



Vol 7

High Performance Variable Index End Mills for Difficult to Machine Materials

HY-PRO[®] CARB VGX





END MILLS

Chatter free, high performance machining!

The HY-PRO® CARB VGx® End Mill Series from OSG is a field proven milling tool with the capability of chatter free, high performance machining in a wide range of materials and milling applications.

ADVANTAGES

1. Versatile design can be used in all milling operations - slotting, side milling and pocketing - in both roughing and finishing operations.
2. Capable of machining a wide range of materials including carbon steels, alloy steels, cast irons, stainless steels, titanium and nickel alloys.
3. Excels in difficult to machine materials and applications while maintaining high metal removal rates.



VGx® End Mills Feature these Innovative Characteristics:

Variable Index: An unequal index with equal flute spacing allows the VGx® end mills to eliminate chatter by breaking up the harmonics produced during normal milling operations.

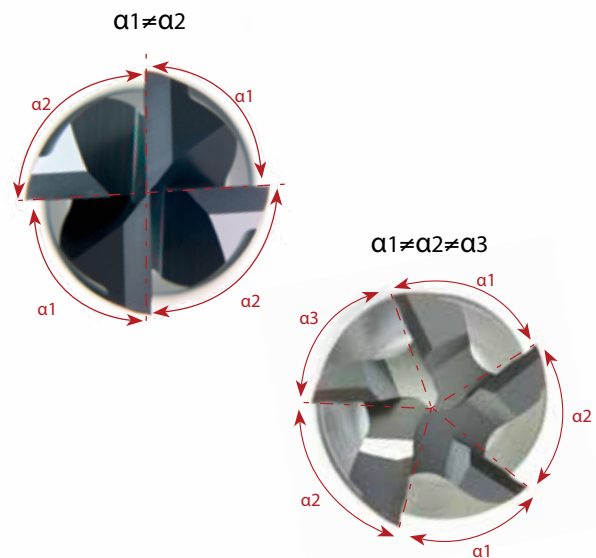
Raised Land: The raised land feature allows for stable consistent milling in mild to severe milling operations.

Eccentric Relief: The unique eccentric relief grind keeps the tool sharp while minimizing friction.

Special Cutting Geometries: The cutting geometries incorporated on the VGx® end mills allow for free cutting in a wide range of materials while inhibiting premature chipping and wear.

TiAlN: OSG's TiAlN coating allows the end mill to cut at accelerated speeds and feeds while minimizing tool wear.

Variable Index



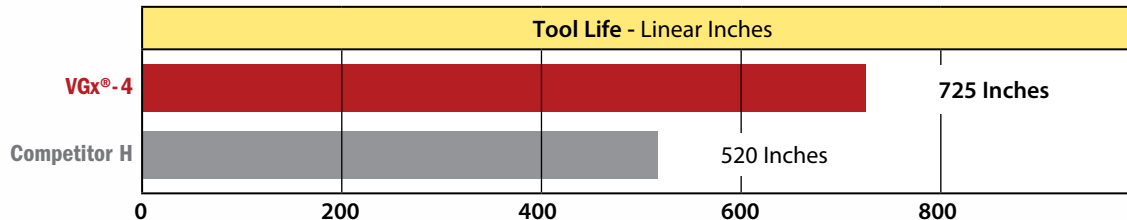
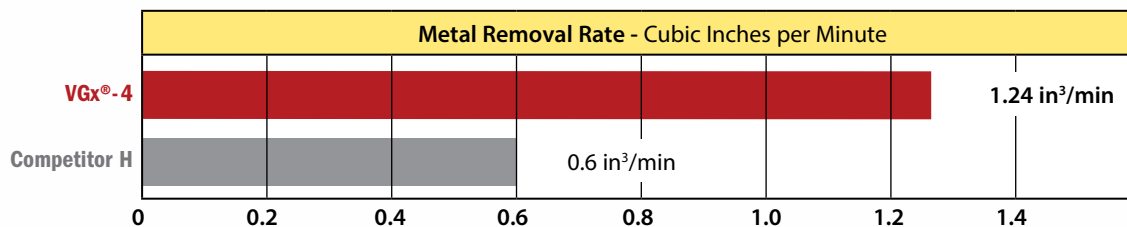
Exceptional Milling Performance in Stainless Steels

VGx®- 4 Flute End Mill Performance

Tool	1/2" VGx®-4 with 0.030 CR
Material	304L Stainless Steel
Speed	3,500 RPM
Feed	19 IPM
Metal Removal Rate	1.24 in³/min
Milling Method	Side Milling
Depth of Cut	Aa=.650" Ar=.100"
Coolant	Water Soluble
Machine	Vertical Machining Center

Competitor H End Mill Performance

Tool	1/2" with 0.030 CR
Material	304L Stainless Steel
Speed	2,300 RPM
Feed	9.2 IPM
Metal Removal Rate	0.60 in ³ /min
Milling Method	Side Milling
Depth of Cut	Aa=.650" Ar=.100"
Coolant	Water Soluble
Machine	Vertical Machining Center

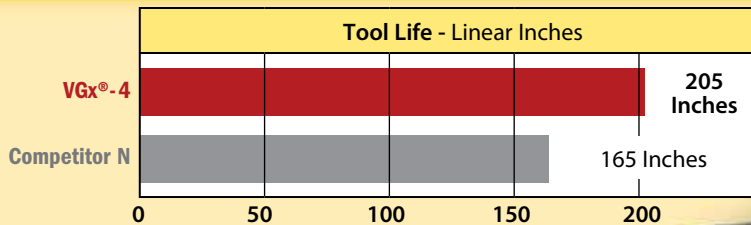


Superior Tool Life in Heat Resistant Alloys

Tool Performance

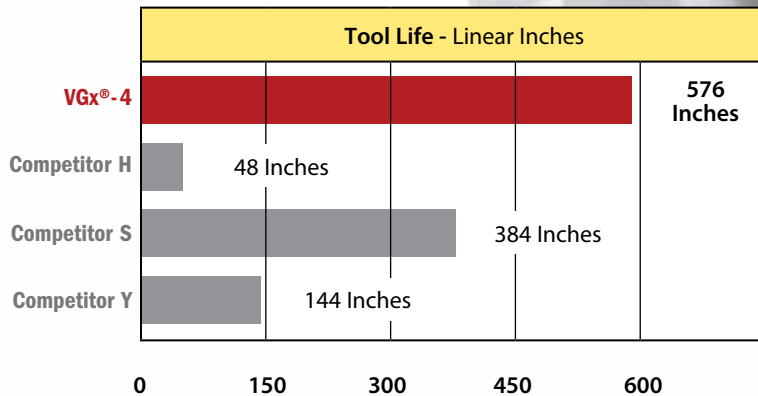
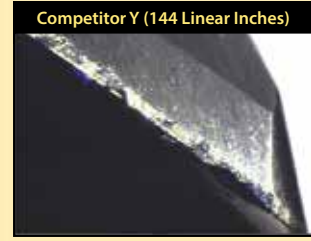
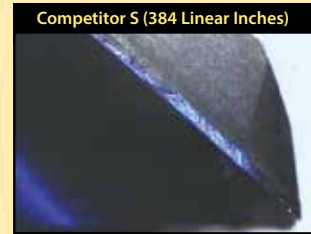
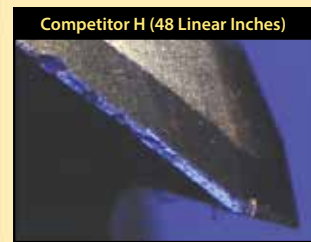
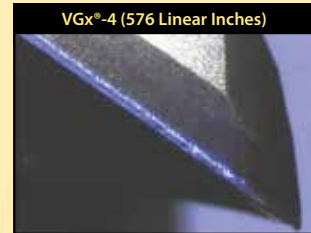
Tool	1/2" VGx®-4 with 0.100 CR
Material	RENE 220 (45 HRC)
Speed	560 RPM
Feed	3.1 IPM
Milling Method	Side Milling
Depth of Cut	Aa=0.5" Ar=0.1"
Coolant	Water Soluble
Machine	Horizontal Machining Center

Tool Life - Linear Inches



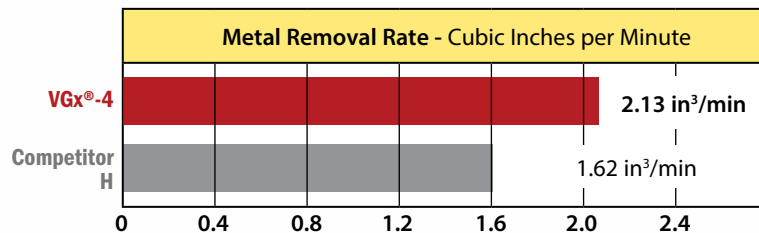
High Efficiency Milling and Superior Tool Life in Heat Resistant Alloys

Tool Performance	
Tool	1/2" VGx [®] -4 with 0.030 CR
Material	Inconel 718 (45 HRC)
Speed	993 RPM
Feed	9.9 IPM
Milling Method	Side Milling
Depth of Cut	Aa=0.75" Ar=0.025"
Coolant	Water Soluble
Machine	Vertical Machining Center



Excellent Metal Removal Rates in Titanium

Tool Performance	
Tool	1/2" VGx [®] -4 with 0.030 CR
Material	Titanium 6Al4V
Speed	1,337 RPM
Feed	8.5 IPM
Milling Method	Slotting
Depth of Cut	Aa=0.5" Ar=0.5"
Coolant	Water Soluble
Machine	Vertical Machining Center

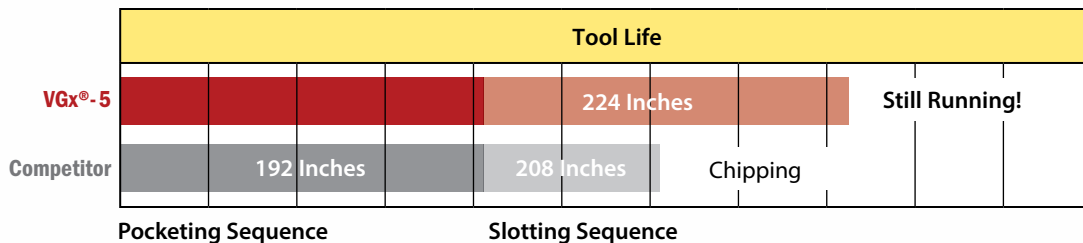
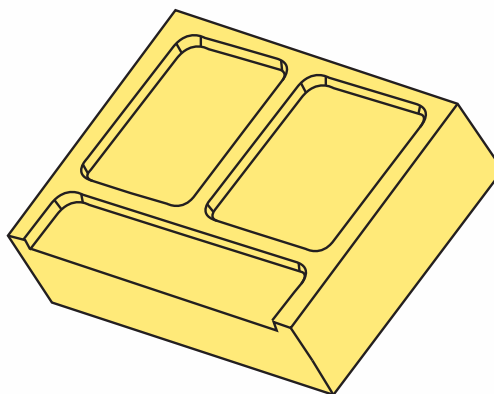




Premium Performance in a Variety of Milling Applications

Pocketing and 1D Slotting in Hardened Stainless

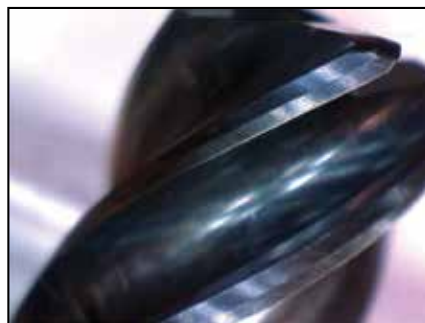
Tool Performance	
Tool	3/8" VGx®-5 with 0.030 CR
Material	17-4 PH H925 (42 HRC)
Speed	2,505 RPM (246 SFM)
Feed	29 IPM (0.0023 IPT)
Milling Method	Pocketing & Slotting
Depth of Cut	Pocketing: Aa: 0.375" / Ar: 0.1875" Slotting: Aa: 0.375" / 0.375"
Coolant	Water Soluble
Machine	Vertical Machining Center



The VGx® end mill shows excellent performance in a variety of machining applications. A study was conducted machining pockets and slotting in hardened stainless steel. The results showed both tools performed the same in pocketing, but the VGx® tool machined twice the distance when slotting.



Competitor: Extreme Chipping



OSG's VGx®-5: Good Wear

VGx[®] Showed Greater Durability Versus the Competition

Tool Life Comparison in Hardened Stainless

Tool Performance	
Tool	1/2" VGx [®] -5 with 0.030 CR
Material	17-4 PH H925 (42 HRC)
Speed	1,566 RPM (205 SFM)
Feed	15.55 IPM (0.002 IPT)
Milling Method	Side Milling
Depth of Cut	Aa: 0.5" / Ar: 0.25"
Coolant	Water Soluble
Machine	Vertical Machining Center

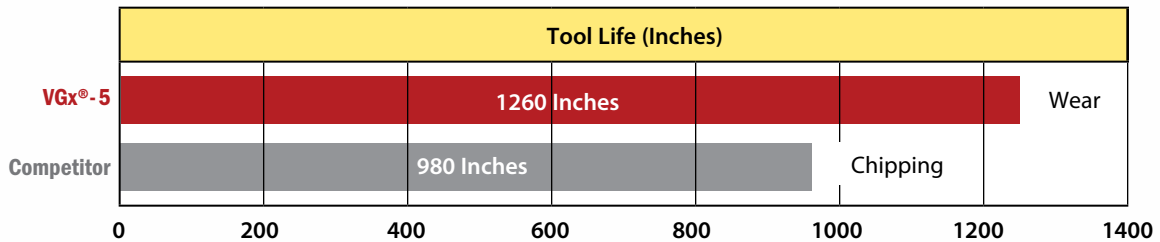
Tool Comparison After 1,200 Inches



OSG's VGx[®]-5: Mild Chipping;
Good Wear



Competitor: Severe Chipping;
Large Wear

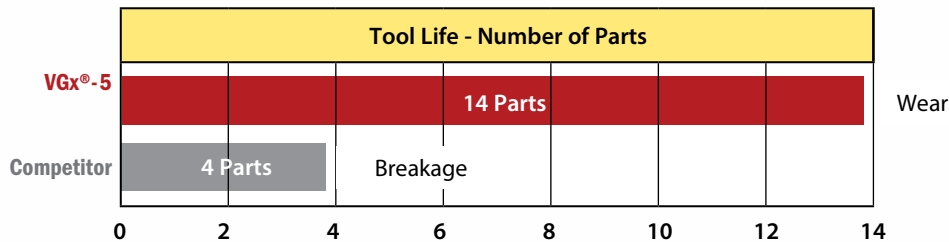


VGx® Increases Productivity and Lowers Cost Per Unit

OSG Reduced Cycle Time by 4 Minutes and Extended Tool Life by 10 Parts.



Tool Performance		
	OSG	Competitor
Tool	1/2" VGx®-5 with 0.030 CR	1/2" 5 Flute End Mill with 0.030 CR
Material	316 Stainless Steel	
Speed	2,300 RPM (300 SFM)	2,600 RPM (340 SFM)
Feed	30 IPM (0.0026 IPT)	24 IPM (0.0018 IPT)
Milling Method	Side Milling	
Depth of Cut	Aa: 0.075" / Ar: 0.225"	
Coolant	Water Soluble	
Machine	Vertical Machining Center	



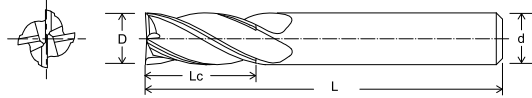


HY-PRO® CARB

High Performance Variable Geometry End Mills

List VG441

Multiple Lengths, 4 Flute, Square End



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Length of Cut	Shank Diameter
		D	L	Lc	d
VG441-1250	-	1/8	1 1/2	3/8	1/8
VG441-1875	-	3/16	2	7/16	3/16
VG441-2500	-	1/4	2 1/2	7/16	1/4
VG441-2501	-	1/4	2 1/2	3/4	1/4
VG441-2502	-	1/4	3 1/4	1 1/4	1/4
VG441-3125	-	5/16	2 1/2	13/16	5/16
VG441-3126	-	5/16	3 1/4	1 1/4	5/16
VG441-3127	-	5/16	4	1 5/8	5/16
VG441-3750	VG441-3752	3/8	2 1/2	1/2	3/8
VG441-3751	VG441-3753	3/8	2 1/2	7/8	3/8
VG441-3754	VG441-3755	3/8	4	1 1/2	3/8
VG441-3756	VG441-3757	3/8	4	2 1/2	3/8
VG441-4375	VG441-4376	7/16	2 3/4	1	7/16
VG441-5007	VG441-5000	1/2	2 1/2	5/8	1/2
VG441-5008	VG441-5001	1/2	3	1	1/2
VG441-5009	VG441-5002	1/2	3 1/2	1 1/4	1/2
VG441-5010	VG441-5003	1/2	4	1 1/2	1/2
VG441-5011	VG441-5004	1/2	4	2	1/2
VG441-5012	VG441-5005	1/2	4	2 1/2	1/2
VG441-5013	VG441-5006	1/2	5	3	1/2
VG441-6255	VG441-6250	5/8	3	3/4	5/8
VG441-6256	VG441-6251	5/8	3 1/2	1 1/4	5/8
VG441-6257	VG441-6252	5/8	5	1 5/8	5/8
VG441-6258	VG441-6253	5/8	5	2 1/4	5/8
VG441-6259	VG441-6254	5/8	6	3	5/8
VG441-7506	VG441-7500	3/4	3 1/2	7/8	3/4
VG441-7507	VG441-7501	3/4	4	1 1/2	3/4
VG441-7508	VG441-7502	3/4	4	1 5/8	3/4
VG441-7509	VG441-7503	3/4	5	2 1/4	3/4
VG441-7510	VG441-7504	3/4	6	3	3/4
VG441-7511	VG441-7505	3/4	6 1/4	4	3/4
VG441-1005	VG441-1000	1	4	1 1/2	1
VG441-1006	VG441-1001	1	5	2	1
VG441-1007	VG441-1002	1	5	2 1/2	1
VG441-1008	VG441-1003	1	6	3	1
VG441-1009	VG441-1004	1	7	4	1

Packed: 1 pc. Available TiAlN coating only.



Work Material															
List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG441			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

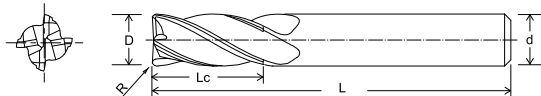
good best





List VG434

Multiple Lengths, 4 Flute, Corner Radius



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Corner Radius	Length of Cut	Shank Diameter
		D	L	R	Lc	d
VG434-1250	-	1/8	1 1/2	0.010	3/8	1/8
VG434-1251	-	1/8	1 1/2	0.015	3/8	1/8
VG434-1875	-	3/16	2	0.015	7/16	3/16
VG434-1876	-	3/16	2	0.030	7/16	3/16
VG434-2500	-	1/4	2 1/2	0.015	7/16	1/4
VG434-2501	-	1/4	2 1/2	0.030	7/16	1/4
VG434-2502	-	1/4	2 1/2	0.015	3/4	1/4
VG434-2503	-	1/4	2 1/2	0.030	3/4	1/4
*VG434-2504	-	1/4	2 1/2	0.060	3/4	1/4
VG434-3125	-	5/16	2 1/2	0.015	13/16	5/16
VG434-3126	-	5/16	2 1/2	0.030	13/16	5/16
VG434-3750	VG434-3754	3/8	2 1/2	0.030	1/2	3/8
VG434-3751	VG434-3755	3/8	2 1/2	0.030	7/8	3/8
VG434-3752	VG434-3756	3/8	2 1/2	0.045	7/8	3/8
VG434-3753	VG434-3757	3/8	2 1/2	0.060	7/8	3/8
VG434-3759	VG434-3758	3/8	2 1/2	0.015	7/8	3/8
VG434-4375	VG434-4377	7/16	2 3/4	0.015	1	7/16
VG434-4376	VG434-4378	7/16	2 3/4	0.030	1	7/16
VG434-5021	VG434-5020	1/2	2 1/2	0.015	5/8	1/2
VG434-5009	VG434-5000	1/2	2 1/2	0.030	5/8	1/2
VG434-5010	VG434-5001	1/2	3	0.030	1	1/2
VG434-5011	VG434-5002	1/2	3	0.060	1	1/2
VG434-5012	VG434-5003	1/2	3 1/2	0.015	1 1/4	1/2
VG434-5013	VG434-5004	1/2	3 1/2	0.030	1 1/4	1/2
VG434-5014	VG434-5005	1/2	3 1/2	0.045	1 1/4	1/2
VG434-5015	VG434-5006	1/2	3 1/2	0.060	1 1/4	1/2
VG434-5016	VG434-5007	1/2	3 1/2	0.090	1 1/4	1/2
VG434-5017	VG434-5008	1/2	3 1/2	0.125	1 1/4	1/2
VG434-5019	VG434-5018	1/2	4	0.020	1 1/2	1/2
VG434-6254	VG434-6250	5/8	3 1/2	0.030	1 1/4	5/8
VG434-6255	VG434-6251	5/8	3 1/2	0.060	1 1/4	5/8
VG434-6256	VG434-6252	5/8	3 1/2	0.090	1 1/4	5/8
VG434-6257	VG434-6253	5/8	3 1/2	0.125	1 1/4	5/8
VG434-7504	VG434-7500	3/4	4	0.030	1 1/2	3/4
VG434-7505	VG434-7501	3/4	4	0.060	1 1/2	3/4
VG434-7506	VG434-7502	3/4	4	0.090	1 1/2	3/4
VG434-7507	VG434-7503	3/4	4	0.125	1 1/2	3/4
VG434-7510	VG434-7508	3/4	4	0.020	1 5/8	3/4
VG434-7511	VG434-7509	3/4	5	0.060	2 1/4	3/4
VG434-1004	VG434-1000	1	4	0.030	1 1/2	1
VG434-1005	VG434-1001	1	4	0.060	1 1/2	1
VG434-1006	VG434-1002	1	4	0.090	1 1/2	1
VG434-1007	VG434-1003	1	4	0.125	1 1/2	1

Packed: 1 pc. Available TiAlN coating only.



Work Material															
List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG434			☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		

☐ good ☐ best



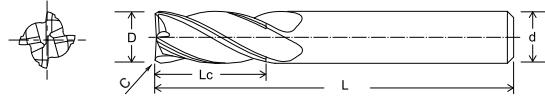


HY-PRO® CARB

High Performance Variable Geometry End Mills

List VG436

Multiple Lengths, 4 Flute, Corner Chamfer



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Corner Chamfer	Length of Cut	Shank Diameter
		D	L	C	Lc	d
VG436-1252	-	1/8	1 1/2	0.010	1/8	1/8
VG436-1250	-	1/8	1 1/2	0.010	1/4	1/8
VG436-1251	-	1/8	1 1/2	0.010	1/2	1/8
VG436-1875	-	3/16	2	0.010	5/16	3/16
VG436-1876	-	3/16	2 1/4	0.010	5/8	3/16
VG436-2500	-	1/4	2	0.016	3/8	1/4
VG436-2501	-	1/4	2 1/2	0.016	3/4	1/4
VG436-3125	-	5/16	2	0.016	1/2	5/16
VG436-3126	-	5/16	2 1/2	0.016	3/4	5/16
-	VG436-3750	3/8	2	0.020	1/2	3/8
-	VG436-3751	3/8	2 1/2	0.020	7/8	3/8
-	VG436-4375	7/16	2 1/2	0.020	5/8	7/16
-	VG436-4376	7/16	2 3/4	0.020	7/8	7/16
-	VG436-5000	1/2	2 1/2	0.020	5/8	1/2
-	VG436-5001	1/2	3	0.020	1	1/2
-	VG436-5002	1/2	3 1/2	0.020	1 1/4	1/2
-	VG436-5003	1/2	4	0.020	1 1/2	1/2
-	VG436-6250	5/8	3	0.020	3/4	5/8
-	VG436-6251	5/8	3 1/2	0.020	1 1/4	5/8
-	VG436-6252	5/8	4 1/8	0.020	1 5/8	5/8
-	VG436-7500	3/4	3 1/2	0.020	7/8	3/4
-	VG436-7501	3/4	4	0.020	1 1/2	3/4
-	VG436-7502	3/4	4	0.020	1 5/8	3/4
-	VG436-1000	1	4	0.020	1 1/2	1
-	VG436-1001	1	5	0.020	2	1

Packed: 1 pc. Available TiAlN coating only.



Work Material															
List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG436			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

good best

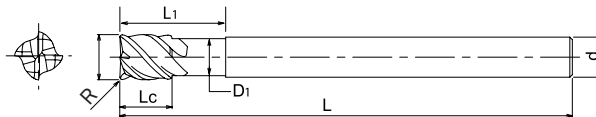




List VG446 **NEW!**



Multiple Lengths, 4 Flute, Reduced Neck, Corner Radius/Corner Chamfer



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Corner Radius	Corner Chamfer	Length of Cut	Neck Diameter	Neck Length	Shank Diameter
		D	L	R	C	Lc	d1	L1	d
VG446-2500	-	1/4	4	0.015	-	3/8	0.235	1-1/4	1/4
VG446-2501	-	1/4	4	0.030	-	3/8	0.235	1-1/4	1/4
VG446-2502	-	1/4	4	-	0.016	3/8	0.235	1-1/4	1/4
-	VG446-3750	3/8	4	0.030	-	1/2	0.353	1-7/8	3/8
-	VG446-3751	3/8	4	0.060	-	1/2	0.353	1-7/8	3/8
-	VG446-3752	3/8	4	-	0.020	1/2	0.353	1-7/8	3/8
-	VG446-5000	1/2	4	0.030	-	5/8	0.470	2-1/4	1/2
-	VG446-5001	1/2	4	0.060	-	5/8	0.470	2-1/4	1/2
-	VG446-5002	1/2	4	0.120	-	5/8	0.470	2-1/4	1/2
-	VG446-5003	1/2	4	-	0.020	5/8	0.470	2-1/4	1/2
-	VG446-6250	5/8	4 1/8	0.060	-	3/4	0.588	2-1/4	5/8
-	VG446-6251	5/8	4 1/8	0.120	-	3/4	0.588	2-1/4	5/8
-	VG446-6252	5/8	4 1/8	-	0.020	3/4	0.588	2-1/4	5/8
-	VG446-6253	5/8	5	-	0.020	3/4	0.588	3-1/8	5/8
-	VG446-7500	3/4	4 1/4	-	0.020	1	0.705	2-1/4	3/4
-	VG446-7501	3/4	5 1/4	0.030	-	1	0.705	3-1/4	3/4
-	VG446-7502	3/4	5 1/4	0.060	-	1	0.705	3-1/4	3/4
-	VG446-7503	3/4	5 1/4	0.120	-	1	0.705	3-1/4	3/4
-	VG446-7504	3/4	5 1/4	-	0.020	1	0.705	3-1/4	3/4
-	VG446-1000	1	4 1/2	-	0.020	1-1/8	0.940	2-1/4	1
-	VG446-1001	1	5 1/2	0.030	-	1-1/8	0.940	3-1/4	1
-	VG446-1002	1	5 1/2	0.060	-	1-1/8	0.940	3-1/4	1
-	VG446-1003	1	5 1/2	0.120	-	1-1/8	0.940	3-1/4	1
-	VG446-1004	1	5 1/2	-	0.020	1-1/8	0.940	3-1/4	1
-	VG446-1005	1	6 1/2	-	0.020	1-1/8	0.940	4-1/4	1

Packed: 1 pc. Available TiAlN coating only.



Work Material															
List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG446			☉	☉	☉	☉	☉	☉	☉	☉	☐	☉	☉		

☐ good ☉ best





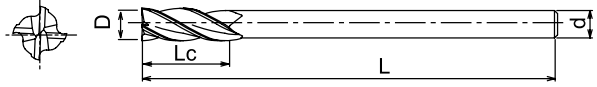
HY-PRO® CARB

High Performance Variable Geometry End Mills

List VG464 **NEW!**



Multiple Lengths, 4 Flute, Extended Length, Square End/Corner Chamfer



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Corner Chamfer	Length of Cut	Shank Diameter
		D	L	C	Lc	d
VG464-2500	-	1/4	4	-	3/8	1/4
VG464-2501	-	1/4	4	0.016	3/8	1/4
-	VG464-3750	3/8	4	-	1/2	3/8
-	VG464-3751	3/8	4	0.020	1/2	3/8
-	VG464-5000	1/2	5	-	5/8	1/2
-	VG464-5001	1/2	5	0.020	5/8	1/2
-	VG464-5002	1/2	6	-	5/8	1/2
-	VG464-5003	1/2	6	0.020	5/8	1/2
-	VG464-6250	5/8	6	-	3/4	5/8
-	VG464-6251	5/8	6	0.020	3/4	5/8
-	VG464-6252	5/8	7	-	3/4	5/8
-	VG464-6253	5/8	7	0.020	3/4	5/8
-	VG464-7500	3/4	6	-	1	3/4
-	VG464-7501	3/4	6	0.020	1	3/4
-	VG464-7502	3/4	7	-	1	3/4
-	VG464-7503	3/4	7	0.020	1	3/4
-	VG464-1000	1	6	-	1-1/8	1
-	VG464-1001	1	6	0.020	1-1/8	1
-	VG464-1002	1	7	-	1-1/8	1
-	VG464-1003	1	7	0.020	1-1/8	1

Packed: 1 pc. Available TiAlN coating only.



Work Material															
List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG464			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

good best

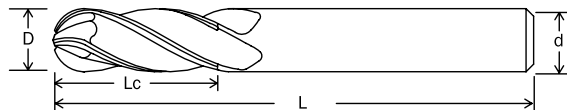




List VG441BN **NEW!**



Multiple Lengths, 4 Flute, Ball Nose



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Length of Cut	Shank Diameter
		D	L	Lc	d
VG441-1250-BN	-	1/8	2	1/2	1/8
VG441-1875-BN	-	3/16	2-1/4	5/8	3/16
VG441-2500-BN	-	1/4	2-1/2	3/4	1/4
VG441-3125-BN	-	5/16	2-1/2	3/4	5/16
-	VG441-3750-BN	3/8	2-1/2	7/8	3/8
-	VG441-4375-BN	7/16	2-1/2	7/8	7/16
-	VG441-5000-BN	1/2	3	1	1/2
-	VG441-5010-BN	1/2	3	1-1/4	1/2
-	VG441-6250-BN	5/8	3-1/2	1-1/4	5/8
-	VG441-7500-BN	3/4	4	1-1/2	3/4
-	VG441-1000-BN	1	4	1-1/2	1
-	VG441-1010-BN	1-1/4	5	2-1/4	1-1/4

Packed: 1 pc. Available TiAlN coating only.



Work Material

List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG441BN			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

good best





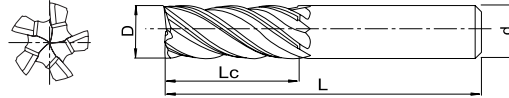
HY-PRO® CARB

High Performance Variable Geometry End Mills

List VG541 **NEW!**



Multiple Lengths, 5 Flute, Square End



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Length of Cut	Shank Diameter
		D	L	Lc	d
VG541-1249	-	1/8	1-1/2	9/32	1/8
VG541-1250	-	1/8	1-1/2	3/8	1/8
VG541-1875	-	3/16	2	7/16	3/16
VG541-1874	-	3/16	2-1/4	5/8	3/16
VG541-2500	-	1/4	2	3/8	1/4
VG541-2501	-	1/4	2-1/2	3/4	1/4
VG541-3125	-	5/16	2	15/32	5/16
VG541-3124	-	5/16	2-1/2	3/4	5/16
VG541-3750	VG541-3752	3/8	2	1/2	3/8
VG541-3751	VG541-3753	3/8	2-1/2	7/8	3/8
VG541-5007	VG541-5000	1/2	2-1/2	5/8	1/2
VG541-5009	VG541-5002	1/2	3-1/2	1-1/4	1/2
VG541-6255	VG541-6250	5/8	3	3/4	5/8
VG541-6256	VG541-6251	5/8	3-1/2	1-1/4	5/8
VG541-7512	VG541-7513	3/4	4	1-1/8	3/4
VG541-7507	VG541-7501	3/4	4	1-1/2	3/4
VG541-1010	VG541-1011	1	4	1-1/4	1
VG541-1005	VG541-1000	1	4	1-1/2	1

Packed: 1 pc. Available TiAlN coating only.



Work Material

List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG541			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

good best

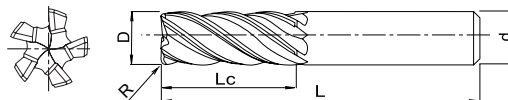




List VG534 NEW!



Multiple Lengths, 5 Flute, Corner Radius



EDP Number	EDP Number w/ Weldon Flat	Milling Diameter	Overall Length	Corner Radius	Length of Cut	Shank Diameter
		D	L	R	Lc	d
VG534-1875	-	3/16	2	0.015	7/16	3/16
VG534-1876	-	3/16	2	0.030	7/16	3/16
VG534-1877	-	3/16	2 1/4	0.015	5/8	3/16
VG534-1878	-	3/16	2 1/4	0.030	5/8	3/16
VG534-2505	-	1/4	2	0.015	3/8	1/4
VG534-2506	-	1/4	2	0.030	3/8	1/4
VG534-2507	-	1/4	2	0.060	3/8	1/4
VG534-2502	-	1/4	2 1/2	0.015	3/4	1/4
VG534-2503	-	1/4	2 1/2	0.030	3/4	1/4
VG534-2504	-	1/4	2 1/2	0.060	3/4	1/4
VG534-3122	-	5/16	2 1/2	0.015	3/4	5/16
VG534-3123	-	5/16	2 1/2	0.030	3/4	5/16
VG534-3124	-	5/16	2 1/2	0.060	3/4	5/16
VG534-3764	VG534-3758	3/8	2	0.015	1/2	3/8
VG534-3765	VG534-3759	3/8	2	0.030	1/2	3/8
VG534-3766	VG534-3760	3/8	2	0.060	1/2	3/8
VG534-3751	VG534-3755	3/8	2 1/2	0.015	7/8	3/8
VG534-3752	VG534-3756	3/8	2 1/2	0.030	7/8	3/8
VG534-3753	VG534-3757	3/8	2 1/2	0.060	7/8	3/8
VG534-5024	VG534-5018	1/2	2 1/2	0.015	5/8	1/2
VG534-5009	VG534-5000	1/2	2 1/2	0.030	5/8	1/2
VG534-5025	VG534-5019	1/2	2 1/2	0.060	5/8	1/2
VG534-5026	VG534-5020	1/2	2 1/2	0.090	5/8	1/2
VG534-5027	VG534-5021	1/2	2 1/2	0.120	5/8	1/2
VG534-5010	VG534-5001	1/2	3	0.030	1	1/2
VG534-5011	VG534-5002	1/2	3	0.060	1	1/2
VG534-5012	VG534-5003	1/2	3 1/2	0.015	1 1/4	1/2
VG534-5013	VG534-5004	1/2	3 1/2	0.030	1 1/4	1/2
VG534-5015	VG534-5006	1/2	3 1/2	0.060	1 1/4	1/2
VG534-5016	VG534-5007	1/2	3 1/2	0.090	1 1/4	1/2
VG534-5017	VG534-5008	1/2	3 1/2	0.120	1 1/4	1/2
VG534-6265	VG534-6258	5/8	3	0.030	3/4	5/8
VG534-6266	VG534-6259	5/8	3	0.060	3/4	5/8
VG534-6267	VG534-6260	5/8	3	0.090	3/4	5/8
VG534-6254	VG534-6250	5/8	3 1/2	0.030	1 1/4	5/8
VG534-6255	VG534-6251	5/8	3 1/2	0.060	1 1/4	5/8
VG534-6256	VG534-6252	5/8	3 1/2	0.090	1 1/4	5/8
VG534-7515	VG534-7508	3/4	4	0.030	1 1/8	3/4
VG534-7516	VG534-7509	3/4	4	0.060	1 1/8	3/4
VG534-7517	VG534-7510	3/4	4	0.090	1 1/8	3/4
VG534-7518	VG534-7511	3/4	4	0.120	1 1/8	3/4
VG534-7504	VG534-7500	3/4	4	0.030	1 1/2	3/4
VG534-7505	VG534-7501	3/4	4	0.060	1 1/2	3/4
VG534-7506	VG534-7502	3/4	4	0.090	1 1/2	3/4
VG534-7507	VG534-7503	3/4	4	0.120	1 1/2	3/4
VG534-1017	VG534-1010	1	4	0.030	1 1/4	1
VG534-1018	VG534-1011	1	4	0.060	1 1/4	1
VG534-1019	VG534-1012	1	4	0.090	1 1/4	1
VG534-1020	VG534-1013	1	4	0.120	1 1/4	1
VG534-1004	VG534-1000	1	4	0.030	1 1/2	1
VG534-1005	VG534-1001	1	4	0.060	1 1/2	1
VG534-1006	VG534-1002	1	4	0.090	1 1/2	1
VG534-1007	VG534-1003	1	4	0.120	1 1/2	1

Packed: 1 pc. Available TiAlN coating only.



Work Material															
List No.	Aluminum		Cast Iron	Carbon Steel	Alloy/Die Steel	Stainless Steels			Hardened Steels			High Heat Materials		MMC	Copper Alloy
	6061 7075	Casting				300	400	17-4PH	~35 HRC	35-45 HRC	45-50 HRC	Ti-Alloy	Inconel & Waspaloy		
VG534			☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		

☐ good ☐ best



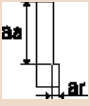
Speeds & Feeds

List VG441 – HY-PRO® CARB VGx® 4 Flute

List VG434 – HY-PRO® CARB VGx® 4 Flute - Corner Radius

List VG436 – HY-PRO® CARB VGx® 4 Flute - Corner Chamfer


Side Milling (Inch)

Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC	
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy	
Cutting Speed	400-600 SFM		300-500 SFM		200-350 SFM		150-250 SFM		250-400 SFM		150-250 SFM		100-200 SFM	
Depth of Cut	Aa=1.5D Ar=0.5D				Aa=1.5D Ar=0.5D		Aa=1.5D Ar=0.5D		Aa=1.5D Ar=0.5D		Aa=1.5D Ar=0.5D		Aa=1.25D Ar=0.3D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min
1/8	13,750	44.0	10,695	25.7	8,400	18.6	6,875	15.2	6,110	14.5	6,110	12.9	3,665	9.5
3/16	9,170	46.8	7,130	28.8	5,600	20.6	4,585	16.9	4,075	16.3	4,075	13.7	2,445	10.9
1/4	6,875	46.8	5,350	31.1	4,200	20.3	3,440	16.7	3,050	16.8	3,050	13.9	1,835	11.2
5/16	5,500	48.1	4,210	31.8	3,350	21.4	2,750	17.6	2,450	17.8	2,450	15.1	1,465	11.7
3/8	4,585	47.1	3,565	30.5	2,800	20.6	2,290	16.9	2,040	16.3	2,040	14.6	1,220	11.1
7/16	3,930	45.4	3,055	30.2	2,400	20.1	1,965	16.5	1,750	16.3	1,750	14.0	1,050	11.1
1/2	3,440	45.4	2,675	29.2	2,100	19.5	1,720	15.9	1,525	15.7	1,525	13.9	915	10.8
5/8	2,750	40.6	2,140	27.7	1,700	19.0	1,375	15.4	1,225	14.7	1,225	12.5	730	9.9
3/4	2,290	37.3	1,785	25.3	1,400	16.8	1,150	13.8	1,025	13.5	1,025	11.8	610	9.3
1	1,720	33.0	1,340	22.8	1,050	14.9	860	12.2	765	12.2	765	10.6	460	8.4

Long Length of Cut Speed Reduction			
LOC/D	Reduce Speed	Aa	Ar
≤3	Use Recommendations above		
3~4*	40% x Recommended	2.5xø	0.1xø
4~6**	60% x Recommended	2.5xø	0.1xø

The above cutting conditions are calculated based on short overhang (LOC/D = 2) and should be adjusted accordingly for longer cutting edge lengths. For LOC/D greater than 3 see table on left.
*Feed rate may be increased at this specified depth of cut
**Only recommended for finishing side milling applications

Slotting (Inch)

Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC	
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy	
Cutting Speed	325-400 SFM		250-400 SFM		175-275 SFM		125-200 SFM		200-325 SFM		125-200 SFM		75-150 SFM	
Depth of Cut	Aa=1D				Aa=0.75D		Aa=0.75D		Aa=0.75D		Aa=0.75D		Aa=0.25D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min
1/8	11,240	35.8	8,860	21.3	6,900	15.4	5,500	10.7	4,890	11.6	5,050	10.6	2,750	7.3
3/16	7,495	38.5	5,910	23.9	4,600	17.5	3,670	11.5	3,260	12.8	3,350	11.5	1,835	8.1
1/4	5,620	37.9	4,430	25.5	3,450	17.2	2,750	12.2	2,445	14.0	2,550	11.8	1,375	8.1
5/16	4,500	39.4	3,545	26.8	2,750	18.3	2,200	12.9	1,955	14.2	2,000	11.8	1,100	9.0
3/8	3,750	38.2	2,955	25.5	2,300	17.5	1,835	12.2	1,630	12.8	1,700	11.6	915	8.3
7/16	3,210	37.1	2,530	24.7	1,950	16.7	1,575	11.8	1,395	12.8	1,450	11.8	785	8.3
1/2	2,810	37.2	2,215	24.2	1,700	16.1	1,375	11.5	1,225	12.8	1,300	12.1	690	8.1
5/8	2,250	33.1	1,775	22.5	1,400	15.9	1,100	11.0	975	11.6	1,000	10.0	550	7.6
3/4	1,875	31.1	1,480	20.9	1,150	14.4	920	10.0	815	10.5	850	9.4	460	6.9
1	1,405	26.7	1,110	18.7	875	12.6	685	8.6	610	9.8	650	9.0	345	6.5

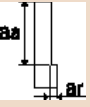
Long Length of Cut Speed Reduction			
LOC/D	Reduce Speed	Aa	Ar
≤3	Use Recommendations above		
3~4*	40% x Recommended	2.5xø	0.1xø
4~6	Not Recommended for slotting		

The above cutting conditions are calculated based on short overhang (LOC/D = 2) and should be adjusted accordingly for longer cutting edge lengths. For LOC/D greater than 3 see table on left.
*Feed rate may be increased at this specified depth of cut




List VG446 – HY-PRO® CARB VGx® 4 Flute - Reduced Neck List VG464 – HY-PRO® CARB VGx® 4 Flute - Extended Length

Side Milling (Inch)

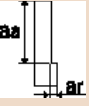
Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC	
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy	
Cutting Speed	400-500 SFM		300-400 SFM		200-350 SFM		200-250 SFM		175-225 SFM		150-250 SFM		100-135 SFM	
Depth of Cut	Aa=1D Ar=0.4D						Aa=0.75D Ar=0.35D		Aa=0.75D Ar=0.15D		Aa=0.75D Ar=0.35D		Aa=0.75D Ar=0.15D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min
1/4	6,875	46.8	5,350	31.1	4,200	20.3	3,440	16.7	3,050	16.8	3,050	13.9	1,835	11.2
3/8	4,585	47.1	3,565	30.5	2,800	20.6	2,290	16.9	2,040	16.3	2,040	14.6	1,220	11.1
1/2	3,440	45.4	2,675	29.2	2,100	19.5	1,720	15.9	1,525	15.7	1,525	13.9	915	10.8
5/8	2,750	40.6	2,140	27.7	1,700	19.0	1,375	15.4	1,225	14.7	1,225	12.5	730	9.9
3/4	2,290	37.3	1,785	25.3	1,400	16.8	1,150	13.8	1,025	13.5	1,025	11.8	610	9.3
1	1,720	33.0	1,340	22.8	1,050	14.9	860	12.2	765	12.2	765	10.6	460	8.4

Slotting (Inch)


Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC	
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy	
Cutting Speed	325-400 SFM		250-325 SFM		175-275 SFM		160-200 SFM		140-180 SFM		125-200 SFM		75-100 SFM	
Depth of Cut	Aa=0.6D						Aa=0.4D		Aa=0.25D		Aa=0.4D		Aa=0.15D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min
1/4	5,620	37.9	4,430	25.5	3,450	17.2	2,750	12.2	2,445	14.0	2,550	11.8	1,375	8.1
3/8	3,750	38.2	2,955	25.5	2,300	17.5	1,835	12.2	1,630	12.8	1,700	11.6	915	8.3
1/2	2,810	37.2	2,215	24.2	1,700	16.1	1,375	11.5	1,225	12.8	1,300	12.1	690	8.1
5/8	2,250	33.1	1,775	22.5	1,400	15.9	1,100	11.0	975	11.6	1,000	10.0	550	7.6
3/4	1,875	31.1	1,480	20.9	1,150	14.4	920	10.0	815	10.5	850	9.4	460	6.9
1	1,405	26.7	1,110	18.7	875	12.6	685	8.6	610	9.8	650	9.0	345	6.5

List VG441BN – HY-PRO® CARB VGx® 4 Flute - Ball Nose

Side Milling (Inch)

Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC	
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy	
Cutting Speed	400-500 SFM		300-400 SFM		200-350 SFM		200-250 SFM		175-225 SFM		150-250 SFM		100-135 SFM	
Depth of Cut	Aa=1.5D Ar=0.5D						Aa=1.25D Ar=0.4D		Aa=1.25D Ar=0.2D		Aa=1.25D Ar=0.4D		Aa=1D Ar=0.2D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min
1/8	13,750	44.0	10,695	25.7	8,400	18.6	6,875	15.2	6,110	14.5	6,110	12.9	3,665	9.5
3/16	9,170	46.8	7,130	28.8	5,600	20.6	4,585	16.9	4,075	16.3	4,075	13.7	2,445	10.9
1/4	6,875	46.8	5,350	31.1	4,200	20.3	3,440	16.7	3,050	16.8	3,050	13.9	1,835	11.2
5/16	5,500	48.1	4,210	31.8	3,350	21.4	2,750	17.6	2,450	17.8	2,450	15.1	1,465	11.7
3/8	4,585	47.1	3,565	30.5	2,800	20.6	2,290	16.9	2,040	16.3	2,040	14.6	1,220	11.1
7/16	3,930	45.4	3,055	30.2	2,400	20.1	1,965	16.5	1,750	16.3	1,750	14.0	1,050	11.1
1/2	3,440	45.4	2,675	29.2	2,100	19.5	1,720	15.9	1,525	15.7	1,525	13.9	915	10.8
5/8	2,750	40.6	2,140	27.7	1,700	19.0	1,375	15.4	1,225	14.7	1,225	12.5	730	9.9
3/4	2,290	37.3	1,785	25.3	1,400	16.8	1,150	13.8	1,025	13.5	1,025	11.8	610	9.3
1	1,720	33.0	1,340	22.8	1,050	14.9	860	12.2	765	12.2	765	10.6	460	8.4
1 1/4	1,375	26.4	1,070	18.2	850	12.1	690	9.8	610	9.7	610	8.3	365	6.7

Slotting (Inch)

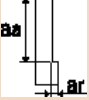
Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC	
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy	
Cutting Speed	325-400 SFM		250-325 SFM		175-275 SFM		160-200 SFM		140-180 SFM		125-200 SFM		75-100 SFM	
Depth of Cut	Aa=1D						Aa=0.75D		Aa=0.5D		Aa=0.5D		Aa=0.2D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min
1/8	11,240	35.8	8,860	21.3	6,900	15.4	5,500	10.7	4,890	11.6	5,050	10.6	2,750	7.3
3/16	7,495	38.5	5,910	23.9	4,600	17.5	3,670	11.5	3,260	12.8	3,350	11.5	1,835	8.1
1/4	5,620	37.9	4,430	25.5	3,450	17.2	2,750	12.2	2,445	14.0	2,550	11.8	1,375	8.1
5/16	4,500	39.4	3,545	26.8	2,750	18.3	2,200	12.9	1,955	14.2	2,000	11.8	1,100	9.0
3/8	3,750	38.2	2,955	25.5	2,300	17.5	1,835	12.2	1,630	12.8	1,700	11.6	915	8.3
7/16	3,210	37.1	2,530	24.7	1,950	16.7	1,575	11.8	1,395	12.8	1,450	11.8	785	8.3
1/2	2,810	37.2	2,215	24.2	1,700	16.1	1,375	11.5	1,225	12.8	1,300	12.1	690	8.1
5/8	2,250	33.1	1,775	22.5	1,400	15.9	1,100	11.0	975	11.6	1,000	10.0	550	7.6
3/4	1,875	31.1	1,480	20.9	1,150	14.4	920	10.0	815	10.5	850	9.4	460	6.9
1	1,405	26.7	1,110	18.7	875	12.6	685	8.6	610	9.8	650	9.0	345	6.5
1 1/4	1,115	21.2	885	14.9	700	10.1	550	6.9	490	7.8	500	6.9	275	5.1



List VG541 – HY-PRO® CARB VGx® 5 Flute

List VG534 – HY-PRO® CARB VGx® 5 Flute - Corner Radius

Side Milling (Inch)


Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC			
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy			
Cutting Speed	400-600 SFM		300-500 SFM		200-350 SFM		150-250 SFM		250-400 SFM		150-250 SFM		100-200 SFM			
Depth of Cut	Aa=1.25D Ar=0.5D								Aa=1.25D Ar=0.5D		Aa=1.25D Ar=0.5D		Aa=1.25D Ar=0.5D		Aa=1D Ar=0.3D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min		
1/8	13,750	55.0	10,695	32.2	8,400	23.2	6,875	19.0	6,110	18.2	6,110	16.1	3,665	11.8		
3/16	9,170	58.5	7,130	36.1	5,600	25.8	4,585	21.1	4,075	20.4	4,075	17.2	2,445	13.6		
1/4	6,875	58.4	5,350	38.9	4,200	25.4	3,440	20.8	3,050	21.1	3,050	17.4	1,835	14.1		
5/16	5,500	60.2	4,210	39.7	3,350	26.8	2,750	22.0	2,450	22.2	2,450	18.9	1,465	14.7		
3/8	4,585	58.8	3,565	38.1	2,800	25.8	2,290	21.1	2,040	20.4	2,040	18.3	1,220	13.9		
7/16	3,930	56.8	3,055	37.8	2,400	25.1	1,965	20.6	1,750	20.4	1,750	17.5	1,050	13.8		
1/2	3,440	56.8	2,675	36.5	2,100	24.3	1,720	19.9	1,525	19.6	1,525	17.4	915	13.4		
5/8	2,750	50.7	2,140	34.6	1,700	23.8	1,375	19.3	1,225	18.4	1,225	15.6	730	12.4		
3/4	2,290	46.7	1,785	31.6	1,400	21.0	1,150	17.3	1,025	16.8	1,025	14.8	610	11.6		
1	1,720	41.3	1,340	28.5	1,050	18.7	860	15.3	765	15.3	765	13.2	460	10.5		

Long Length of Cut Speed Reduction			
LOC/D	Reduce Speed	Aa	Ar
≤3	Use Recommendations above		
3~4*	40% x Recommended	2.5xø	0.1xø
4~6**	60% x Recommended	2.5xø	0.1xø

The above cutting conditions are calculated based on short overhang (LOC/D = 2) and should be adjusted accordingly for longer cutting edge lengths. For LOC/D greater than 3 see table on left.

*Feed rate may be increased at this specified depth of cut

**Only recommended for finishing side milling applications

Hardness	Up to 25 HRC		25 to 30 HRC		30 to 35 HRC		35 to 45 HRC		45 to 50 HRC		Less than 40 HRC		Less than 45 HRC			
Work Material	Mild Steels Carbon Steels Cast Iron		400 Stainless Steels Alloy Steels Tool Steels		300 Stainless Steels Hardened Steels Pre-hardened Steels		PH Stainless Steels Hardened Steels		Hardened Steels		Titanium Alloys		High Temp. Alloys Inconel Hastelloy			
Cutting Speed	325-475 SFM		250-400 SFM		175-275 SFM		125-200 SFM		200-325 SFM		125-200 SFM		75-150 SFM			
Depth of Cut	Aa=1D								Aa=0.75D		Aa=0.75D		Aa=0.75D		Aa=0.25D	
Mill Dia.	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min		
1/8	11,240	44.8	8,860	26.6	6,900	19.3	5,500	13.4	4,890	14.6	5,050	13.3	2,750	9.1		
3/16	7,495	48.2	5,910	29.9	4,600	21.9	3,670	14.3	3,260	16.0	3,350	14.3	1,835	10.2		
1/4	5,620	47.5	4,430	31.9	3,450	21.6	2,750	15.3	2,445	17.5	2,550	14.8	1,375	10.2		
5/16	4,500	49.2	3,545	33.4	2,750	22.9	2,200	16.1	1,955	17.8	2,000	14.8	1,100	11.2		
3/8	3,750	47.8	2,955	31.9	2,300	21.9	1,835	15.3	1,630	16.0	1,700	14.5	915	10.4		
7/16	3,210	46.4	2,530	30.8	1,950	20.9	1,575	14.8	1,395	16.0	1,450	14.7	785	10.3		
1/2	2,810	46.5	2,215	30.2	1,700	20.1	1,375	14.3	1,225	16.0	1,300	15.1	690	10.2		
5/8	2,250	41.4	1,775	28.2	1,400	19.8	1,100	13.8	975	14.5	1,000	12.5	550	9.6		
3/4	1,875	38.8	1,480	26.1	1,150	18.0	920	12.5	815	13.1	850	11.8	460	8.7		
1	1,405	33.4	1,110	23.4	875	15.8	685	10.7	610	12.2	650	11.3	345	8.0		


Long Length of Cut Speed Reduction			
LOC/D	Reduce Speed	Aa	Ar
≤3	Use Recommendations above		
3~4*	40% x Recommended	2.5xø	0.1xø
4~6	Not Recommended for slotting		

The above cutting conditions are calculated based on short overhang (LOC/D = 2) and should be adjusted accordingly for longer cutting edge lengths. For LOC/D greater than 3 see table on left.

*Feed rate may be increased at this specified depth of cut



shaping your dreams

 **Safe use of cutting tools**

- Use safety cover, safety glasses and safety shoes during operation.
- Do not touch cutting edges with bare hands.
- Do not touch cutting chips with bare hands. Chips will be hot after cutting.
- Stop cutting when the tool becomes dull.
- Stop cutting operation immediately if you hear any abnormal cutting sounds.
- Do not modify tools.
- Please use appropriate tools for the operation. Check dimensions to ensure proper selection.

ILLINOIS (HEADQUARTERS)

676 East Fullerton Avenue
Glendale Heights, IL 60139 USA
Toll Free: 800-837-2223
Fax: 800-837-3334

CALIFORNIA

1921 Miraloma Ave. Suite B
Placentia, CA 92870 USA
Toll Free: 800-837-2223
Fax: 714-528-9209

OHIO

3611 Socialville Foster Rd. Ste 102
Mason, OH 45040 USA
Phone: 513-755-3360
Fax: 513-755-3362

GEORGIA

5324 Highway 85 Ste 100
Forest Park, GA 30297
Toll Free: 800-837-2223
Fax: 800-837-3334

CANADA

538 King Forest Court
Burlington, ON L7P 5C1 Canada
Toll Free: 800-263-4861
Fax: 905-632-8466

MEXICO

Avenida Central No. 186
Col. Nueva Industrial Vallejo
07700 Ciudad de Mexico, D.F., Mexico
Phone: (52) 55-51-19-3363
Fax: (52) 55-51-19-3370