

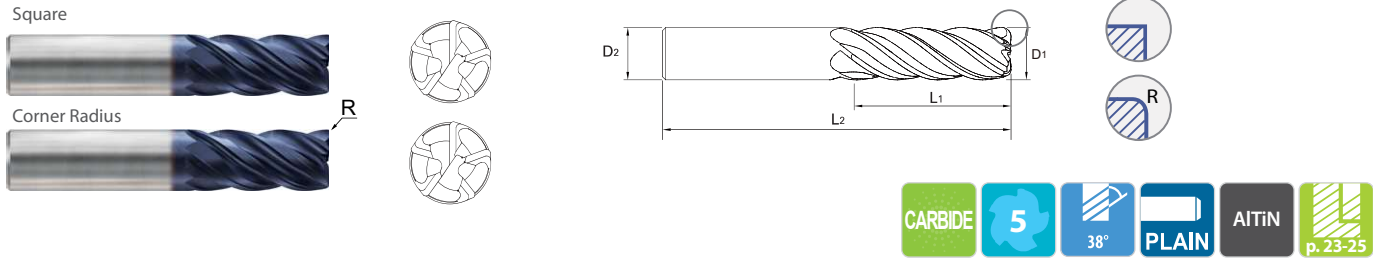
HIGH PERFORMANCE SOLID CARBIDE END MILLS - *TitaNox Power HPC*

5-FLUTE STANDARD LENGTH (PLAIN SHANK)

Square **EMI42**
 Corner Radius **EMI43**

- ▶ 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



Unit : INCH

OD (D1)	SD (D2)	LOC (L1)	OAL (L2)	Square ●	Corner Radius								
					.015	.030	.060	.090	.125	.190	.250		
					EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.		
1/4	1/4	3/8	2	EMI42016	EMI43016	EMI43901	EMI43902						
		1/2	2_1/2	EMI42901	EMI43903	EMI43904	EMI43905						
		3/4	2_1/2	EMI42902	EMI43906	EMI43907	EMI43908						
5/16	5/16	7/16	2	EMI42020	EMI43020	EMI43909							
		13/16	2_1/2	EMI42903	EMI43910	EMI43911							
3/8	3/8	1/2	2_1/2	EMI42024	EMI43024	EMI43912	EMI43913	EMI43914					
		1	3	EMI42904	EMI43915	EMI43916	EMI43917	EMI43918					
		1_1/4	3	EMI42905	EMI43919	EMI43920	EMI43921	EMI43922					
1/2	1/2	5/8	2_1/2	EMI42032	EMI43032	EMI43923	EMI43924	EMI43925	EMI43926				
		1	3	EMI42906	EMI43927	EMI43928	EMI43929	EMI43930	EMI43931				
		1_1/4	3	EMI42907	EMI43932	EMI43933	EMI43934	EMI43935	EMI43936				
		1_5/8	4	EMI42908	EMI43937	EMI43938	EMI43939	EMI43940	EMI43941				
5/8	5/8	3/4	3	EMI42040		EMI43040	EMI43942	EMI43943	EMI43944				
		1_1/4	3_1/2	EMI42909	EMI43945	EMI43946	EMI43947	EMI43948	EMI43949				
		1_5/8	4	EMI42910		EMI43950	EMI43951	EMI43952	EMI43953				
		2_1/8	4_1/2	EMI42911		EMI43954	EMI43955	EMI43956	EMI43957				
3/4	3/4	1	3_1/2	EMI42048		EMI43048	EMI43958	EMI43959	EMI43960	EMI43961			
		1_1/2	4	EMI42912	EMI43962	EMI43963	EMI43964	EMI43965	EMI43966	EMI43967	EMI43968		
		1_5/8	5	EMI42913		EMI43969		EMI43970	EMI43973	EMI43971	EMI43972		
		2_1/4	5	EMI42914	EMI43974	EMI43975	EMI43976	EMI43977	EMI43978	EMI43979	EMI43980		

Mill Dia. Tolerance (in)	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 3x D

NEXT PAGE ▶

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

◎ : Excellent ○ : Good

ISO	P										M				K						
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel		Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron		
Material Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
VDI 3323	13	25	28	32	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21	
HRc	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230	
HB																					
Recommend	○	○	○	○	○	○	○	○	○	○	◎	◎	◎	◎	○	○	○	○	○	○	
ISO	N									S							H				
	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		
Material Description	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
VDI 3323	15	30	25	38	34	15	30	25	38	34	15	30	25	38	34	400 Rm	1050 Rm	55	60	42	55
HRc	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
HB																					
Recommend											○	○	○	○	○	◎	◎				

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

5-FLUTE STANDARD LENGTH (PLAIN SHANK)

Square **EMI42**

Corner Radius **EMI43**

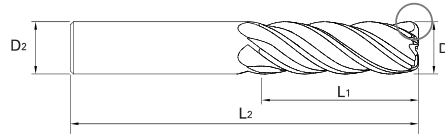
- ▶ New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- ▶ Unequal index design for Chatter-Free cutting

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

Square



Corner Radius



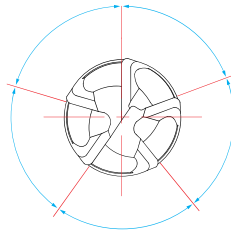
Unit : INCH

OD (D1)	SD (D2)	LOC (L1)	OAL (L2)	Square ●	Corner Radius							
					.015	.030	.060	.090	.125	.190	.250	
					EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.	EDP No.
1	1	1_1/8	4	EMI42064				EMI43064		EMI43981		
		1_1/2	4	EMI42915	EMI43982	EMI43983	EMI43984		EMI43985			
		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 (in)	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 3x D

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



Unequal Index

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



38° Single Helix

Core Design

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

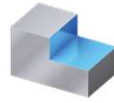
◎ : Excellent ○ : Good

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											○	○	○	○	○	◎	◎				

RECOMMENDED CUTTING CONDITIONS – INCH

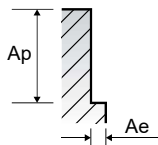
EMI42, EMI43 SERIES

5 FLUTES (TitaNox Power HPC) - Heavy Side cutting



RPM = rev./min. Feed = in./min.
Vc = ft./min. fz = in./tooth

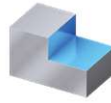
ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)							
						3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
P	1-5	Non-alloy steel	0.5D	1.5D	SFM (Vc)	500	500	500	500	500	500	500	500
					IPT (fz)	.0013	.0016	.0018	.0022	.0031	.0037	.0043	.0049
					RPM	10190	7640	6110	5090	3820	3060	2550	1910
	6-8	Low alloy steel	0.5D	1.5D	SFM (Vc)	500	500	500	500	500	500	500	500
					IPT (fz)	.0013	.0016	.0018	.0022	.0031	.0037	.0043	.0049
					RPM	10190	7640	6110	5090	3820	3060	2550	1910
	9	High alloyed steel, and tool steel	0.5D	1.5D	SFM (Vc)	400	400	400	400	400	400	400	400
					IPT (fz)	.0008	.0012	.0014	.0017	.0024	.0028	.0033	.0038
					RPM	8150	6110	4890	4070	3060	2440	2040	1530
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM (Vc)	450	450	450	450	450	450	450	450
IPT (fz)					.0013	.0016	.0018	.0022	.0031	.0037	.0043	.0049	
RPM					9170	6880	5500	4580	3440	2750	2290	1720	
11.1	High alloyed steel, and tool steel	0.5D	1.5D	SFM (Vc)	400	400	400	400	400	400	400	400	
				IPT (fz)	.0008	.0012	.0014	.0017	.0024	.0028	.0033	.0038	
				RPM	8150	6110	4890	4070	3060	2440	2040	1530	
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.5D	1.5D	SFM (Vc)	250	250	250	250	250	250	250	250
					IPT (fz)	.0007	.0010	.0012	.0015	.0021	.0024	.0028	.0032
					RPM	5090	3820	3060	2550	1910	1530	1270	950
	14.1	Stainless steel (SUS 316, 316L, X5CrNiMo 17122)	0.5D	1.5D	SFM (Vc)	300	300	300	300	300	300	300	300
					IPT (fz)	.0008	.0013	.0014	.0018	.0026	.0028	.0031	.0036
					RPM	6110	4580	3670	3060	2290	1830	1530	1150
	14.2	Stainless steel (SUS 630, PH 15-5)	0.5D	1.5D	SFM (Vc)	200	200	200	200	200	200	200	200
					IPT (fz)	.0007	.0010	.0011	.0014	.0021	.0022	.0025	.0029
					RPM	4070	3060	2440	2040	1530	1220	1020	760
K	15-20	Grey cast iron	0.5D	1.5D	SFM (Vc)	370	370	370	370	370	370	370	370
					IPT (fz)	.0010	.0014	.0016	.0019	.0026	.0032	.0037	.0042
					RPM	7540	5650	4520	3770	2830	2260	1880	1410
S	31-35	Heat Resistant Super Alloys (X12 NiCrSi 36-16, 1.4864, Inconel 718, NiCr 20TiAl, 2.4631, NiCu30Al, 2.4375, G-X120Mn12, 1.3401)	0.2D	1.5D	SFM (Vc)	90	90	90	90	90	90	90	90
					IPT (fz)	.0006	.0010	.0012	.0014	.0019	.0021	.0023	.0027
					RPM	1830	1380	1100	920	690	550	460	340
	36-37	Titanium Alloys (HB 400 Rm, HB 1050 Rm TiAl6V4, 3.7165)	0.5D	1.5D	SFM (Vc)	160	160	160	160	160	160	160	160
					IPT (fz)	.0006	.0010	.0012	.0014	.0019	.0021	.0023	.0027
					RPM	3260	2440	1960	1630	1220	980	810	610
					IPM (FEED)	60	55	50	50	53	51	49	42
					IPM (FEED)	33	37	34	35	37	34	34	29
					IPM (FEED)	18	19	18	19	20	18	18	15
					IPM (FEED)	24	30	26	28	30	26	24	21
					IPM (FEED)	14	15	13	14	16	13	13	11
					IPM (FEED)	38	40	36	36	37	36	35	30
					IPM (FEED)	5	7	7	6	7	6	5	5
					IPM (FEED)	10	12	12	11	12	10	9	8



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

RECOMMENDED CUTTING CONDITIONS – INCH

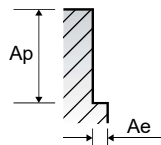
EMI42, EMI43 SERIES



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

RPM = rev./min. Feed = in./min.
Vc = ft./min. fz = in./tooth

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)								
						3/16	1/4	5/16	3/8	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	
					IPT (fz)	.0018	.0022	.0026	.0031	.0043	.0051	.0060	.0068	
					RPM	13240	9930	7950	6620	4970	3970	3310	2480	
	6-8	Low alloy steel	0.08D	2.0D	SFM (Vc)	650	650	650	650	650	650	650	650	
					IPT (fz)	.0018	.0022	.0026	.0031	.0043	.0051	.0060	.0068	
					RPM	13240	9930	7950	6620	4970	3970	3310	2480	
	9	Low alloy steel	0.08D	2.0D	SFM (Vc)	650	650	650	650	650	650	650	650	
					IPT (fz)	.0011	.0017	.0020	.0024	.0033	.0040	.0046	.0053	
					RPM	13240	9930	7950	6620	4970	3970	3310	2480	
	10	High alloyed steel, and tool steel	0.08D	2.0D	SFM (Vc)	580	580	580	580	580	580	580	580	
					IPT (fz)	.0018	.0022	.0026	.0031	.0043	.0051	.0060	.0068	
					RPM	11820	8860	7090	5910	4430	3540	2950	2220	
	11.1	High alloyed steel, and tool steel	0.08D	2.0D	SFM (Vc)	550	550	550	550	550	550	550	550	
					IPT (fz)	.0011	.0017	.0020	.0024	.0033	.0040	.0046	.0053	
					RPM	11200	8400	6720	5600	4200	3360	2800	2100	
M	12-13	Stainless steel (SUS 420, X40Cr13, 420)	0.06D	2.0D	SFM (Vc)	350	350	350	350	350	350	350	350	
					IPT (fz)	.0010	.0015	.0016	.0021	.0029	.0034	.0039	.0045	
					RPM	7130	5350	4280	3570	2670	2140	1780	1340	
	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	
					IPT (fz)	.0011	.0018	.0019	.0025	.0036	.0039	.0044	.0051	
					RPM	8660	6490	5190	4330	3250	2600	2160	1620	
	14.2	Stainless steel (SUS 630, PH 15-5)	0.06D	2.0D	SFM (Vc)	300	300	300	300	300	300	300	300	
					IPT (fz)	.0010	.0014	.0015	.0020	.0029	.0031	.0035	.0041	
					RPM	6110	4580	3670	3060	2290	1830	1530	1150	
K	15-20	Grey cast iron	0.07D	2.0D	SFM (Vc)	550	550	550	550	550	550	550	550	
					IPT (fz)	.0014	.0020	.0022	.0027	.0037	.0045	.0052	.0059	
					RPM	11200	8400	6720	5600	4200	3360	2800	2100	
	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
						IPT (fz)	.0006	.0010	.0012	.0014	.0019	.0021	.0023	.0027
						RPM	2440	1830	1470	1220	920	730	610	460
		36-37	Titanium Alloys (HB 400 Rm, HB 1050 Rm TiAl6V4, 3.7165)	0.05D	2.0D	SFM (Vc)	300	300	300	300	300	300	300	300
						IPT (fz)	.0006	.0010	.0012	.0014	.0019	.0021	.0023	.0027
						RPM	6110	4580	3670	3060	2290	1830	1530	1150



- NOTES:**
- ▶ Maximum recommended depth shown
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 - ▶ 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

YU-TP21 AMERICAS

BEST VALUE IN THE WORLD OF CUTTING TOOLS



FOR TITANIUM, STAINLESS STEELS AND ALLOY STEELS :
TOUGH MATERIALS
TAKE IT ON WITH TITANOX

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
- 5 Flute Heavy Cutting Solution
TitaNox Power HPC **NEW**

Take It On With

TitaNox Power

HIGH-PERFORMANCE MACHINING MADE EASY.

- ▶ Titanium
- ▶ Stainless Steels
- ▶ Alloy Steels



4 Flute

5 Flute

TitaNox-Power HPC
5 Flute



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.

The TitaNox 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 makes the perfect match for aerospace, power generation and medical applications.

TitaNox — 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 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 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.

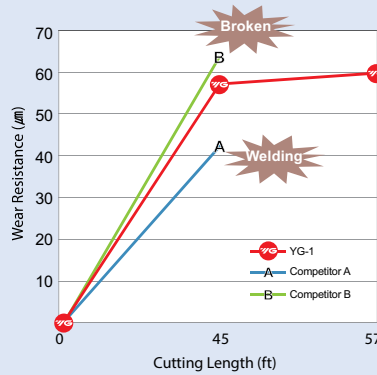
These new 5 flute end mills are built to handle high-speed machining with fine finishing ability.

- ▶ 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



TitaNox-POWER Total Milling Length : 57 ft.




Competitor A Total Milling Length : 53 ft.

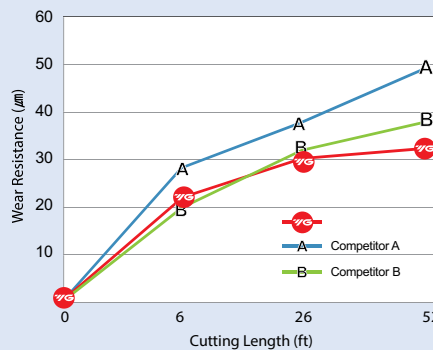


Competitor B Total Milling Length : 53 ft.



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 x Ø12 x 26 x 83
RPM	1591 rev./min.
IPM	15.669 in./min.
Axial Depth	.710"
Radial Depth	.141"
Coolant	Wet Cut
Machine	Machining Center



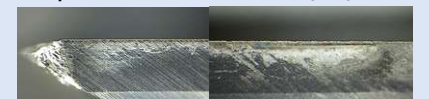
TitaNox-POWER Total Milling Length : 52 ft.




Competitor A Total Milling Length : 52 ft.

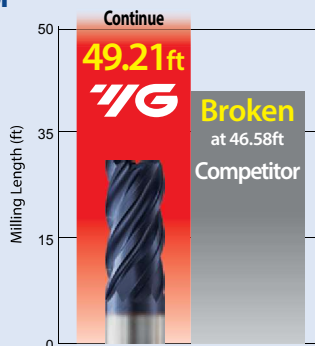


Competitor B Total Milling Length : 52 ft.



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

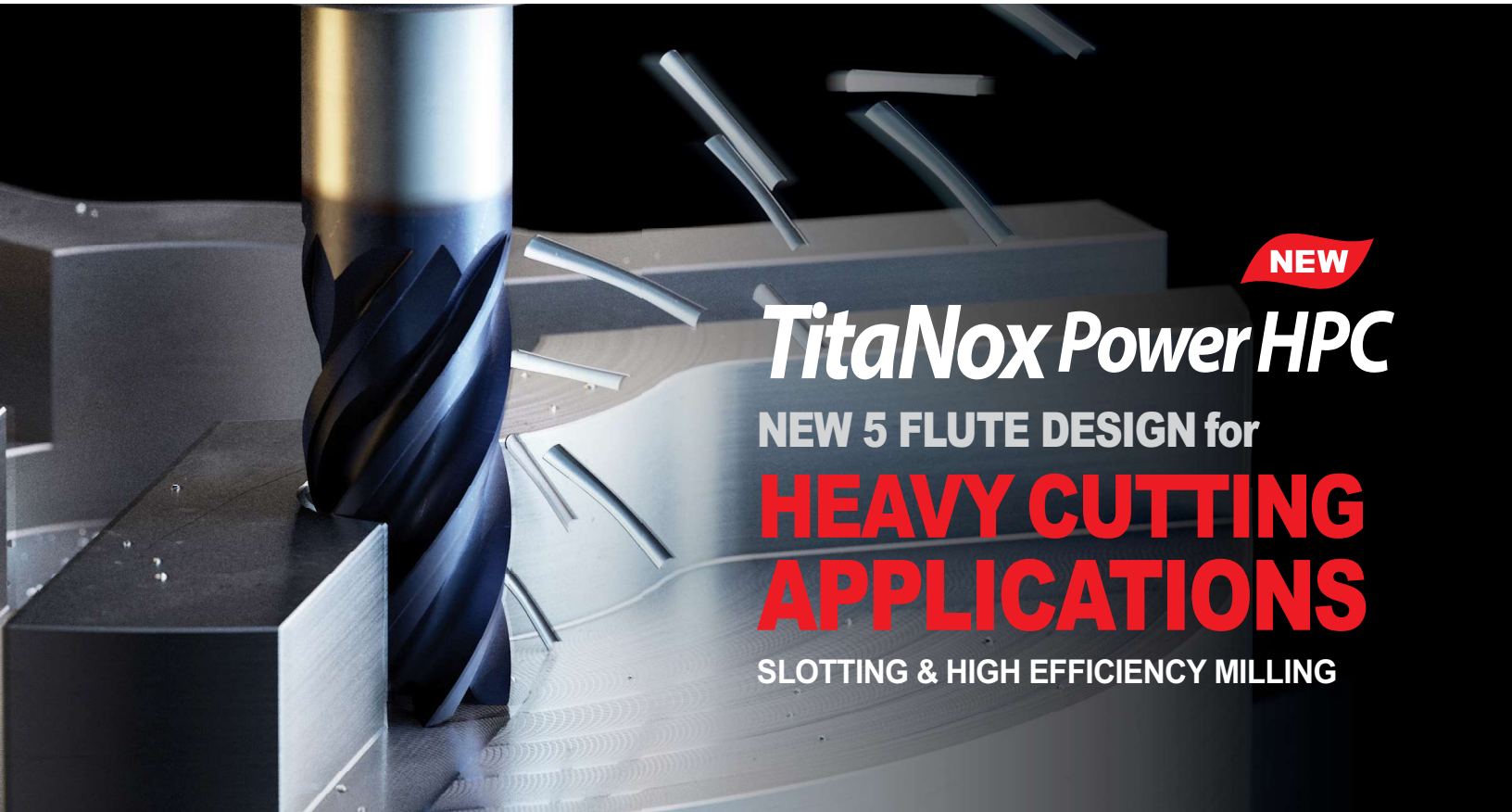


TitaNox-POWER Milling Length = 49.21ft



Competitor A Broken at 46.58ft





NEW

TitaNox Power HPC

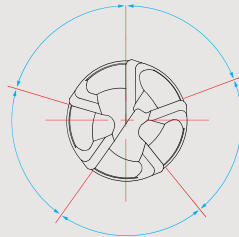
NEW 5 FLUTE DESIGN for

HEAVY CUTTING APPLICATIONS

SLOTTING & HIGH EFFICIENCY MILLING

Features

- New design enhances chip space in heavy cuts, while still maintaining rigidity in peel milling.
- Full eccentric relief for edge strength.
- YG-1 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

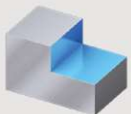


38° Single Helix

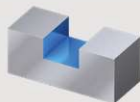
Core Design

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

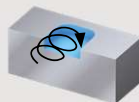
Applications



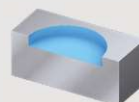
Side Cutting



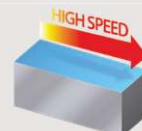
Slotting



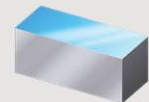
Trochoidal Milling
And Peel Milling



Circular Interpolation



HSM



Finishing

Work Materials

M

S

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