.019
1	.019

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

* Length of cut in excess of 3xD on 45° single-helix requires feed reduction of approximately 50%

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

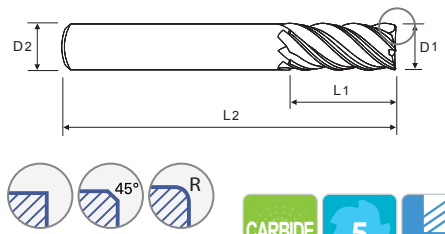
ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

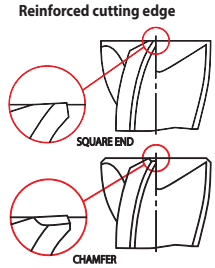
HIGH PERFORMANCE SOLID CARBIDE END MILLS

5-FLUTE STANDARD LENGTH (PLAIN SHANK)

Square UGMH12
Chamfer UGMG32
Corner Radius UGMG34

- Suitable for Titanium, Titanium Alloys, Inconel and Stainless Steels.
- Optimized flute design for chip evacuation and rigidity when machining difficult-to-cut materials.
- Special roughing profile for machining Titanium and Titanium Alloys.
- Longer tool life with special coating.





CARBIDE | 5 | 43°/44°/45° | PLAIN | C x 45° | Y Coating | p. 34

Unit : INCH

OD (D1)	SD (D2)	LOC (L1)	OAL (L2)	Square	Chamfer	Corner Radius .015	Corner Radius .030	Corner Radius .060	Corner Radius .090	Corner Radius .125	Corner Radius .190	Corner Radius .250
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
5/8	5/8	3/4	3	UGMH12040	UGMG32040	-	UGMG34040	UGMG34925	UGMG34999	UGMG34801	-	-
		1-1/4	3-1/2	UGMH12919	UGMG32908	UGMG34926	UGMG34927	UGMG34928	UGMG34929	UGMG34930	-	-
		1-5/8	4	UGMH12920	-	-	UGMG34802	UGMG34803	UGMG34804	UGMG34805	-	-
		2-1/8	4-1/2	UGMH12S921*	-	-	UGMG34S806*	UGMG34S807*	UGMG34S808*	UGMG34S809*	-	-
		2-1/2	5	UGMH12S922*	-	-	UGMG34S810*	UGMG34S811*	UGMG34S812*	UGMG34S813*	-	-
3/4	3/4	1	3-1/2	UGMH12048	UGMG32048	-	UGMG34048	UGMG34931	UGMG34932	UGMG34814	UGMG34815	UGMG34816
		1-1/2	4	UGMH12923	UGMG32909	UGMG34933	UGMG34934	UGMG34935	UGMG34936	UGMG34937	UGMG34938	UGMG34817
		1-7/8	5	UGMH12924	-	-	UGMG34818	UGMG34819	UGMG34820	UGMG34821	UGMG34822	UGMG34823
		2-1/4	5	UGMH12925	-	-	UGMG34824	UGMG34825	UGMG34826	UGMG34827	UGMG34828	UGMG34829
		2-3/4	5	UGMH12S926*	-	-	UGMG34S830*	UGMG34S831*	UGMG34S832*	UGMG34S833*	UGMG34S834*	UGMG34S835*
		3-1/4	6	UGMH12S927*	-	-	UGMG34S836*	UGMG34S837*	UGMG34S838*	UGMG34S839*	UGMG34S840*	UGMG34S841*
1	1	1-1/8	4	UGMH12064	UGMG32064	-	UGMG34064	UGMG34939	UGMG34940	UGMG34842	UGMG34843	UGMG34844
		1-1/2	4	UGMH12928	UGMG32910	UGMG34941	UGMG34942	UGMG34943	UGMG34944	UGMG34945	UGMG34946	UGMG34845
		2	5	UGMH12929	UGMG32911	-	UGMG34947	UGMG34948	UGMG34949	UGMG34846	UGMG34847	UGMG34848
		2-5/8	5	UGMH12930	-	-	UGMG34849	UGMG34850	UGMG34851	UGMG34852	UGMG34853	UGMG34854
		3-1/4	6	UGMH12S931*	-	-	UGMG34S855*	UGMG34S856*	UGMG34S857*	UGMG34S858*	UGMG34S859*	UGMG34S860*
		4-1/4	7	UGMH12S932*	-	-	UGMG34S861*	UGMG34S862*	UGMG34S863*	UGMG34S864*	UGMG34S865*	UGMG34S866*
1-1/4	1-1/4	1-1/2	4-1/2	UGMH12116	-	-		UGMG34116	UGMG34867	UGMG34868	UGMG34869	UGMG34870
		2	4-1/2	UGMH12933	-	-		UGMG34871	UGMG34872	UGMG34873	UGMG34874	UGMG34875
		2-5/8	5-1/2	UGMH12934	-	-		UGMG34876	UGMG34877	UGMG34878	UGMG34879	UGMG34880
		3-1/4	6	UGMH12935	-	-		UGMG34881	UGMG34882	UGMG34883	UGMG34884	UGMG34885
		4-1/2	7	UGMH12S936*	-	-		UGMG34S886*	UGMG34S887*	UGMG34S888*	UGMG34S889*	UGMG34S890*

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

* Length of cut in excess of 3xD on 45° single-helix requires feed reduction of approximately 50%

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

SERIES

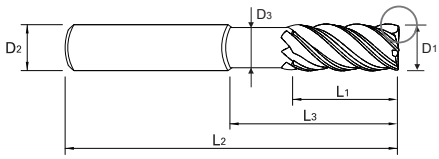
Square **UGMH06**

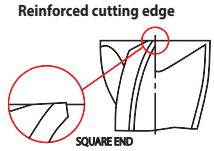
Corner Radius **UGMH07**

HIGH PERFORMANCE SOLID CARBIDE END MILLS

5-FLUTE EXTENDED LENGTH (PLAIN SHANK)

- Suitable for Titanium, Titanium Alloys, Inconel and Stainless Steels.
- Optimized flute design for chip evacuation and rigidity when machining difficult-to-cut materials.
- Special roughing profile for machining Titanium and Titanium Alloys.
- Longer tool life with special coating.





CARBIDE | 5 | 43°/44°/45° | PLAIN | Y Coating | p. 34

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	LBS (L_3)	OAL (L_2)	Neck Dia (D_3)	Square	Corner Radius					
							.030	.060	.090	.125	.190	.250
						EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1/8	1/8	5/32	3/8	3	.113	UGMH06008	UGMH07008	-	-	-	-	-
		5/32	1/2	3	.113	UGMH06901	UGMH07901	-	-	-	-	-
		5/32	5/8	3	.113	UGMH06902	UGMH07902	-	-	-	-	-
3/16	3/16	7/32	1/2	3	.176	UGMH06012	UGMH07012	-	-	-	-	-
		7/32	3/4	3	.176	UGMH06903	UGMH07903	-	-	-	-	-
		7/32	1	3	.176	UGMH06904	UGMH07904	-	-	-	-	-
1/4	1/4	3/8	3/4	4	.230	UGMH06016	UGMH07016	UGMH07905	-	-	-	-
		3/8	1-1/8	4	.230	UGMH06905	UGMH07906	UGMH07907	-	-	-	-
		3/8	2-1/8	4	.230	UGMH06906	UGMH07908	UGMH07909	-	-	-	-
3/8	3/8	1/2	1-1/8	4	.344	UGMH06024	UGMH07024	UGMH07910	UGMH07911	-	-	-
		1/2	2-1/8	4	.344	UGMH06907	UGMH07912	UGMH07913	UGMH07914	-	-	-
		1/2	3-1/8	5	.344	UGMH06923	UGMH07804	UGMH07805	UGMH07806	-	-	-
		1/2	3-1/8	6	.344	UGMH06908	UGMH07915	UGMH07916	UGMH07917	-	-	-
		1/2	4-1/8	6	.344	UGMH06909	UGMH07918	UGMH07919	UGMH07920	-	-	-
1/2	1/2	5/8	1-1/2	4	.461	UGMH06032	UGMH07032	UGMH07921	UGMH07922	UGMH07923	-	-
		5/8	2-1/4	4	.461	UGMH06910	UGMH07924	UGMH07925	UGMH07926	UGMH07927	-	-
		5/8	3-3/8	5	.461	UGMH06924	UGMH07807	UGMH07808	UGMH07809	UGMH07810	-	-
		5/8	3-3/8	6	.461	UGMH06911	UGMH07928	UGMH07929	UGMH07930	UGMH07931	-	-
		5/8	4-1/8	6	.461	UGMH06912	UGMH07932	UGMH07933	UGMH07934	UGMH07935	-	-
5/8	5/8	3/4	1-5/8	4	.586	UGMH06040	UGMH07040	UGMH07936	UGMH07937	UGMH07938	-	-
		3/4	2-3/8	6	.586	UGMH06913	UGMH07939	UGMH07940	UGMH07941	UGMH07942	-	-
		3/4	3-3/8	6	.586	UGMH06914	UGMH07943	UGMH07944	UGMH07945	UGMH07946	-	-
		3/4	4-1/8	6	.586	UGMH06915	UGMH07947	UGMH07948	UGMH07949	UGMH07950	-	-

NEXT PAGE ▶

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

Feed to be reduced by approximately 50% if L.O.C. (Length Of Cut) is over 3xD

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

SERIES

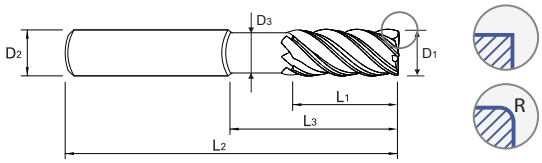
Square **UGMH06**

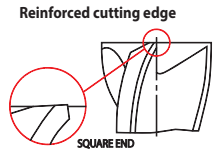
Corner Radius **UGMH07**

HIGH PERFORMANCE SOLID CARBIDE END MILLS

5-FLUTE EXTENDED LENGTH (PLAIN SHANK)

- Suitable for Titanium, Titanium Alloys, Inconel and Stainless Steels.
- Optimized flute design for chip evacuation and rigidity when machining difficult-to-cut materials.
- Special roughing profile for machining Titanium and Titanium Alloys.
- Longer tool life with special coating.





CARBIDE | 5 | 43°/44°/45° | PLAIN | Y Coating | p. 34

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	LBS (L_3)	OAL (L_2)	Neck Dia (D_3)	Square	Corner Radius					
							.030	.060	.090	.125	.190	.250
						EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
3/4	3/4	1-1/8	2	4	.711	UGMH06048	UGMH07048	UGMH07951	UGMH07952	UGMH07953	UGMH07954	UGMH07955
		1-1/8	2-5/8	5	.711	UGMH06916	UGMH07956	UGMH07957	UGMH07958	UGMH07959	UGMH07960	UGMH07961
		1-1/8	3-1/4	6	.711	UGMH06917	UGMH07962	UGMH07963	UGMH07964	UGMH07965	UGMH07966	UGMH07967
		1-1/8	4-1/4	7	.711	UGMH06918	UGMH07968	UGMH07969	UGMH07970	UGMH07971	UGMH07972	UGMH07973
1	1	1-1/4	2-1/4	4	.961	UGMH06064	UGMH07064	UGMH07974	UGMH07975	UGMH07976	UGMH07977	UGMH07978
		1-1/4	2-5/8	5	.961	UGMH06919	UGMH07979	UGMH07980	UGMH07981	UGMH07982	UGMH07983	UGMH07984
		1-1/4	3-1/4	6	.961	UGMH06920	UGMH07985	UGMH07986	UGMH07987	UGMH07988	UGMH07989	UGMH07990
		1-1/4	4-1/4	7	.961	UGMH06921	UGMH07991	UGMH07992	UGMH07993	UGMH07994	UGMH07995	UGMH07996
		1-1/4	5-1/4	8	.961	UGMH06922	UGMH07997	UGMH07998	UGMH07999	UGMH07801	UGMH07802	UGMH07803

Mill Dia.Tolerance(inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

Feed to be reduced by approximately 50% if L.O.C. (Length Of Cut) is over 3xD

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

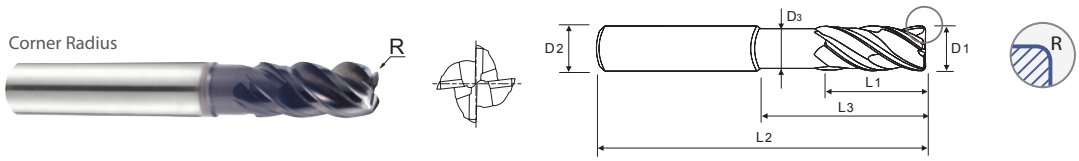
ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

HIGH PERFORMANCE SOLID CARBIDE END MILLS

4-FLUTE DOUBLE CORE EXTENDED LENGTH (PLAIN SHANK)

SERIES
Corner Radius **GMG40**

▶ Double core end mill has a unique flute design for excellent chip evacuation and higher rigidity.
▶ The double core adds stability and aids chip flow, reducing tool deflection, improving dimensional stability and workpiece accuracy.



CARBIDE | 4 | 43°/45° | PLAIN | Y Coating | p. 35-36

Unit : METRIC

OD (D_1)		SD (D_2)	LOC (L_1)	LBS (L_3)	OAL (L_2)	Neck Dia (D_3)	Corner Radius						
							0.50	1.00	1.50	2.00	3.00	3.50	4.00
Metric	Inch						EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
6.0	.2362	6	13	20	57	5.5	GMG40060	GMG40901	-	-	-	-	-
8.0	.315	8	19	25	63	7.5	GMG40080	GMG40902	GMG40903	GMG40904	-	-	-
10.0	.3937	10	22	30	72	9.2	GMG40100	GMG40905	GMG40906	GMG40907	-	-	-
12.0	.4724	12	26	35	83	11.0	GMG40120	GMG40908	GMG40909	GMG40910	GMG40911	-	-
14.0	.5512	14	26	35	83	13.0	-	GMG40140	-	GMG40912	-	-	-
16.0	.6299	16	35	43	92	15.0	-	GMG40160	GMG40913	GMG40914	GMG40915	-	GMG40916
20.0	.7874	20	44	56	110	19.0	-	GMG40200	GMG40917	GMG40918	GMG40919	GMG40920	GMG40921
25.0	.9843	25	55	70	130	24.0	-	GMG40250	GMG40922	GMG40923	GMG40924	-	GMG40925

Mill Dia.Tolerance (mm)	Shank Dia.Tolerance
0 ~ - 0.03	h5 * Shank Dia.≥Ø12 : h6

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

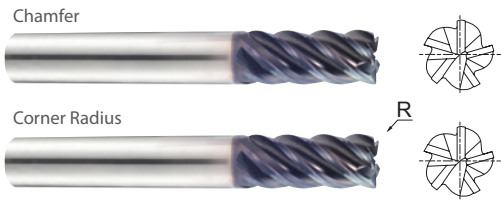
SERIES

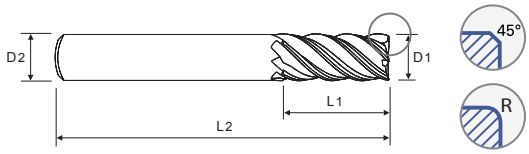
Chamfer **GMG24, GMG26**

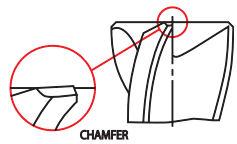
Corner Radius **GMG28, GMG30**

HIGH PERFORMANCE SOLID CARBIDE END MILLS
5-FLUTE STANDARD LENGTH (PLAIN SHANK)

- Suitable for Titanium, Titanium Alloys, Inconel and Stainless Steels.
- Optimized flute design for chip evacuation and rigidity when machining difficult-to-cut materials.
- Special roughing profile for machining Titanium and Titanium Alloys.
- Longer tool life with special coating.







CARBIDE | 5 | 43°/44°/45° | C x 45° | PLAIN | Y Coating | p. 37

Unit : METRIC

OD (D1)		SD (D2)	LOC (L1)	OAL (L2)	Chamfer	Corner Radius								
						0.30	0.50	1.00	1.50	2.00	2.50	3.00	4.00	5.00
Metric	Inch				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
6.0	.2362	6	10	54	GMG24060	-	GMG28060	-	-	-	-	-	-	-
		6	13	57	GMG26060	GMG30060	GMG30901	GMG30902	-	-	-	-	-	-
8.0	.315	8	12	58	GMG24080	-	GMG28080	-	-	-	-	-	-	-
		8	19	63	GMG26080	-	GMG30080	GMG30903	GMG30904	GMG30905	-	-	-	-
10.0	.3937	10	14	66	GMG24100	-	GMG28100	-	-	-	-	-	-	-
		10	22	72	GMG26100	-	GMG30100	GMG30906	GMG30907	GMG30908	-	-	-	-
12.0	.4724	12	16	73	GMG24120	-	GMG28120	-	-	-	-	-	-	-
		12	26	83	GMG26120	-	GMG30120	GMG30909	GMG30910	GMG30911	GMG30912	GMG30913	-	-
16.0	.6299	16	22	82	GMG24160	-	-	GMG28160	-	-	-	-	-	-
		16	36	92	GMG26160	-	-	GMG30160	GMG30914	GMG30915	GMG30916	GMG30917	GMG30918	-
20.0	.7874	20	26	92	GMG24200	-	-	GMG28200	-	-	-	-	-	-
		20	44	104	GMG26200	-	-	GMG30200	GMG30919	GMG30920	GMG30921	GMG30922	GMG30923	GMG30924
25.0	.9843	25	29	100	GMG24250	-	-	GMG28250	-	-	-	-	-	-
		25	54	121	GMG26250	-	-	GMG30250	GMG30925	GMG30926	GMG30927	GMG30928	GMG30929	GMG30930

Mill Dia.Tolerance (mm)	Shank Dia.Tolerance
0 ~ - 0.03	h5 * Shank Dia.≥Ø12 : h6

CHAMFER KEY GMG24 | GMG26

Mill Diameter		Chamfer Size (mm)
Metric	Inch	
6.0	.2362	0.20
8.0	.315	0.20
10.0	.3937	0.30
12.0	.4724	0.35
16.0	.6299	0.40
20.0	.7478	0.50
25.0	.9843	0.50

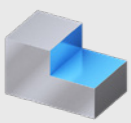
◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

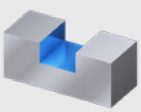
ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											○	○	○	○	○	◎	◎				

TitaNox-Power HPC
HEAVY CUTTING APPLICATIONS
SLOTTING & HIGH EFFICIENCY MILLING

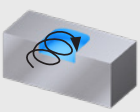
Applications



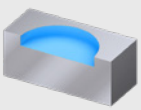
Side Cutting



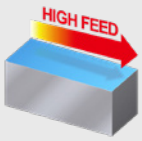
Slotting



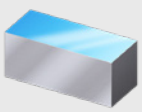
Trochoidal Milling And Peel Milling



Circular Interpolation



HSM (High-Speed Machining)



Finishing

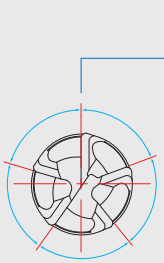
Work Materials

M **S**

Recommended for high performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys

TitaNox-Power HPC
5 FLUTE END MILLS

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Full eccentric relief for edge strength.
- YG-1's advanced coating for better wear resistance
- Unequal index design for Chatter-free cutting

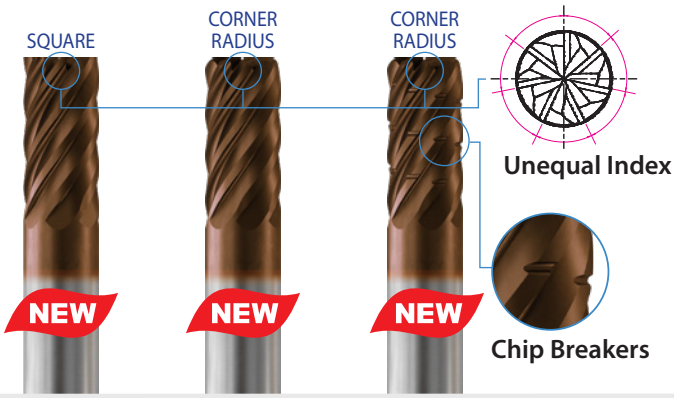


Unequal Index
Exclusively designed unique geometry applied to reduce vibration and also to achieve excellent surface finish

Core Design
Yg-1's high performance core geometries is designed for superior chip evacuation. It's excellent at slotting & heavy profiling.

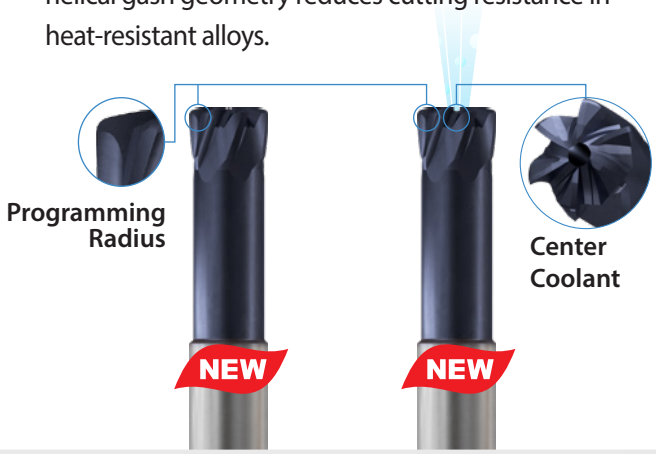
TitaNox-Power HPC
7 FLUTE END MILLS

- Purpose-designed 7 flute geometry for high-efficiency milling enables stable deep-axial engagement and increased feed rates.



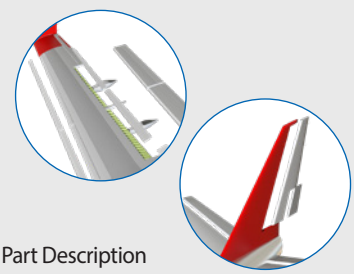
TitaNox-Power HPC
4 & 6 FLUTE HIGH FEED END MILLS

- High-feed optimized double-radius bottom edge with helical gash geometry reduces cutting resistance in heat-resistant alloys.



CASE STUDY

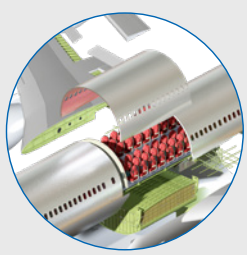
TEST 1 | 5 FLUTE END MILLS



Part Description
Hydraulic Valve

Size(inch)	1/2(R.03") x 1/2 x 1-1/4 x 3-1/2
Work Material	15-5PH (HRc 34-42 / HB 320-400)
Tool Holder	Shrink fit
SFM	420 ft/min.
IPM	80 inch/min.
RPM	3,200 rev./min.
Milling Method	Trochoidal Cutting
Ap	1.000"
Ae	.025"
Coolant	Water-Based
Machine	Machining Center

TEST 2 | 5 FLUTE END MILLS



Part Description
Aerospace Structure Part

Size(inch)	5/8(R.12") x 5/8 x 1-1/2(2") x 4"
Work Material	Ti6Al4V (HRc 36 / HB 336)
Tool Holder	Shrink Fit
SFM	275-375 ft/min.
IPM	20-45 inch/min.
RPM	1680-2292 rev./min.
Milling Method	Helical Ramping, Pocket, Ramping, Profile and Slotting
Ap	.300" - 1.500"
Ae	.050" - .625"
Ramping	1°- 1-1/2°
Helical Interpolation	0.5°
Coolant	Water-Based
Machine	Machining Center

TEST 3 | 7 FLUTE CHIP BREAKER END MILLS

Part Description
Aerospace Part

Size(inch)	Ø1/2(R.02")x Ø1/2 x 1-1/4 x 3"	
Work Material	13-8 PH H1000 (HRc 40~44)	
SFM	420 ft/min.	
IPM	YG-1 : 60.0 in/min	Competitor C : 54.0 in/min
RPM	3209 rev./min.	
Milling Method	Side Cutting	
Ap	1.12" (Axial Depth)	
Ae	.03"(Radial Depth)	
Coolant	Water-Based	
Machine	Machining Center	

HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC

NEW SIZE

SERIES

Square **EMI42**

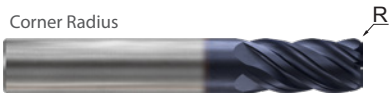
Corner Radius **EMI43**

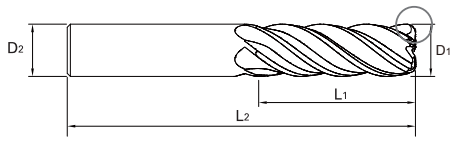
5-FLUTE DOUBLE CORE STANDARD LENGTH (PLAIN SHANK)

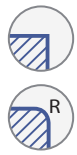
- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for chatter-free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys

Square

Corner Radius







CARBIDE | 5 | 38° | PLAIN | AlTiN | p. 38-40

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Square ●	Corner Radius								
					.010	.015	.020	.030	.060	.090	.125	.190	.250
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1/8	1/8	1/4	1-1/2	EMI42008	EMI43008	EMI43803	EMI43804	EMI43805	-	-	-	-	-
		3/8	2	EMI42919	EMI43806	EMI43807	EMI43808	EMI43809	-	-	-	-	-
		1/2	2-1/2	EMI42920	EMI43810	EMI43811	EMI43812	EMI43813	-	-	-	-	-
		5/8	2-1/2	EMI42925	EMI43814	EMI43815	EMI43816	EMI43817	-	-	-	-	-
		3/4	2-1/2	EMI42926	EMI43818	EMI43819	-	EMI43820	-	-	-	-	-
		7/8	2-1/2	EMI42927	EMI43821	-	-	EMI43822	-	-	-	-	-
		1	2-1/2	EMI42928	-	-	-	-	-	-	-	-	-
5/32	3/16	5/16	2	EMI42010	EMI43010	-	-	EMI43823	-	-	-	-	-
		7/16	2	EMI42929	EMI43824	-	-	EMI43825	-	-	-	-	-
		9/16	2-1/2	EMI42930	EMI43826	-	-	EMI43827	-	-	-	-	-
		3/4	2-1/2	EMI42931	EMI43828	-	-	EMI43829	-	-	-	-	-
		1	2-1/2	EMI42932	-	-	-	-	-	-	-	-	-
3/16	3/16	5/16	2	EMI42012	EMI43012	EMI43830	-	EMI43831	-	-	-	-	-
		7/16	2	EMI42933	EMI43832	EMI43833	-	EMI43834	-	-	-	-	-
		9/16	2-1/2	EMI42934	EMI43835	EMI43836	-	EMI43837	-	-	-	-	-
		3/4	2-1/2	EMI42935	EMI43838	EMI43839	-	EMI43840	-	-	-	-	-
		1	2-1/2	EMI42936	EMI43841	EMI43842	-	EMI43843	-	-	-	-	-
		1-3/16	3	EMI42937	-	-	-	-	-	-	-	-	-
7/32	1/4	3/8	2	EMI42014	-	-	-	-	-	-	-	-	-
		3/4	2-1/2	EMI42938	-	-	-	-	-	-	-	-	-

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

Feed to be reduced by approximately 50% if L.O.C. (Length Of Cut) is over 3xD

● TitaNox-Power HPC Square Tools are designed with a true sharp corner while TitaNox-Power Square tools feature a dubbed corner for extra protection

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H		
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

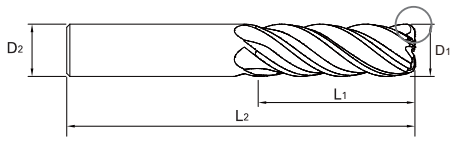
SERIES
Square EMI42
Corner Radius EMI43

HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW SIZE
5-FLUTE DOUBLE CORE STANDARD LENGTH (PLAIN SHANK)

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for chatter-free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys

Square

Corner Radius



CARBIDE | 5 | 38° | PLAIN | AlTiN | p. 38-40

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Square ●	Corner Radius								
					.010	.015	.020	.030	.060	.090	.125	.190	.250
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1/4	1/4	3/8	2	EMI42016	EMI43844	EMI43016	EMI43845	EMI43901	EMI43902	-	-	-	-
		1/2	2-1/2	EMI42901	EMI43846	EMI43903	EMI43847	EMI43904	EMI43905	-	-	-	-
		3/4	2-1/2	EMI42902	EMI43848	EMI43906	EMI43849	EMI43907	EMI43908	-	-	-	-
		1	3	EMI42939	EMI43850	EMI43851	EMI43852	EMI43853	EMI43854	-	-	-	-
		1-1/4	3	EMI42940	EMI43855	EMI43856	EMI43857	EMI43858	EMI43859	-	-	-	-
		1-1/2	3	EMI42941	-	-	-	-	-	-	-	-	-
		1-3/4	4	EMI42942	-	-	-	-	-	-	-	-	-
5/16	5/16	7/16	2	EMI42020	EMI43860	EMI43020	EMI43861	EMI43909	EMI43862	-	-	-	-
		13/16	2-1/2	EMI42903	EMI43863	EMI43910	EMI43864	EMI43911	EMI43865	-	-	-	-
		1	3	EMI42943	EMI43866	EMI43867	EMI43868	EMI43869	EMI43870	-	-	-	-
		1-1/4	3	EMI42944	-	-	-	-	-	-	-	-	-
3/8	3/8	1/2	2	EMI42024	EMI43871	EMI43024	EMI43872	EMI43912	EMI43913	EMI43914	EMI43873	-	-
		3/4	2-1/2	EMI42945	EMI43874	EMI43875	EMI43876	EMI43877	EMI43878	EMI43879	EMI43880	-	-
		1	3	EMI42904	EMI43881	EMI43915	EMI43882	EMI43916	EMI43917	EMI43918	EMI43883	-	-
		1-1/4	3	EMI42905	EMI43884	EMI43919	EMI43885	EMI43920	EMI43921	EMI43922	EMI43886	-	-
		1-1/2	3-1/2	EMI42946	EMI43887	-	EMI43888	EMI43889	EMI43890	-	-	-	-
		2	4	EMI42947	-	-	-	EMI43891	-	-	-	-	-
7/16	7/16	5/8	2-1/2	EMI42028	-	-	-	-	-	-	-	-	-
		1	2-3/4	EMI42948	-	-	-	-	-	-	-	-	-
		1-5/16	3-1/2	EMI42949	-	-	-	-	-	-	-	-	-

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

Feed to be reduced by approximately 50% if L.O.C. (Length Of Cut) is over 3xD

● TitaNox-Power HPC Square Tools are designed with a true sharp corner while TitaNox-Power Square tools feature a dubbed corner for extra protection

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
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HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
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HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC

NEW SIZE

SERIES

Square **EMI42**

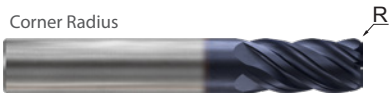
Corner Radius **EMI43**

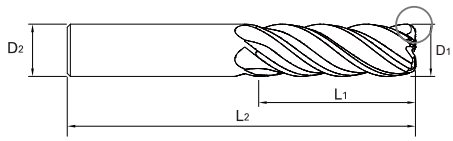
5-FLUTE DOUBLE CORE STANDARD LENGTH (PLAIN SHANK)

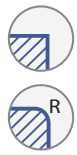
- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for chatter-free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys

Square

Corner Radius







CARBIDE | 5 | 38° | PLAIN | AlTiN | p. 38-40

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Square ●	Corner Radius								
					.010	.015	.020	.030	.060	.090	.125	.190	.250
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1/2	1/2	5/8	2-1/2	EMI42032	EMI43892	EMI43032	EMI43893	EMI43923	EMI43924	EMI43925	EMI43926	-	-
		1	3	EMI42906	EMI43894	EMI43927	EMI43895	EMI43928	EMI43929	EMI43930	EMI43931	-	-
		1-1/4	3	EMI42907	EMI43896	EMI43932	EMI43897	EMI43933	EMI43934	EMI43935	EMI43936	-	-
		1-5/8	4	EMI42908	EMI43898	EMI43937	EMI43899	EMI43938	EMI43939	EMI43940	EMI43941	-	-
		2	4	EMI42950	EMI43701	EMI43702	EMI43703	EMI43704	EMI43705	EMI43706	EMI43707	-	-
		2-1/2	5	EMI42951	-	-	-	EMI43708	-	-	EMI43709	-	-
		3-1/8	6	EMI42952	-	-	-	-	-	-	-	-	-
5/8	5/8	3/4	3	EMI42040	-	EMI43710	-	EMI43040	EMI43942	EMI43943	EMI43944	-	-
		1-1/4	3-1/2	EMI42909	-	EMI43945	-	EMI43946	EMI43947	EMI43948	EMI43949	-	-
		1-5/8	3-1/2	EMI42910	-	EMI43711	-	EMI43950	EMI43951	EMI43952	EMI43953	-	-
		2-1/8	4	EMI42911	-	EMI43712	-	EMI43954	EMI43955	EMI43956	EMI43957	-	-
		2-1/2	5	EMI42953	-	-	-	EMI43713	EMI43714	-	-	-	-
		3-1/4	6	EMI42954	-	-	-	-	-	-	-	-	-
3/4	3/4	1	3	EMI42048	-	EMI43715	-	EMI43048	EMI43958	EMI43959	EMI43960	EMI43961	-
		1-1/4	4	-	-	EMI43716	-	EMI43717	EMI43718	-	EMI43719	-	-
		1-1/2	4	EMI42912	-	EMI43962	-	EMI43963	EMI43964	EMI43965	EMI43966	EMI43967	EMI43968
		1-5/8	4	EMI42913	-	EMI43720	-	EMI43969	EMI43802	EMI43970	EMI43973	EMI43971	EMI43972
		2-1/4	5	EMI42914	-	EMI43974	-	EMI43975	EMI43976	EMI43977	EMI43978	EMI43979	EMI43980
		2-3/4	5	EMI42955	-	-	-	EMI43721	EMI43722	-	EMI43723	-	-
		3-1/4	6	EMI42956	-	-	-	EMI43724	EMI43725	-	EMI43726	-	-
		4	6-1/2	EMI42957	-	-	-	-	-	-	-	-	-

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

Feed to be reduced by approximately 50% if L.O.C. (Length Of Cut) is over 3xD

● TitaNox-Power HPC Square Tools are designed with a true sharp corner while TitaNox-Power Square tools feature a dubbed corner for extra protection

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

SERIES

Square **EMI42**

Corner Radius **EMI43**

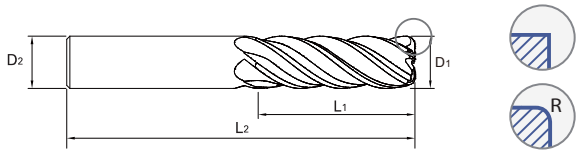
HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW SIZE

5-FLUTE DOUBLE CORE STANDARD LENGTH (PLAIN SHANK)

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for chatter-free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys

Square

Corner Radius



CARBIDE | 5 | 38° | PLAIN | AlTiN | p. 38-40

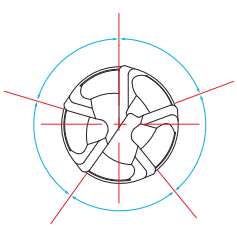
Unit : INCH

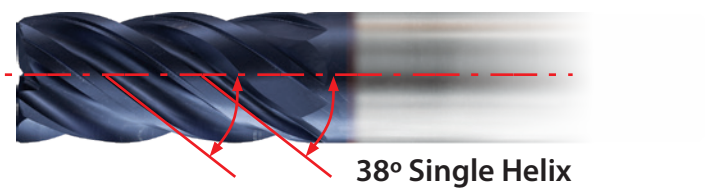
OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Square ●	Corner Radius								
					.010	.015	.020	.030	.060	.090	.125	.190	.250
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1	1	1-1/8	4	EMI42064	-	-	-	EMI43727	EMI43064	-	EMI43981	-	-
		1-1/2	4	EMI42915	-	EMI43982	-	EMI43983	EMI43984	-	EMI43985	-	EMI43728
		2	5	EMI42916	-	EMI43986	-	EMI43987	EMI43988	EMI43989	EMI43990	-	EMI43991
		2-5/8	5	EMI42917	-	-	-	EMI43992	EMI43993	-	EMI43994	-	EMI43995
		3-1/4	6	EMI42918	-	-	-	EMI43996	EMI43997	EMI43998	EMI43999	-	EMI43801

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

Feed to be reduced by approximately 50% if L.O.C. (Length Of Cut) is over 3xD

● TitaNox-Power HPC Square Tools are designed with a true sharp corner while TitaNox-Power Square tools feature a dubbed corner for extra protection





38° Single Helix

Unequal Index

Exclusively Designed Unique Geometry applied to Reduce Vibration and also to achieve Excellent surface finish

Core Design

YG-1's High Performance Core Geometries is designed for superior chip evacuation. It's excellent at Slotting & Heavy Profiling.

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

SERIES

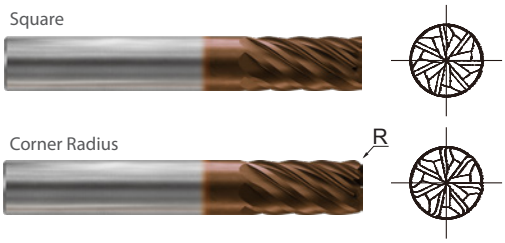
Square **HHK82**

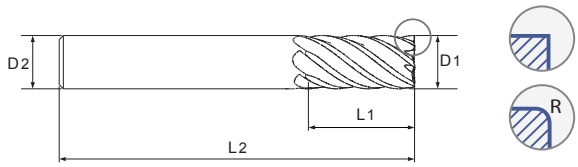
Corner Radius **HHK83**

HIGH PERFORMANCE SOLID CARBIDE END MILLS - *TitaNox-Power HPC* NEW

7-FLUTE STANDARD LENGTH (PLAIN SHANK)

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys





CARBIDE | 7 | 38° | PLAIN | C Coating | p. 41

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Square	Corner Radius					
					.010	.020	.030	.060	.090	.125
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1/8	1/8	1/4	1-1/2	HHK82008	HHK83008	-	-	-	-	-
		3/8	2	HHK82901	HHK83901	-	-	-	-	-
		1/2	2-1/2	HHK82902	HHK83902	-	-	-	-	-
		5/8	2-1/2	HHK82903	HHK83903	-	-	-	-	-
3/16	3/16	5/16	2	HHK82012	HHK83012	-	-	-	-	-
		7/16	2	HHK82904	HHK83904	-	-	-	-	-
		9/16	2-1/2	HHK82905	HHK83905	-	-	-	-	-
		3/4	2-1/2	HHK82906	HHK83906	-	-	-	-	-
1/4	1/4	3/8	2	HHK82016	HHK83016	HHK83907	HHK83908	-	-	-
		1/2	2	HHK82907	HHK83909	HHK83910	HHK83911	-	-	-
		3/4	2-1/2	HHK82908	HHK83912	HHK83913	HHK83914	-	-	-
		1	3	HHK82909	HHK83915	HHK83916	HHK83917	-	-	-
		1-1/4	3	HHK82910	HHK83918	HHK83919	HHK83920	-	-	-
5/16	5/16	7/16	2	HHK82020	-	-	-	-	-	-
		3/4	2-1/2	HHK82911	-	-	-	-	-	-
		1	3	HHK82912	-	-	-	-	-	-
		1-1/4	3	HHK82913	-	-	-	-	-	-
3/8	3/8	1/2	2	HHK82024	HHK83024	HHK83921	HHK83922	HHK83923	-	HHK83924
		3/4	2-1/2	HHK82914	HHK83925	HHK83926	HHK83927	HHK83928	-	HHK83929
		1	2-1/2	HHK82915	HHK83930	HHK83931	HHK83932	HHK83933	-	HHK83934
		1-1/4	3	HHK82916	HHK83935	HHK83936	HHK83937	HHK83938	-	HHK83939
		1-1/2	3-1/2	HHK82917	HHK83940	HHK83941	HHK83942	HHK83943	-	HHK83944
		2	4	HHK82918	-	HHK83945	-	-	-	-

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

- 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%

NEXT PAGE ▶

◎ : Excellent ○ : Good

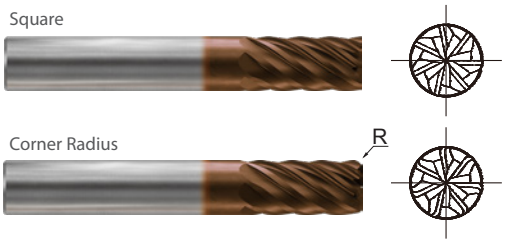
ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

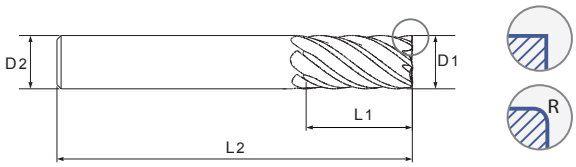
ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

SERIES
Square HHK82
Corner Radius HHK83

HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW
7-FLUTE STANDARD LENGTH (PLAIN SHANK)

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys





CARBIDE | 7 | 38° | PLAIN | C Coating | p.41

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Square	Corner Radius					
					.010	.020	.030	.060	.090	.125
				EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1/2	1/2	5/8	2-1/2	HHK82032	HHK83032	HHK83946	HHK83947	HHK83948	-	HHK83949
		1	3	HHK82919	HHK83950	HHK83951	HHK83952	HHK83953	-	HHK83954
		1-1/4	3	HHK82920	HHK83955	HHK83956	HHK83957	HHK83958	-	HHK83959
		1-5/8	4	HHK82921	HHK83960	HHK83961	HHK83962	HHK83963	-	HHK83964
		2	4	HHK82922	HHK83965	HHK83966	HHK83967	HHK83968	-	HHK83969
		2-1/2	5	HHK82923	-	-	HHK83970	-	-	-
		3-1/8	6	HHK82924	-	-	-	-	-	-
5/8	5/8	3/4	3	HHK82040	-	-	HHK83040	HHK83971	-	-
		1-1/4	3-1/2	HHK82925	-	-	HHK83972	HHK83973	HHK83996	HHK83997
		1-5/8	4	HHK82926	-	-	HHK83974	HHK83975	HHK83998	HHK83999
		2-1/8	4	HHK82927	-	-	HHK83976	HHK83977	HHK83801	HHK83802
		2-1/2	5	HHK82935	-	-	HHK83978	HHK83803	HHK83804	HHK83805
		3-1/8	6	-	-	-	HHK83806	HHK83807	HHK83808	HHK83809
3/4	3/4	1	3	-	-	-	HHK83048	HHK83979	-	-
		1-1/4	3-1/2	HHK82048	-	-	HHK83980	-	-	-
		1-5/8	4	HHK82928	-	-	HHK83981	HHK83982	-	HHK83983
		2-1/4	5	HHK82929	-	-	HHK83984	HHK83985	-	HHK83986
		2-3/4	5	HHK82930	-	-	HHK83987	HHK83988	-	HHK83989
		3-1/4	6	HHK82931	-	-	HHK83990	HHK83991	-	-
1	1	1-1/4	4	HHK82064	-	-	HHK83064	-	-	-
		2	5	HHK82932	-	-	HHK83992	-	-	-
		2-5/8	5	HHK82933	-	-	HHK83993	-	-	-
		3-1/4	6	HHK82934	-	-	HHK83994	-	-	-
		4-1/4	7	-	-	-	HHK83995	-	-	-

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

- 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%

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

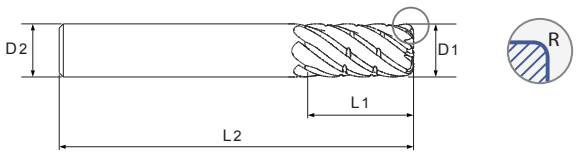
HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW

7-FLUTE CORNER RADIUS - CHIP BREAKER (PLAIN SHANK)

SERIES

Corner Radius **HHK84**

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys



CARBIDE | 7 | 38° | PLAIN | C Coating | p. 41

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Corner Radius .010 EDP No.	.020 EDP No.	.030 EDP No.	.060 EDP No.	.090 EDP No.	.125 EDP No.
1/4	1/4	3/8	2	-	HHK84016	HHK84901	-	-	-
		1/2	2	-	HHK84902	HHK84903	-	-	-
		3/4	2-1/2	-	HHK84904	HHK84905	-	-	-
		1	3	-	HHK84906	-	-	-	-
		1-1/4	3	-	HHK84907	-	-	-	-
5/16	5/16	7/16	2	-	HHK84020	-	-	-	-
		3/4	2-1/2	-	HHK84908	-	-	-	-
		1	3	-	HHK84909	-	-	-	-
3/8	3/8	1/2	2	-	HHK84024	HHK84910	HHK84911	-	-
		3/4	2-1/2	-	HHK84912	HHK84913	HHK84914	-	-
		1	2-1/2	-	HHK84915	HHK84916	HHK84917	-	-
		1-1/2	3-1/2	-	HHK84918	-	-	-	-
1/2	1/2	5/8	2-1/2	HHK84032	HHK84919	HHK84920	HHK84921	-	-
		1	3	HHK84922	HHK84923	HHK84924	HHK84925	-	-
		1-1/4	3	HHK84926	HHK84927	HHK84928	HHK84929	-	-
		1-5/8	4	HHK84930	HHK84931	HHK84932	HHK84933	-	-
		2	4	HHK84934	HHK84935	HHK84936	HHK84937	-	-
		2-1/2	5	-	-	HHK84938	-	-	-
		3-1/8	6	-	-	HHK84939	-	-	-

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

- 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%

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

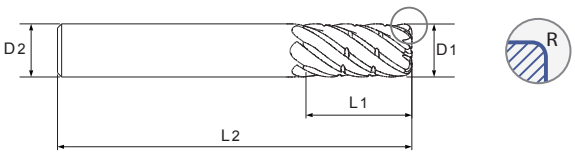
ISO	N										S							H		
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW

7-FLUTE CORNER RADIUS - CHIP BREAKER (PLAIN SHANK)

SERIES
Corner Radius **HHK84**

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys



CARBIDE | 7 | 38° | PLAIN | C Coating | p. 41

Unit : INCH

OD (D_1)	SD (D_2)	LOC (L_1)	OAL (L_2)	Corner Radius .010 EDP No.	.020 EDP No.	.030 EDP No.	.060 EDP No.	.090 EDP No.	.125 EDP No.
5/8	5/8	1-1/4	3-1/2	-	-	HHK84040	HHK84940	HHK84958	HHK84959
		1-5/8	4	-	-	HHK84941	HHK84942	HHK84960	HHK84961
		2-1/8	4	-	-	HHK84943	HHK84944	HHK84962	HHK84963
		2-1/2	5	-	-	HHK84964	HHK84965	HHK84966	HHK84967
		3-1/8	6	-	-	HHK84968	HHK84969	HHK84970	HHK84971
3/4	3/4	1-1/4	3-1/2	-	-	HHK84048	HHK84945	-	-
		1-5/8	4	-	-	HHK84946	HHK84947	-	-
		2-1/4	5	-	-	HHK84948	HHK84949	-	-
		2-3/4	5	-	-	HHK84950	HHK84951	-	-
		3-1/4	6	-	-	HHK84952	HHK84953	-	-
		4	6-1/2	-	-	HHK84954	HHK84955	-	-
1	1	2-5/8	5	-	-	HHK84064	-	-	-
		3-1/4	6	-	-	HHK84956	-	-	-
		4-1/8	7	-	-	HHK84957	-	-	-

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5 * Shank Dia.≥Ø1/2 : h6

- 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%

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend	○	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	○	○	○	○	○	○

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

SERIES

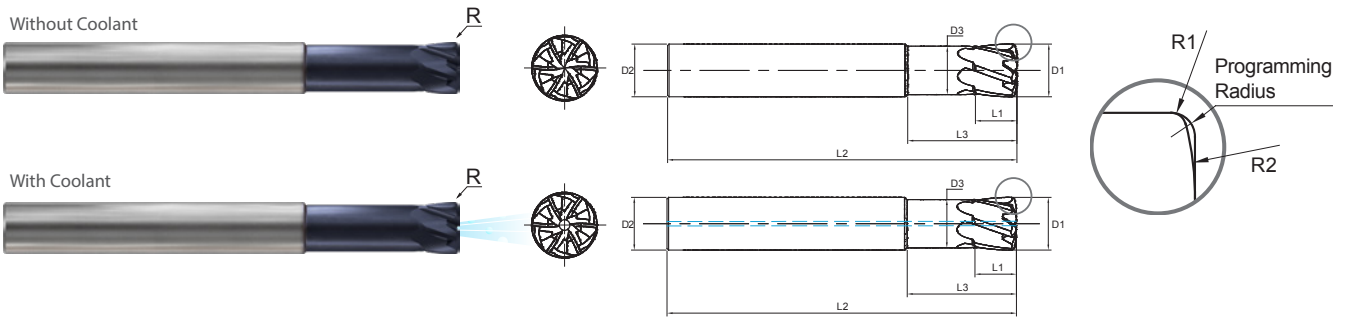
HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW

4 & 6-FLUTE CORNER RADIUS - HIGH FEED (PLAIN SHANK)

Without Coolant Hole **EML09**

With Coolant Hole **EML10**

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys



CARBIDE | 4 | 6 | 20° | PLAIN | AlTiN | p. 42

Unit : INCH

OD (D_1)	SD (D_2)	R1	R2	Program Radius	LOC (L_1)	LBS (L_3)	OAL (L_2)	Neck Dia (D_3)	Without Coolant Hole EDP No.	With Coolant Hole EDP No.	No. of Flute
5/32	1/4	R.01	R.195	R.016	.120	9/16	2-1/2	.144	EML09010	EML10010	4
						3/4	3		-	EML10901	4
						1	3		-	EML10908	4
3/16	1/4	R.012	R.234	R.019	.150	5/8	2-1/2	.176	EML09012	EML10012	4
						7/8	3		-	EML10902	4
						1-3/16	4		-	EML10909	4
1/4	1/4	R.016	R.313	R.025	.180	3/4	2-1/2	.230	EML09016	EML10016	6
						1	3		-	EML10903	6
						1-3/8	4		-	EML10910	6
5/16	5/16	R.02	R.391	R.032	.240	1	3	.293	EML09020	EML10020	6
						1-5/16	4		-	EML10904	6
						1-13/16	4		-	EML10911	6
3/8	3/8	R.023	R.469	R.037	.300	1-1/4	4	.344	EML09024	EML10024	6
						1-5/8	4		-	EML10905	6
						2-1/4	5		-	EML10912	6
1/2	1/2	R.031	R.625	R.05	.350	1-1/2	4	.461	EML09032	EML10032	6
						2	5		-	EML10906	6
						2-5/8	6		-	EML10913	6

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend												◎	◎	◎						

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

SERIES

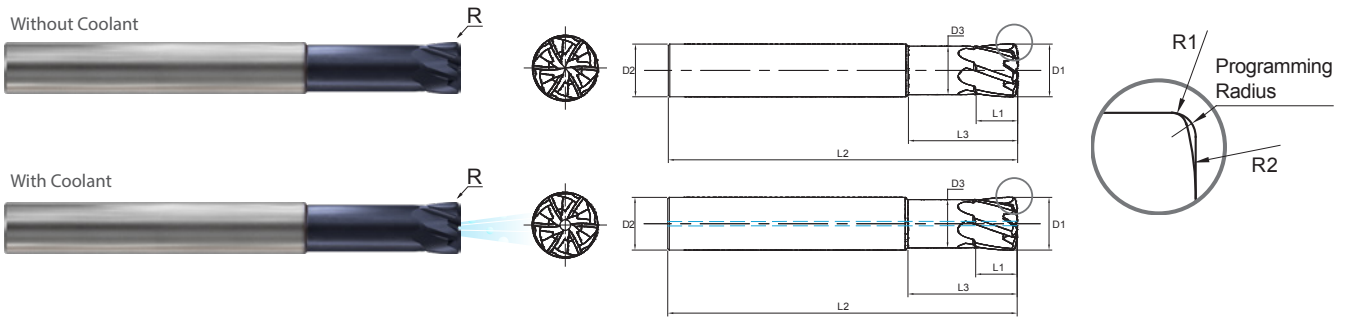
HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW

4 & 6-FLUTE CORNER RADIUS - HIGH FEED (PLAIN SHANK)

Without Coolant Hole **EML09**

With Coolant Hole **EML10**

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys

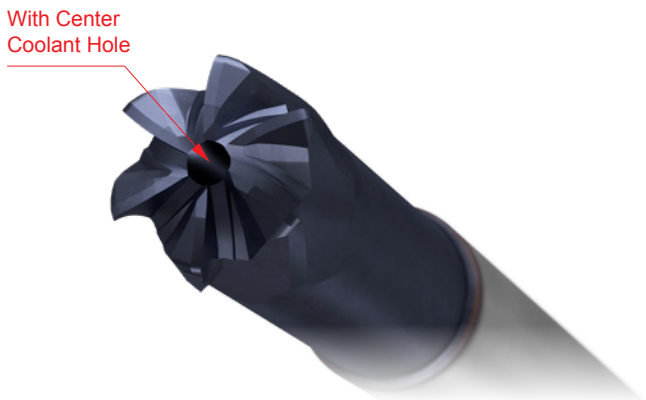


CARBIDE | 4 | 6 | 20° | PLAIN | AlTiN | p. 42

Unit : INCH

OD (D_1)	SD (D_2)	R1	R2	Program Radius	LOC (L_1)	LBS (L_3)	OAL (L_2)	Neck Dia (D_3)	Without Coolant Hole EDP No.	With Coolant Hole EDP No.	No. of Flute
5/8	5/8	R.039	R.781	R.063	.470	2	4	.586	EML09040	EML10040	6
						2-5/8	6		-	EML10907	6
						3-1/2	7		-	EML10914	6
3/4	3/4	R.047	R.938	R.075	.590	2-1/2	5	.711	EML09048	EML10048	6
1	1	R.063	R1.25	R.101	.740	3	6	.961	EML09064	EML10064	6

Mill Dia.Tolerance (inch)	Shank Dia.Tolerance
0 ~ - .0012	h5



◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend												◎	◎	◎						

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

SERIES

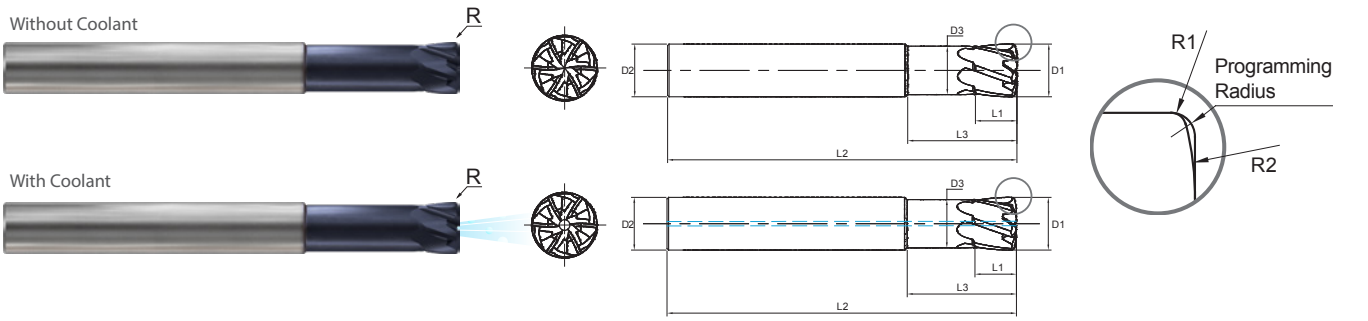
HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW

4 & 6-FLUTE CORNER RADIUS - HIGH FEED (PLAIN SHANK)

Without Coolant Hole **EML07**

With Coolant Hole **EML08**

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys



CARBIDE | 4 | 6 | 20° | PLAIN | AlTiN | p. 42

Unit : METRIC

OD (D_1)	SD (D_2)	R1	R2	Program Radius	LOC (L_1)	LBS (L_3)	OAL (L_2)	Neck Dia (D_3)	Without Coolant Hole EDP No.	With Coolant Hole EDP No.	No. of Flute
4.0	6	0.25	5	0.4	3	14	65	3.7	EML07040	EML08040	4
						18	70		-	EML08901	4
						24	80		-	EML08902	4
5.0	6	0.31	6.25	0.5	3.75	17	65	4.7	EML07050	EML08050	4
						22	80		-	EML08903	4
						30	90		-	EML08904	4
6.0	6	0.38	7.5	0.61	4.5	20	65	5.5	EML07060	EML08060	6
						26	80		-	EML08905	6
						35	90		-	EML08906	6
8.0	8	0.5	10	0.8	6	26	76	7.5	EML07080	EML08080	6
						34	90		-	EML08907	6
						46	110		-	EML08908	6
10.0	10	0.63	12.5	1.01	7.5	32	90	9.2	EML07100	EML08100	6
						42	110		-	EML08909	6
						57	130		-	EML08910	6
12.0	12	0.75	15	1.2	9	38	100	11	EML07120	EML08120	6
						50	120		-	EML08911	6
						68	140		-	EML08912	6

Mill Dia.Tolerance (mm)	Shank Dia.Tolerance
0 ~ -0.030	h5

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend												◎	◎	◎						

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

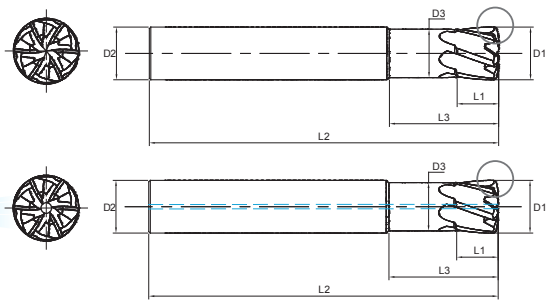
SERIES

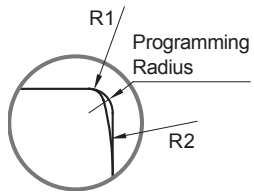
HIGH PERFORMANCE SOLID CARBIDE END MILLS - TitaNox-Power HPC NEW
4 & 6-FLUTE CORNER RADIUS - HIGH FEED (PLAIN SHANK)

Without Coolant Hole **EML07**

With Coolant Hole **EML08**

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Unequal index design for Chatter-Free cutting
- High performance milling of Stainless Steel, Titanium, and Heat-Resistant Super Alloys



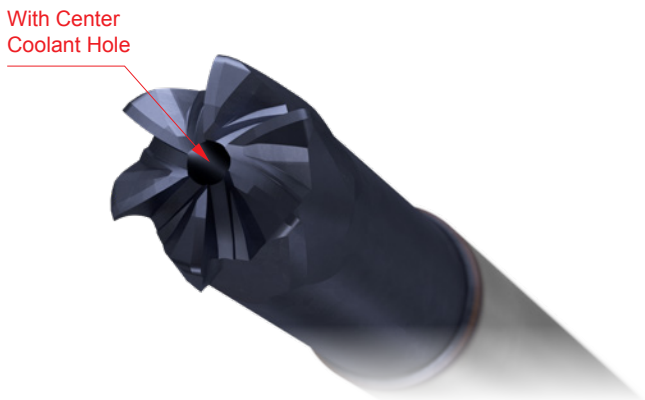


CARBIDE | 4 | 6 | 20° | PLAIN | AlTiN | p. 42

Unit : METRIC

OD (D_1)	SD (D_2)	R1	R2	Program Radius	LOC (L_1)	LBS (L_3)	OAL (L_2)	Neck Dia (D_3)	Without Coolant Hole EDP No.	With Coolant Hole EDP No.	No. of Flute
16.0	16	1	20	1.61	12	50	110	15	EML07160	EML08160	6
						66	140		-	EML08913	6
						90	170		-	EML08914	6
20.0	20	1.25	25	2.01	15	62	125	19	EML07200	EML08200	6
25.0	25	1.56	31.25	2.51	18.75	77	150	23.5	EML07250	EML08250	6

Mill Dia.Tolerance (mm)	Shank Dia.Tolerance
0 ~ -0.030	h5



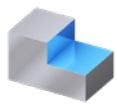
◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommend												◎	◎	◎						

ISO	N										S					H				
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommend											◎	◎	◎	◎	◎	◎	◎				

RECOMMENDED CUTTING CONDITIONS – INCH

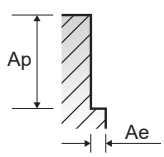
UGMG42, UGMG43 SERIES



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

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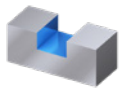
RECOMMENDED CUTTING CONDITIONS – INCH

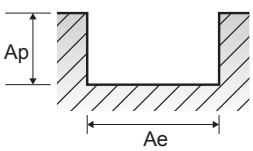
UGMG42, UGMG43 SERIES

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:
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* (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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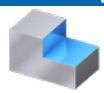
RECOMMENDED CUTTING CONDITIONS – INCH

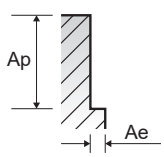
UGMH12, UGMG32, UGMG34, UGMH06, UGMH07 SERIES

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



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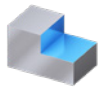
RECOMMENDED CUTTING CONDITIONS – METRIC

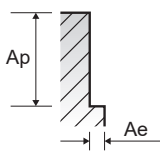
GMG40 SERIES

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



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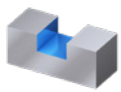
RECOMMENDED CUTTING CONDITIONS – METRIC

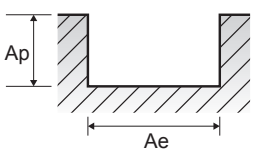
GMG40 SERIES

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



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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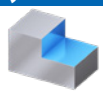
RECOMMENDED CUTTING CONDITIONS – METRIC

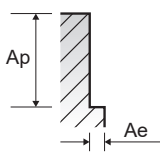
GMG24, GMG26, GMG28, GMG30 SERIES

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
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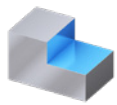
RECOMMENDED CUTTING CONDITIONS – INCH

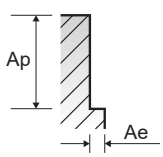
EMI42, EMI43 SERIES



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:
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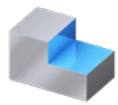
RECOMMENDED CUTTING CONDITIONS – INCH

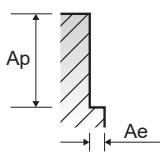
EMI42, EMI43 SERIES



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:
- 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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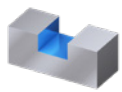
RECOMMENDED CUTTING CONDITIONS – INCH

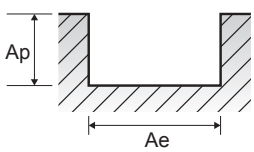
EMI42, EMI43 SERIES

5 FLUTES (TitaNox-Power HPC) - 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
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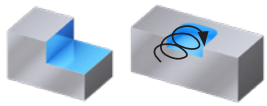
RECOMMENDED CUTTING CONDITIONS – INCH

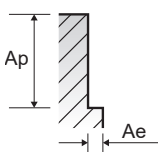
HHK82, HHK83, HHK84 SERIES



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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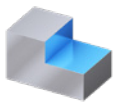
RECOMMENDED CUTTING CONDITIONS – INCH

EML09, EML10 SERIES



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

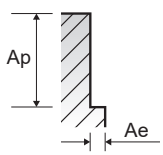
RPM = rev./min. IPM = in./min.
SFM = ft./min. IPT = in./tooth

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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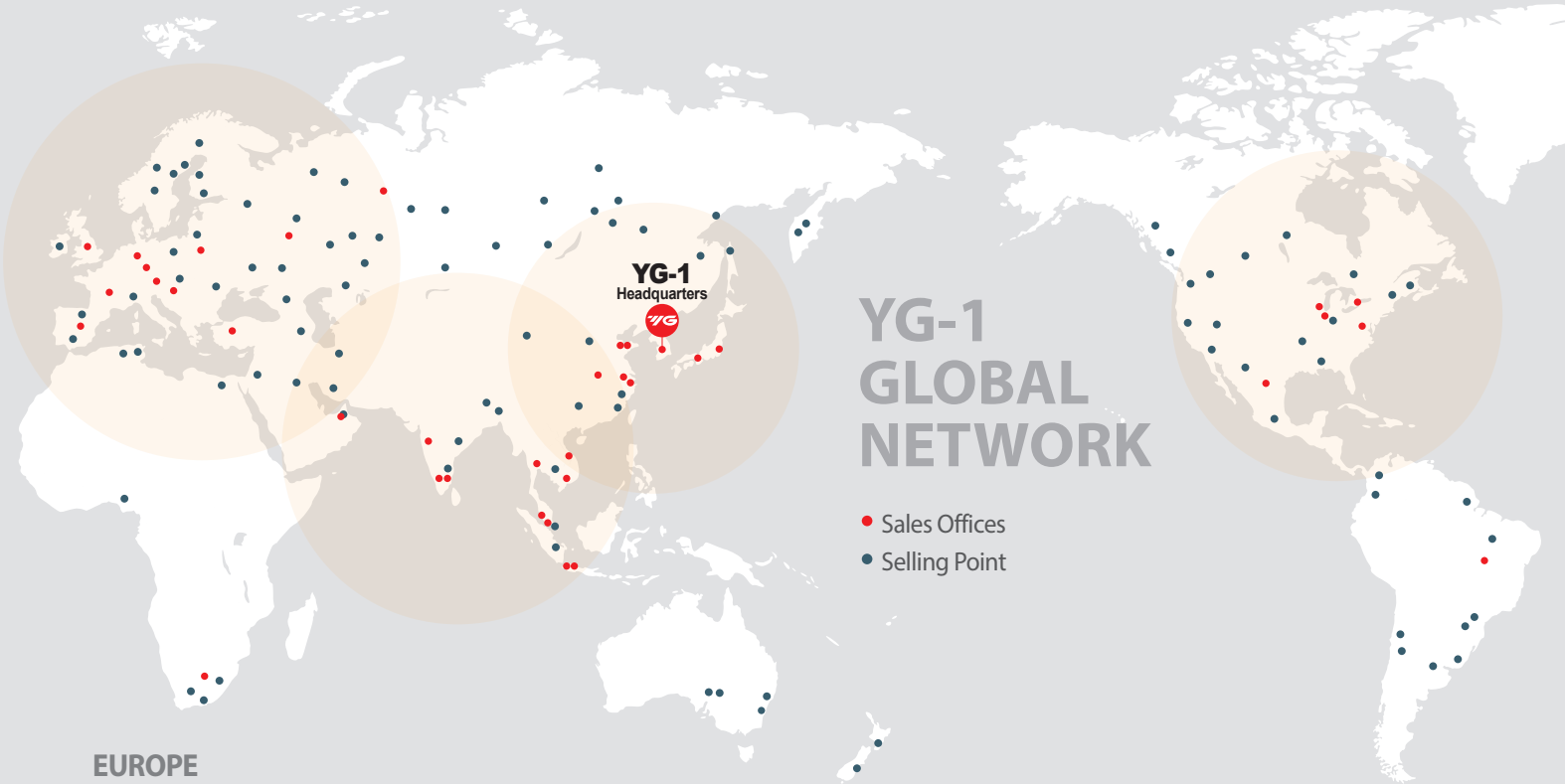

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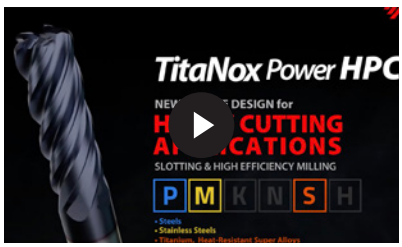

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