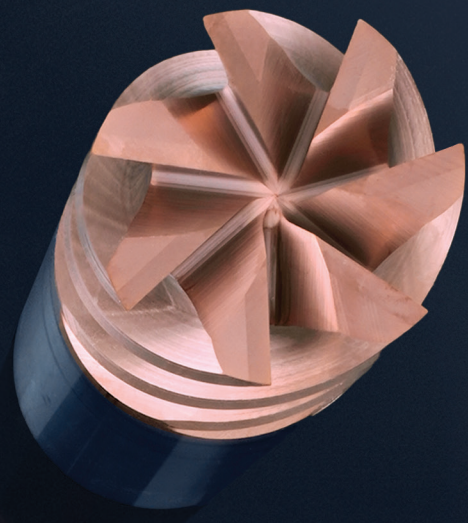


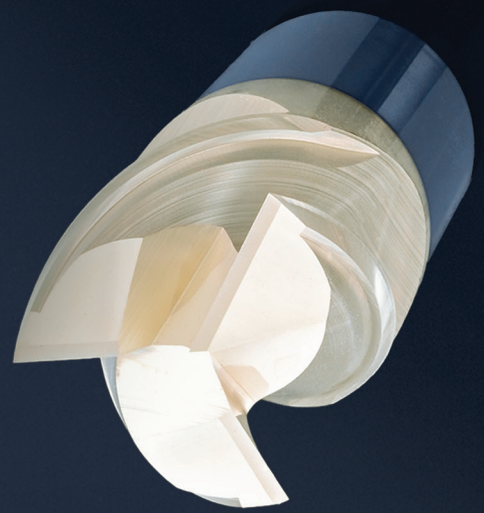
More TOOLING
More APPLICATIONS
More CHIPS



2023 Product Catalog

Helical

Let Helical Impress You



Helical

Exceptional, Fully Stocked Tooling

Helical has earned and maintained a reputation as an industry leading manufacturer of high performance carbide end mills. We consistently outperform other manufacturers by offering **extremely high quality, fully stocked cutting tools** at competitive prices, ensuring that you enjoy the best results while maximizing your shop's profitability.

Unbeatable Custom Tool Experience

Helical's Custom-Engineered Solutions Program is designed to give you the best possible custom tool experience from beginning-to-end. We set ourselves apart with a team of engineers eager to understand every aspect of your project. Within 48 hours, we will return a quote with **expertly crafted geometries designed to produce extraordinary results** in your specific application. We'll then work with you to ensure proper tool setup and running parameters that deliver maximized performance.

Outstanding Technical Expertise

Our team of experienced engineers live and breathe cutting tools and are enthusiastic about maximizing your shop floor productivity. Whether it be in your shop or over the phone, we have **knowledgeable technical field representatives and in-house tool experts** available to help you with tool selection, tool design, application support, and troubleshooting.

Harvey Performance Company combines the leading Harvey Tool, Helical Solutions, Micro 100, Titan USA, and CoreHog brands to provide world class tooling, unmatched service, and innovative solutions that increase productivity for our customers.



Think Harvey Tool First



More than 27,000 miniature and specialty end mills. Ship today, in your machine tomorrow.

HARVEY PERFORMANCE COMPANY



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Material-optimized high performance carbide end mills. Run faster, push harder, machine smarter.



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Exceptional quality turning tools designed for durability and performance in a range of difficult-to-machine materials.



Trust in Titan USA



Broad assortment of premium quality fully stocked cutting tools of exceptional value.



Innovative Tools for Innovative Materials



The industry's most innovative and advanced composite and honeycomb core cutting tools.

Let Helical Impress You

At Helical, it is our goal to design and manufacture industry-leading products at competitive prices so you don't have to settle for ordinary cutting tools.

Helical end mills are built to last and **excel at aggressive running parameters,**

meaning you will experience greatly reduced cycle times, heightened productivity, and superior part finish. This translates directly to savings and efficiencies in your shop, and positively affects your bottom line.

We offer **more than 8,800 fully stocked tools** optimized for a variety of operations and designed for the unique challenges of non-ferrous and ferrous material groups. If you can't find what you're looking for, consider our custom-engineered solutions program (details on page 301).

Our Tools Deliver

- + Superior Part Finish
- + Extended Tool Life
- + Improved Bottom Line
- + Increased Material Removal Rates

11 End Mills for Aluminum Alloys & Non-Ferrous Materials



75 End Mills for Steels, Tool Steels & Cast Iron



171 End Mills for Stainless Steels & High Temp Alloys



228 End Mills for Nickel Alloys



235 End Mills for Titanium & Titanium Alloys



271 High Feed End Mills



286 Specialty Profiles



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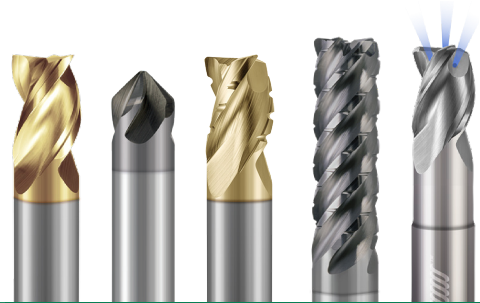
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- MAP Connection
- Check Stock
- Table Filtering
- Build a Tool
- Smart-Search

END MILLS FOR ALUMINUM

Aluminum Alloys & Non-Ferrous Materials



ROUGHERS

				PG
H35ALV-C-3	3 Flute	Corner Radius	35° Helix - Chipbreaker Rougher - Variable Pitch	11
H35ALV-C-RN-3	3 Flute	Corner Radius	35° Helix - Chipbreaker Rougher - Variable Pitch - Reduced Neck	14
H45AL-C-3	3 Flute	Corner Radius	45° Helix - Chipbreaker Rougher New Items!	16
H45AL-C-RN-3	3 Flute	Corner Radius	45° Helix - Chipbreaker Rougher - Reduced Neck New Items!	18
HVAL-C-5	5 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - HEM	20

2 FLUTE

				PG
HMG-RN-2	2 Flute	Square	High Balance - Reduced Neck	22
HMG-RN-2	2 Flute	Corner Radius	High Balance - Reduced Neck	23
H45AL-2	2 Flute	Square	45° Helix	25
H45AL-2	2 Flute	Ball	45° Helix	27
H45AL-2	2 Flute	Corner Radius	45° Helix	28
H45AL-RN-2	2 Flute	Square	45° Helix - Reduced Neck	29
H45AL-RN-2	2 Flute	Ball	45° Helix - Reduced Neck	30

3 FLUTE

				PG
HMGC-R N-3	3 Flute	Square	Coolant Through - High Balance - Reduced Neck	32
HMGC-RN-3	3 Flute	Corner Radius	Coolant Through - High Balance - Reduced Neck	33
H35AL-3	3 Flute	Square	35° Helix	35
MH35AL-3	3 Flute	Square	35° Helix Metric	37
H35AL-3	3 Flute	Corner Radius	35° Helix	38
MH35AL-3	3 Flute	Corner Radius	35° Helix Metric	41
H35AL-RN-3	3 Flute	Square	35° Helix - Reduced Neck	42
H35AL-RN-3	3 Flute	Corner Radius	35° Helix - Reduced Neck New!	44
H40ALV-3	3 Flute	Square	40° Helix - Variable Pitch New Items!	46
H40ALV-3	3 Flute	Ball	40° Helix - Variable Pitch New Items!	48
H40ALV-3	3 Flute	Corner Radius	40° Helix - Variable Pitch New Items!	50
H40ALV-RN-3	3 Flute	Square	40° Helix - Variable Pitch - Reduced Neck New Items!	55
H40ALV-RN-3	3 Flute	Ball	40° Helix - Variable Pitch - Reduced Neck New Items!	57
H40ALV-RN-3	3 Flute	Corner Radius	40° Helix - Variable Pitch - Reduced Neck New Items!	59
H45AL-3	3 Flute	Square	45° Helix New Items!	63
H45AL-3	3 Flute	Corner Radius	45° Helix New Items!	65
H45AL-RN-3	3 Flute	Square	45° Helix - Reduced Neck	68

5 FLUTE

				PG
HVAL-5	5 Flute	Corner Radius	Variable Pitch - HEM	70

FINISHERS

				PG
HMAF-AL-3	3 Flute	Lens	Multi-Axis Finisher	72
HMAF-AL-4	4 Flute	Taper	Multi-Axis Finisher	73
HMAF-AL-4	4 Flute	Oval	Multi-Axis Finisher	74



END MILLS FOR STEELS

Steels, Tool Steels, & Cast Iron

ROUGHERS				PG
HSVR-C-4	4 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch	75
HSVR-C-RN-4	4 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - Reduced Neck	77
HEV-C-5	5 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	79
HEV-C-RN-5	5 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - Reduced Neck New Items!	82
HEV-C-6	6 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	84
HEV-C-7	7 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	87
HEV-C-RN-7	7 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - Reduced Neck	89
HXVR	Multi-Flute	Corner Radius	Knuckle Rougher - Variable Pitch	91
HXVR-RN	Multi-Flute	Corner Radius	Knuckle Rougher - Variable Pitch - Reduced Neck	92
3 FLUTE				PG
HSV-3	3 Flute	Square	Variable Pitch	95
HSV-3	3 Flute	Corner Radius	Variable Pitch	96
HST-3	3 Flute	Ball		98
HST-3	3 Flute	Corner Radius		99
HST-RN-3	3 Flute	Ball	Reduced Neck	100
HST-RN-3	3 Flute	Corner Radius	Reduced Neck	101
4 FLUTE				PG
HSV-4	4 Flute	Square	Variable Pitch	103
MHSV-4	4 Flute	Square	Variable Pitch Metric	105
HSV-4	4 Flute	Ball	Variable Pitch	106
MHSV-4	4 Flute	Ball	Variable Pitch Metric	108
HSV-4	4 Flute	Corner Radius	Variable Pitch	109
MHSV-4	4 Flute	Corner Radius	Variable Pitch Metric	115
HSV-RN-4	4 Flute	Square	Variable Pitch - Reduced Neck	116
HSV-RN-4	4 Flute	Ball	Variable Pitch - Reduced Neck	117
HSV-RN-4	4 Flute	Corner Radius	Variable Pitch - Reduced Neck	119
5 FLUTE				PG
HEV-5	5 Flute	Square	Variable Pitch	123
MHEV-5	5 Flute	Square	Variable Pitch Metric	125
HEV-5	5 Flute	Corner Radius	Variable Pitch	126
MHEV-5	5 Flute	Corner Radius	Variable Pitch Metric	132
HEV-RN-5	5 Flute	Square	Variable Pitch - Reduced Neck New Items!	133
HEV-RN-5	5 Flute	Corner Radius	Variable Pitch - Reduced Neck	135

END MILLS FOR STEELS Steels, Tool Steels, & Cast Iron (cont.)**6 FLUTE****PG**

HEV-6	6 Flute	Square	Variable Pitch	139
MHEV-6	6 Flute	Square	Variable Pitch Metric	141
HEV-6	6 Flute	Ball	Variable Pitch	142
HEV-6	6 Flute	Corner Radius	Variable Pitch New Items!	143
MHEV-6	6 Flute	Corner Radius	Variable Pitch Metric	148
HEV-RN-6	6 Flute	Square	Variable Pitch - Reduced Neck New Items!	149
HEV-RN-6	6 Flute	Ball	Variable Pitch - Reduced Neck New Items!	150
HEV-RN-6	6 Flute	Corner Radius	Variable Pitch - Reduced Neck	151

7 FLUTE**PG**

HEV-7	7 Flute	Square	Variable Pitch	153
MHEV-7	7 Flute	Square	Variable Pitch Metric	155
HEV-7	7 Flute	Corner Radius	Variable Pitch New Items!	156
MHEV-7	7 Flute	Corner Radius	Variable Pitch Metric	159
HEV-RN-7	7 Flute	Square	Variable Pitch - Reduced Neck	161
HEV-RN-7	7 Flute	Corner Radius	Variable Pitch - Reduced Neck	162

FINISHERS**PG**

HEF-5	5 Flute	Square	Finisher	164
HSF-7	7 Flute	Square	Finisher	167
HXF	Multi-Flute	Corner Radius	Finisher	169

END MILLS FOR STAINLESS STEELS & HIGH TEMP ALLOYS**ROUGHERS****PG**

HEVC-C-4	4 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - Coolant Through	171
HEV-C-5	5 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	173
HEV-C-6	6 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	175
HEVC-C-6	6 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - Coolant Through	177
HEV-C-7	7 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	178
HXVR	Multi-Flute	Corner Radius	Knuckle Rougher - Variable Pitch	180

4 FLUTE**PG**

HSV-4 / HSM-4	4 Flute	Square	Variable Pitch New Items!	181
HSV-4	4 Flute	Ball	Variable Pitch New Items!	183
HSV-4 / HSM-4	4 Flute	Corner Radius	Variable Pitch New Items!	185
HSV-RN-4	4 Flute	Square	Variable Pitch - Reduced Neck New!	189
HSV-RN-4	4 Flute	Ball	Variable Pitch - Reduced Neck New!	190
HSV-RN-4	4 Flute	Corner Radius	Variable Pitch - Reduced Neck New!	191
HEVC-4	4 Flute	Corner Radius	Variable Pitch - Coolant Through	192

END MILLS FOR STAINLESS STEELS & HIGH TEMP ALLOYS (cont.)

5 FLUTE

PG

HEV-5 / HSM-5	5 Flute	Square	Variable Pitch New Items!	194
HEV-5 / HSM-5	5 Flute	Corner Radius	Variable Pitch New Items!	196
HEV-RN-5	5 Flute	Square	Variable Pitch - Reduced Neck New!	201
HEV-RN-5	5 Flute	Corner Radius	Variable Pitch - Reduced Neck New!	202

6 FLUTE

PG

HEV-6	6 Flute	Square	Variable Pitch New Items!	204
HEVC-6	6 Flute	Square	Variable Pitch - Coolant Through	206
HEV-6	6 Flute	Ball	Variable Pitch New Items!	207
HEV-6	6 Flute	Corner Radius	Variable Pitch New Items!	208
HEVC-6	6 Flute	Corner Radius	Variable Pitch - Coolant Through	211
HEV-RN-6	6 Flute	Square	Variable Pitch - Reduced Neck New!	212
HEV-RN-6	6 Flute	Ball	Variable Pitch - Reduced Neck New!	213
HEV-RN-6	6 Flute	Corner Radius	Variable Pitch - Reduced Neck New!	214

7 FLUTE

PG

HEV-7	7 Flute	Square	Variable Pitch New Items!	215
HEV-7	7 Flute	Corner Radius	Variable Pitch New Items!	216

FINISHERS

PG

HCF-TN-4	4 Flute	Ball	Contour Finishers - Tapered Neck New!	218
HMAF-FE-4	4 Flute	Lens	Multi-Axis Finisher	220
HMAF-FE-4	4 Flute	Taper	Multi-Axis Finisher New!	221
HMAF-FE-4	4 Flute	Oval	Multi-Axis Finisher New!	222
HMAF-FE-6	6 Flute	Taper	Multi-Axis Finisher	224
HMAF-FE-6	6 Flute	Oval	Multi-Axis Finisher	225
HXF	Multi-Flute	Corner Radius	Finisher	227



END MILLS FOR NICKEL ALLOYS

6 FLUTE

PG

HVNI-6	6 Flute	Corner Radius	Variable Pitch New Items!	228
HVNIC-6	6 Flute	Corner Radius	Variable Pitch - Coolant Through New!	230

8 FLUTE

PG

HVNI-8	8 Flute	Corner Radius	Variable Pitch - HEM New Items!	232
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END MILLS FOR TITANIUM

Titanium & Titanium Alloys



ROUGHERS

PG

HEV-C-5	5 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	235
HVTI-C-6	6 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - HEM	238
HVTIC-C-6	6 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch - HEM - Coolant Through	239
HEV-C-6	6 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	241
HEV-C-7	7 Flute	Corner Radius	Chipbreaker Rougher - Variable Pitch New Items!	243

5 FLUTE

PG

HEV-5	5 Flute	Corner Radius	Variable Pitch	245
MHEV-5	5 Flute	Corner Radius	Variable Pitch Metric	251

6 FLUTE

PG

HVTI-6	6 Flute	Square	Variable Pitch - HEM New Items!	252
HVTI-6	6 Flute	Ball	Variable Pitch - HEM New Items!	253
HVTI-6	6 Flute	Corner Radius	Variable Pitch - HEM New Items!	254
HVTIC-6	6 Flute	Corner Radius	Variable Pitch - HEM - Coolant Through	257
HEV-6	6 Flute	Ball	Variable Pitch	259
HEV-6	6 Flute	Corner Radius	Variable Pitch New Items!	260
MHEV-6	6 Flute	Corner Radius	Variable Pitch Metric	265

7 FLUTE

PG

HEV-7	7 Flute	Corner Radius	Variable Pitch New Items!	266
MHEV-7	7 Flute	Corner Radius	Variable Pitch Metric	269

FINISHERS

PG

HXF	Multi-Flute	Corner Radius	Finisher	270
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CAM Tool Libraries

Harvey Performance Company works closely with industry-leading CAM software companies to optimize Helical Solutions and Harvey Tool product libraries for their platforms.



Download Now: harveyperformance.com/tool-libraries



HIGH FEED END MILLS

ALUMINUM

PG

HFAL-2	Reduced Neck	New Items!	271
MHFAL-2	Reduced Neck	Metric	272

FOR STEELS UP TO 45 RC

PG

HFV	Steels Up to 45 Rc - Variable Pitch - Reduced Neck	New Items!	274
MHFV	Steels Up to 45 Rc - Variable Pitch - Reduced Neck	Metric New Items!	276
HFVC	Steels Up to 45 Rc - Variable Pitch - Coolant Through - Reduced Neck		277
MHFVC	Steels Up to 45 Rc - Variable Pitch - Coolant Through - Reduced Neck	Metric	278

COMBINATION FEED & HEM

PG

HEVF-C-4	4 Flute	Chipbreaker Rougher - Variable Pitch	280
HEVFC-C-4	4 Flute	Chipbreaker Rougher - Variable Pitch - Coolant Through	New! 281
HEVF-C-5	5 Flute	Chipbreaker Rougher - Variable Pitch	New Items! 283
HEVFC-C-5	5 Flute	Chipbreaker Rougher - Variable Pitch - Coolant Through	New! 284



SPECIALTY PROFILES

TAPERED END MILLS

PG

HTPR-4	4 Flute	Ball	Variable Pitch	286
HTPR-5	5 Flute	Square	Variable Pitch	288

CHAMFER MILLS

PG

HCM	2 & 4 Flute	Chamfer	Straight Flute	New Items! 290
HPCM	2 & 4 Flute	Chamfer	Helical Flute - High Performance - Pointed	292
HPCM	3 & 5 Flute	Chamfer	Helical Flute - High Performance - Tipped Off	New Items! 293

COMBINATION CHAMFER / END MILLS

PG

HCCM	4 Flute	Combo	Combination Chamfer / End Mill - High Performance	296
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CORNER ROUNDING END MILLS

PG

HPCR	3 & 5 Flute	Corner Rounding End Mills - Helical Flute - High Performance	New! 298
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TECHNICAL INFORMATION

OUR COATINGS

	Nplus	Zplus	Tplus	Aplus
Application Benefits	Nplus is specially engineered for optimal performance and extended tool life in aluminum alloys and non-ferrous materials, especially high-silicon aluminums and copper alloys. Its high hardness and excellent edge retention provide improved wear resistance.	Zplus provides higher hardness, lubricity, and abrasion resistance. While it's specifically engineered for aluminum applications, it is also an optimal coating for other non-ferrous materials. Zplus holds up well in abrasive materials and reduces the chance of built-upedge in softer, gummy alloys.	Tplus is an ideal choice for increased wear resistance and edge strength in stainless steels, high temp alloys, and hardened steels up to 65Rc. Also an excellent choice for increased wear resistance in a wide variety of ferrous materials.	Aplus allows for high temperature resistance, decreased wear, and improved tool life. Proven to work in high speed machining and dry conditions, these benefits are seen in a wide range of ferrous materials and titanium alloys.
Materials	Wrought Aluminum, Cast Aluminum, Graphite, and Other Non-Ferrous Alloys	Wrought Aluminum, Cast Aluminum, Graphite, and Other Non-Ferrous Alloys	Stainless Steels, High Temp Alloys, Hardened Steels	Low Alloy Steels, Medium Alloy Steels, Tool Steels, Cast Iron, and Titanium
Coating Appearance	light grey/silver 	light gold / champagne 	copper 	black / grey 
Max. Usage Temp.	2,012° F	1,110° F	2,192° F	2,012° F
Microhardness (HV 0.05)	4079 (40 GPa)	2243 (22 GPa)	4487 (44 GPa)	4079 (40 GPa)
Coefficient of Friction	0.45	0.40	0.35	0.45

The Advantageous Qualities of Helical Solutions' Nplus Coating

In The Loupe
MACHINISTS BLOG

Is Nplus coating the right option for you, and your next project? Let us answer that question for you in our "In the Loupe" blog post: *The Advantageous Qualities of Helical Solutions' Nplus Coating.* There, we bring you through the many benefits of this unique coating option, but also tell you when Nplus may not be your best option.



SCAN TO READ

www.harveypformance.com/in-the-loupe/nplus-coating/

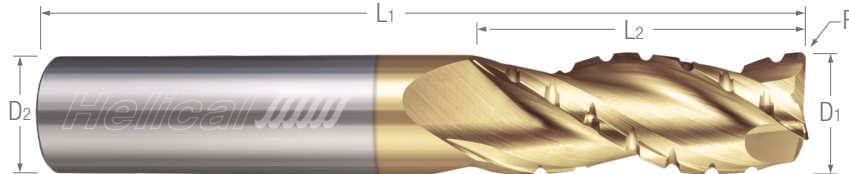
H35ALV-C-3



3 FLUTE - CORNER RADIUS

35° Helix - Variable Pitch - Chipbreaker Rougher

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Engineered with optimized variable pitch and chipbreaker geometry for reduced harmonics and elevated material removal rates
- Unique tool design requires less torque and horsepower
- Unique "3 teeth-to-center" end geometry for ramping applications
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	Length of Cut L2 $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L1 $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Flutes	Uncoated	<i>Zplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	3	82101	82102	H35ALV-C-020-30125-R.010
	1/8	.010	3/8	2	3	82103	82104	H35ALV-C-030-30125-R.010
	1/8	.010	1/2	2-1/2	3	82105	82106	H35ALV-C-040-30125-R.010
	1/8	.010	5/8	2-1/2	3	84792	84793	H35ALV-C-050-30125-R.010
	1/8	.010	3/4	2-1/2	3	84794	84795	H35ALV-C-060-30125-R.010
	1/8	.030	1/4	1-1/2	3	84796	84797	H35ALV-C-020-30125-R.030
	1/8	.030	3/8	2	3	84798	84799	H35ALV-C-030-30125-R.030
	1/8	.030	1/2	2-1/2	3	84800	84801	H35ALV-C-040-30125-R.030
3/16	3/16	.010	5/16	2	3	82107	82108	H35ALV-C-016-30187-R.010
	3/16	.010	7/16	2	3	84802	84803	H35ALV-C-023-30187-R.010
	3/16	.010	9/16	2-1/2	3	82109	82110	H35ALV-C-030-30187-R.010
	3/16	.010	3/4	2-1/2	3	82111	82112	H35ALV-C-040-30187-R.010
	3/16	.010	1	2-1/2	3	84804	84805	H35ALV-C-053-30187-R.010
	3/16	.010	1-3/16	3	3	84806	84807	H35ALV-C-063-30187-R.010
	3/16	.030	5/16	2	3	84808	84809	H35ALV-C-016-30187-R.030
	3/16	.030	9/16	2-1/2	3	84810	84811	H35ALV-C-030-30187-R.030
1/4	1/4	.010	1/2	2-1/2	3	81991	81992	H35ALV-C-020-30250-R.010
	1/4	.010	3/4	2-1/2	3	81993	81994	H35ALV-C-030-30250-R.010
	1/4	.010	1	3	3	81995	81996	H35ALV-C-040-30250-R.010
	1/4	.010	1-1/4	3	3	82113	82114	H35ALV-C-050-30250-R.010
	1/4	.015	1/2	2-1/2	3	82115	82116	H35ALV-C-020-30250-R.015
	1/4	.015	3/4	2-1/2	3	82117	82118	H35ALV-C-030-30250-R.015
	1/4	.020	1/2	2-1/2	3	82119	82120	H35ALV-C-020-30250-R.020
	1/4	.020	3/4	2-1/2	3	82121	82122	H35ALV-C-030-30250-R.020
	1/4	.030	1/2	2-1/2	3	81997	81998	H35ALV-C-020-30250-R.030
	1/4	.030	3/4	2-1/2	3	81999	82000	H35ALV-C-030-30250-R.030
	1/4	.030	1	3	3	82001	82002	H35ALV-C-040-30250-R.030
	1/4	.030	1-1/4	3	3	84814	84815	H35ALV-C-050-30250-R.030

*.0003 max TIR

continued on next page

3 FLUTE - CORNER RADIUS



H35ALV-C-3

35° Helix - Variable Pitch - Chipbreaker Rougher (cont.)

Roughers

continued from previous page

Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.02"} -0.02"	Length of Cut L ₂ ^{+0.032"} -0.000"	OAL L ₁ ^{+0.062"} -0.062"	Flutes	Uncoated	Zplus Coated	Tool Description
5/16	5/16	.010	7/16	2	3	84816	84817	H35ALV-C-014-30312-R.010
	5/16	.010	3/4	2-1/2	3	84818	84819	H35ALV-C-024-30312-R.010
	5/16	.010	1	3	3	84820	84821	H35ALV-C-032-30312-R.010
	5/16	.030	7/16	2	3	84822	84823	H35ALV-C-014-30312-R.030
	5/16	.030	3/4	2-1/2	3	84824	84825	H35ALV-C-024-30312-R.030
	5/16	.030	1	3	3	84826	84827	H35ALV-C-032-30312-R.030
3/8	3/8	.010	1/2	2	3	82123	82124	H35ALV-C-013-30375-R.010
	3/8	.010	1	3	3	82125	82126	H35ALV-C-026-30375-R.010
	3/8	.010	1-1/4	3-1/2	3	82127	82128	H35ALV-C-033-30375-R.010
	3/8	.010	1-1/2	4	3	84828	84829	H35ALV-C-040-30375-R.010
	3/8	.020	1/2	2	3	82129	82130	H35ALV-C-013-30375-R.020
	3/8	.020	1	3	3	82131	82132	H35ALV-C-026-30375-R.020
	3/8	.020	1-1/4	3-1/2	3	82133	82134	H35ALV-C-033-30375-R.020
	3/8	.030	1/2	2	3	82003	82004	H35ALV-C-013-30375-R.030
	3/8	.030	1	3	3	82005	82006	H35ALV-C-026-30375-R.030
	3/8	.030	1-1/4	3-1/2	3	82007	82008	H35ALV-C-033-30375-R.030
	3/8	.030	1-1/2	4	3	84830	84831	H35ALV-C-040-30375-R.030
	3/8	.060	1/2	2	3	82009	82010	H35ALV-C-013-30375-R.060
3/8	.060	1	3	3	82011	82012	H35ALV-C-026-30375-R.060	
3/8	.060	1-1/4	3-1/2	3	82013	82014	H35ALV-C-033-30375-R.060	
1/2	1/2	.010	5/8	2-1/2	3	82135	82136	H35ALV-C-012-30500-R.010
	1/2	.010	1	3	3	82137	82138	H35ALV-C-020-30500-R.010
	1/2	.010	1-1/4	3	3	82139	82140	H35ALV-C-025-30500-R.010
	1/2	.010	1-5/8	4	3	82141	82142	H35ALV-C-032-30500-R.010
	1/2	.020	5/8	2-1/2	3	82143	82144	H35ALV-C-012-30500-R.020
	1/2	.020	1	3	3	82145	82146	H35ALV-C-020-30500-R.020
	1/2	.020	1-1/4	3	3	82147	82148	H35ALV-C-025-30500-R.020
	1/2	.020	1-5/8	4	3	82149	82150	H35ALV-C-032-30500-R.020
	1/2	.030	5/8	2-1/2	3	82015	82016	H35ALV-C-012-30500-R.030
	1/2	.030	1	3	3	82017	82018	H35ALV-C-020-30500-R.030
	1/2	.030	1-1/4	3	3	82019	82020	H35ALV-C-025-30500-R.030
	1/2	.030	1-5/8	4	3	82021	82022	H35ALV-C-032-30500-R.030
	1/2	.030	2	4	3	82023	82024	H35ALV-C-040-30500-R.030
	1/2	.030	2-1/2	5	3	82151	82152	H35ALV-C-050-30500-R.030
	1/2	.030	3-1/8	6	3	84832	84833	H35ALV-C-062-30500-R.030
	1/2	.060	5/8	2-1/2	3	82025	82026	H35ALV-C-012-30500-R.060
	1/2	.060	1	3	3	82027	82028	H35ALV-C-020-30500-R.060
	1/2	.060	1-1/4	3	3	82029	82030	H35ALV-C-025-30500-R.060
	1/2	.060	1-5/8	4	3	82031	82032	H35ALV-C-032-30500-R.060
	1/2	.060	2	4	3	82033	82034	H35ALV-C-040-30500-R.060
	1/2	.125	5/8	2-1/2	3	84834	84835	H35ALV-C-012-30500-R.125
1/2	.125	1	3	3	84836	84837	H35ALV-C-020-30500-R.125	
1/2	.125	1-1/4	3	3	84838	84839	H35ALV-C-025-30500-R.125	
1/2	.125	1-5/8	4	3	84840	84841	H35ALV-C-032-30500-R.125	

* .0003 max TIR

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H35ALV-C-3



3 FLUTE - CORNER RADIUS

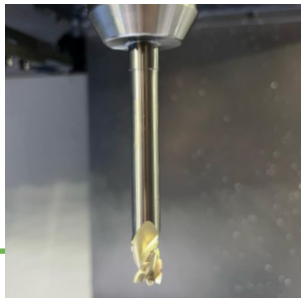
35° Helix - Variable Pitch - Chipbreaker Rougher (cont.)

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Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut L2 $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	OAL L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Uncoated	Zplus Coated	Tool Description
5/8	5/8	.030	3/4	3	3	82035	82036	H35ALV-C-012-30625-R.030
	5/8	.030	1-5/8	3-1/2	3	82037	82038	H35ALV-C-026-30625-R.030
	5/8	.060	3/4	3	3	82039	82040	H35ALV-C-012-30625-R.060
	5/8	.060	1-5/8	3-1/2	3	82041	82042	H35ALV-C-026-30625-R.060
3/4	3/4	.010	1-5/8	4	3	82153	82154	H35ALV-C-021-30750-R.010
	3/4	.010	2-1/4	5	3	82155	82156	H35ALV-C-030-30750-R.010
	3/4	.030	1-5/8	4	3	82043	82044	H35ALV-C-021-30750-R.030
	3/4	.030	2-1/4	5	3	82045	82046	H35ALV-C-030-30750-R.030
	3/4	.030	3-1/4	6	3	82047	82048	H35ALV-C-043-30750-R.030
	3/4	.060	1-5/8	4	3	82049	82050	H35ALV-C-021-30750-R.060
	3/4	.060	2-1/4	5	3	82051	82052	H35ALV-C-030-30750-R.060
	3/4	.060	3-1/4	6	3	82053	82054	H35ALV-C-043-30750-R.060
	3/4	.125	1-5/8	4	3	82157	82158	H35ALV-C-021-30750-R.125
3/4	.125	2-1/4	5	3	82159	82160	H35ALV-C-030-30750-R.125	
1	1	.030	2	5	3	82055	82056	H35ALV-C-020-31000-R.030
	1	.030	3-1/4	6	3	84842	84843	H35ALV-C-032-31000-R.030
	1	.060	2	5	3	82057	82058	H35ALV-C-020-31000-R.060
	1	.060	3-1/4	6	3	84844	84845	H35ALV-C-032-31000-R.060
	1	.125	2	5	3	84846	84847	H35ALV-C-020-31000-R.125
	1	.250	2	5	3	84848	84849	H35ALV-C-020-31000-R.250

*.0003 max TIR

@hankprecision



Follow Helical Tools on Instagram and See How We Help You
Run Faster. Push Harder. Machine Smarter.

SKU: [82184](#)
Coating: Zplus
Cutter Dia: 1/2"
Length of Cut: 5/8"
Radius: .030"
Reach (LBS): 3-3/8"

@helicaltools

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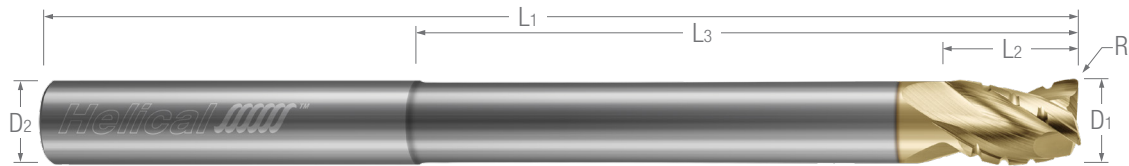
3 FLUTE - CORNER RADIUS



H35ALV-C-RN-3

35° Helix - Variable Pitch - Chipbreaker Rougher - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Engineered with optimized variable pitch and chipbreaker geometry for reduced harmonics and elevated material removal rates
- Unique tool design requires less torque and horsepower
- Excellent performance in High Efficiency Milling (HEM)
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Unique "3 teeth-to-center" end geometry for ramping applications
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.*	Shank Dia.	Corner Radius	Length of Cut	OAL	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	R ^{+0.002"} / _{-0.002"}	L ₂ ^{+0.032"} / _{-0.000"}	L ₁ ^{+0.062"} / _{-0.062"}	L ₃					
1/8	1/8	.010	5/32	3	1/2	.118	3	84850	84851	H35ALV-C-RN-040-30125-R.010
	1/8	.010	5/32	3	5/8	.118	3	84852	84853	H35ALV-C-RN-050-30125-R.010
	1/8	.010	5/32	3	3/4	.118	3	84854	84855	H35ALV-C-RN-060-30125-R.010
3/16	3/16	.010	7/32	3	3/4	.178	3	84856	84857	H35ALV-C-RN-040-30187-R.010
	3/16	.010	7/32	3	1	.178	3	84858	84859	H35ALV-C-RN-053-30187-R.010
	3/16	.010	7/32	3	1-1/8	.178	3	84860	84861	H35ALV-C-RN-060-30187-R.010
1/4	1/4	.010	3/8	4	3/4	.237	3	84862	84863	H35ALV-C-RN-030-30250-R.010
	1/4	.010	3/8	4	1-1/8	.237	3	82161	82162	H35ALV-C-RN-045-30250-R.010
	1/4	.010	3/8	4	1-5/8	.237	3	82163	82164	H35ALV-C-RN-065-30250-R.010
	1/4	.010	3/8	4	2-1/8	.237	3	82165	82166	H35ALV-C-RN-085-30250-R.010
	1/4	.010	3/8	4	2-1/2	.237	3	82167	82168	H35ALV-C-RN-100-30250-R.010
5/16	5/16	.030	7/16	4	1-7/16	.296	3	84864	84865	H35ALV-C-RN-045-30312-R.030
	5/16	.030	7/16	4	1-3/4	.296	3	84866	84867	H35ALV-C-RN-056-30312-R.030
	5/16	.030	7/16	4	2-1/8	.296	3	84868	84869	H35ALV-C-RN-068-30312-R.030
3/8	3/8	.030	1/2	4	1-1/8	.356	3	82169	82170	H35ALV-C-RN-030-30375-R.030
	3/8	.030	1/2	4	1-5/8	.356	3	82171	82172	H35ALV-C-RN-043-30375-R.030
	3/8	.030	1/2	4	2-1/8	.356	3	82173	82174	H35ALV-C-RN-056-30375-R.030
	3/8	.030	1/2	5	2-1/2	.356	3	82175	82176	H35ALV-C-RN-066-30375-R.030
1/2	1/2	.030	5/8	4	1-3/8	.475	3	82177	82178	H35ALV-C-RN-027-30500-R.030
	1/2	.030	5/8	4	1-3/4	.475	3	82179	82180	H35ALV-C-RN-035-30500-R.030
	1/2	.030	5/8	4	2-1/4	.475	3	82181	82182	H35ALV-C-RN-045-30500-R.030
	1/2	.030	5/8	6	3-3/8	.475	3	82183	82184	H35ALV-C-RN-067-30500-R.030
	1/2	.030	5/8	6	4-1/4	.475	3	82185	82186	H35ALV-C-RN-085-30500-R.030
	1/2	.060	5/8	4	1-3/8	.475	3	82187	82188	H35ALV-C-RN-027-30500-R.060
	1/2	.060	5/8	4	1-3/4	.475	3	82189	82190	H35ALV-C-RN-035-30500-R.060
	1/2	.060	5/8	4	2-1/4	.475	3	82191	82192	H35ALV-C-RN-045-30500-R.060
	1/2	.060	5/8	6	3-3/8	.475	3	82193	82194	H35ALV-C-RN-067-30500-R.060
	1/2	.060	5/8	6	4-1/4	.475	3	82195	82196	H35ALV-C-RN-085-30500-R.060

* .0003 max TIR

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H35ALV-C-RN-3



3 FLUTE - CORNER RADIUS

35° Helix - Variable Pitch - Chipbreaker Rougher - Reduced Neck (cont.)

Roughers

continued from previous page

Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.002"} -0.002"	Length of Cut L ₂ ^{+0.032"} -0.000"	OAL		Reach (LBS) L ₃	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
				L ₁ ^{+0.062"} -0.062"	L ₃						
3/4	3/4	.030	1	4	2	.712	3	82197	82198	H35ALV-C-RN-026-30750-R.030	
	3/4	.030	1	6	2-1/2	.712	3	82199	82200	H35ALV-C-RN-033-30750-R.030	
	3/4	.030	1	6	3	.712	3	82201	82202	H35ALV-C-RN-040-30750-R.030	
	3/4	.030	1	6	3-3/8	.712	3	82203	82204	H35ALV-C-RN-045-30750-R.030	
	3/4	.060	1	4	2	.712	3	82205	82206	H35ALV-C-RN-026-30750-R.060	
	3/4	.060	1	6	2-1/2	.712	3	82207	82208	H35ALV-C-RN-033-30750-R.060	
	3/4	.060	1	6	3	.712	3	82209	82210	H35ALV-C-RN-040-30750-R.060	
	3/4	.060	1	6	3-3/8	.712	3	82211	82212	H35ALV-C-RN-045-30750-R.060	

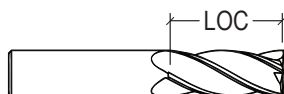
* .0003 max TIR

H35ALV-C-3 / H35ALV-C-RN-3

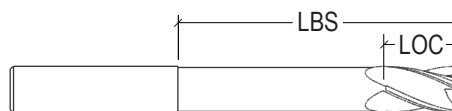
Material Guide		SFM	Inches per Tooth (IPT)													
			1/8		3/16		1/4		3/8		1/2		3/4		1	
			Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
WROUGHT ALUMINUM ALLOY 2014, 5062, 6061, 7050, 7075, 7475	2100	.0007	.0013	.0011	.0020	.0014	.0026	.0021	.0039	.0027	.0051	.0039	.0073	.0050	.0094	
		.0011	.0021	.0017	.0031	.0022	.0041	.0033	.0061	.0043	.0080	.0061	.0114	.0078	.0145	
CAST ALUMINUM ALLOY 319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0008	.0014	.0011	.0021	.0015	.0028	.0022	.0041	.0029	.0053	.0041	.0076	.0052	.0097	
COPPER ALLOY Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770															

MILLING PROCESS	STYLE	ADOC	RDOC
Slot (Full Slotting)	Non-Reached	75%-125% Diameter	100% Diameter
	Reached	Up to Max LOC	100% Diameter
Rgh (Traditional Roughing)	Non-Reached	125%-200% Diameter	30%-40% Diameter
	Reached	Up to Max LOC	30%-40% Diameter

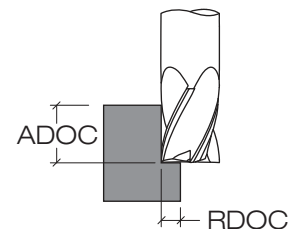
NOTES:
IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Regular Style



Reduced Neck Style



Key: LOC=Length of Cut

ADOC=Axial Depth of Cut

RDOC=Radial Depth of Cut

3 FLUTE - CORNER RADIUS

New Items!

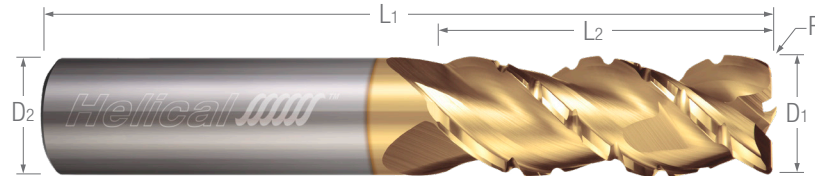


H45AL-C-3

45° Helix - Chipbreaker Rougher

Roughers

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Engineered with high helix and chipbreaker geometry for optimal chip evacuation and a semi-finished surface
- Unique tool design requires less torque and horsepower
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	Length of Cut L ₂ ^{+0.032"} / _{-0.000"}	OAL L ₁ ^{+0.062"} / _{-0.062"}	Flutes	Uncoated	Zplus Coated	Tool Description	
1/8	1/8	.010	1/4	1-1/2	3	86562	86563	H45AL-C-S-30125-R.010	new
	1/8	.010	3/8	2	3	86564	86565	H45AL-C-SR-30125-R.010	new
	1/8	.010	1/2	2-1/2	3	86566	86567	H45AL-C-R-30125-R.010	new
3/16	3/16	.010	7/16	2	3	86568	86569	H45AL-C-SR-30187-R.010	new
	3/16	.010	9/16	2-1/2	3	86570	86571	H45AL-C-R-30187-R.010	new
	3/16	.010	3/4	2-1/2	3	86572	86573	H45AL-C-M-30187-R.010	new
1/4	1/4	.010	1/2	2-1/2	3	82717	82718	H45AL-C-SR-30250-R.010	
	1/4	.010	3/4	2-1/2	3	82719	82720	H45AL-C-R-30250-R.010	
	1/4	.010	1	3	3	82721	82722	H45AL-C-M-30250-R.010	
	1/4	.010	1-1/4	3	3	86574	86575	H45AL-C-L-30250-R.010	new
	1/4	.020	3/8	2	3	29120	29122	H45AL-C-S-30250-R.020	
	1/4	.020	1/2	2-1/2	3	29135	29137	H45AL-C-SR-30250-R.020	
	1/4	.020	3/4	2-1/2	3	29150	29152	H45AL-C-R-30250-R.020	
	1/4	.020	1	3	3	29165	29167	H45AL-C-M-30250-R.020	
5/16	5/16	.020	13/16	2-1/2	3	29225	29227	H45AL-C-R-30312-R.020	
	5/16	.020	1	3	3	29240	29242	H45AL-C-M-30312-R.020	
	5/16	.020	1-1/4	3	3	86576	86577	H45AL-C-L-30312-R.020	new
3/8	3/8	.010	1/2	2	3	86578	86579	H45AL-C-S-30375-R.010	new
	3/8	.010	3/4	2-1/2	3	86580	86581	H45AL-C-SR-30375-R.010	new
	3/8	.010	1	3	3	86582	86583	H45AL-C-R-30375-R.010	new
	3/8	.010	1-1/4	3-1/2	3	86584	86585	H45AL-C-M-30375-R.010	new
	3/8	.010	1-1/2	4	3	86586	86587	H45AL-C-L-30375-R.010	new
	3/8	.020	1/2	2	3	29285	29287	H45AL-C-S-30375-R.020	
	3/8	.020	3/4	2-1/2	3	81305	81306	H45AL-C-SR-30375-R.020	
	3/8	.020	1	3	3	29300	29302	H45AL-C-R-30375-R.020	
	3/8	.020	1-1/4	3-1/2	3	29315	29317	H45AL-C-M-30375-R.020	
	3/8	.020	1-1/2	4	3	29330	29332	H45AL-C-L-30375-R.020	
	3/8	.020	2	4	3	29345	29347	H45AL-C-LX-30375-R.020	
	3/8	.060	1/2	2	3	82723	82724	H45AL-C-S-30375-R.060	
	3/8	.060	1	3	3	82725	82726	H45AL-C-R-30375-R.060	
3/8	.060	1-1/4	3-1/2	3	82727	82728	H45AL-C-M-30375-R.060		

* .0003 max TIR

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H45AL-C-3



New Items!

3 FLUTE - CORNER RADIUS

45° Helix - Chipbreaker Rougher (cont.)

continued from previous page

	Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Corner Radius R ^{+.002"} _{-.002"}	Length of Cut L ₂ ^{+.032"} _{-.000"}	OAL L ₁ ^{+.062"} _{-.062"}	Flutes	Uncoated	Zplus Coated	Tool Description		
new	1/2	1/2	.010	5/8	2-1/2	3	86588	86589	H45AL-C-S-30500-R.010		
		1/2	.010	1	3	3	82729	82730	H45AL-C-SR-30500-R.010		
		1/2	.010	1-1/4	3	3	82731	82732	H45AL-C-R-30500-R.010		
		1/2	.010	1-5/8	4	3	82733	82734	H45AL-C-M-30500-R.010		
		1/2	.010	2	4	3	82735	82736	H45AL-C-L-30500-R.010		
		new	1/2	1/2	.020	5/8	2-1/2	3	86590	86591	H45AL-C-S-30500-R.020
				1/2	.020	1	3	3	86592	86593	H45AL-C-SR-30500-R.020
				1/2	.020	1-1/4	3	3	86594	86595	H45AL-C-R-30500-R.020
				1/2	.020	1-5/8	4	3	86596	86597	H45AL-C-M-30500-R.020
		new	1/2	1/2	.020	2	4	3	86598	86599	H45AL-C-L-30500-R.020
				1/2	.030	5/8	2-1/2	3	29375	29377	H45AL-C-S-30500-R.030
				1/2	.030	1	3	3	29390	29392	H45AL-C-SR-30500-R.030
				1/2	.030	1-1/4	3	3	29405	29407	H45AL-C-R-30500-R.030
				1/2	.030	1-5/8	4	3	29420	29422	H45AL-C-M-30500-R.030
				1/2	.030	2	4	3	29435	29437	H45AL-C-L-30500-R.030
				1/2	.030	2-1/2	5	3	29450	29452	H45AL-C-LX-30500-R.030
1/2	.030			3-1/8	6	3	29465	29467	H45AL-C-X-30500-R.030		
new	1/2	1/2	.060	5/8	2-1/2	3	86600	86601	H45AL-C-S-30500-R.060		
		1/2	.060	1	3	3	82737	82738	H45AL-C-SR-30500-R.060		
		1/2	.060	1-1/4	3	3	82739	82740	H45AL-C-R-30500-R.060		
		1/2	.060	1-5/8	4	3	82741	82742	H45AL-C-M-30500-R.060		
	1/2	.060	2	4	3	82743	82744	H45AL-C-L-30500-R.060			
new	5/8	5/8	.030	3/4	3	3	29480	29482	H45AL-C-S-30625-R.030		
		5/8	.030	1-5/8	3-1/2	3	29495	29497	H45AL-C-R-30625-R.030		
		5/8	.030	2-1/8	4	3	29510	29512	H45AL-C-M-30625-R.030		
		5/8	.030	2-1/2	5	3	29525	29527	H45AL-C-L-30625-R.030		
		5/8	.060	3/4	3	3	86602	86603	H45AL-C-S-30625-R.060		
		5/8	.060	1-5/8	3-1/2	3	86604	86605	H45AL-C-R-30625-R.060		
		5/8	.060	2-1/8	4	3	86606	86607	H45AL-C-M-30625-R.060		
new	3/4	3/4	.030	1	4	3	29570	29572	H45AL-C-S-30750-R.030		
		3/4	.030	1-5/8	4	3	29585	29587	H45AL-C-R-30750-R.030		
		3/4	.030	2	4	3	81307	81308	H45AL-C-A-30750-R.030		
		3/4	.030	2-1/4	5	3	29600	29602	H45AL-C-M-30750-R.030		
		3/4	.030	2-3/4	5	3	81309	81310	H45AL-C-ML-30750-R.030		
		3/4	.030	3-1/4	6	3	29615	29617	H45AL-C-L-30750-R.030		
		3/4	.030	4	6-1/2	3	29630	29632	H45AL-C-X-30750-R.030		
		3/4	.060	1-5/8	4	3	82745	82746	H45AL-C-R-30750-R.060		
		3/4	.060	2-1/4	5	3	82747	82748	H45AL-C-M-30750-R.060		
3/4	.060	3-1/4	6	3	82749	82750	H45AL-C-L-30750-R.060				
new	1	1	.030	1-1/4	4	3	29645	29647	H45AL-C-S-31000-R.030		
		1	.030	2	5	3	29660	29662	H45AL-C-R-31000-R.030		
		1	.030	2-5/8	6	3	29675	29677	H45AL-C-M-31000-R.030		
		1	.030	3-1/4	6	3	29690	29692	H45AL-C-L-31000-R.030		
		1	.030	4-1/8	7	3	29705	29707	H45AL-C-X-31000-R.030		
		1	.060	2	5	3	86608	86609	H45AL-C-R-31000-R.060		
		1	.060	2-5/8	6	3	86610	86611	H45AL-C-M-31000-R.060		
		1	.060	3-1/4	6	3	86612	86613	H45AL-C-L-31000-R.060		

*.0003 max TIR

3 FLUTE - CORNER RADIUS New Items!

45° Helix - Chipbreaker Rougher - Reduced Neck



H45AL-C-RN-3

Roughers

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Engineered with high helix and chipbreaker geometry for optimal chip evacuation and a semi-finished surface
- Unique tool design requires less torque and horsepower
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.*	Shank Dia.	Corner Radius	Length of Cut	OAL	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	R ^{+0.002"} _{-0.002"}	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}	L ₃					
1/4	1/4	.020	3/8	4	3/4	.237	3	28105	28107	H45AL-C-RN-S-30250-R.020
	1/4	.020	3/8	4	1-1/8	.237	3	28120	28122	H45AL-C-RN-R-30250-R.020
	1/4	.020	3/8	4	1-5/8	.237	3	82751	82752	H45AL-C-RN-A-30250-R.020
	1/4	.020	3/8	4	2-1/8	.237	3	28135	28137	H45AL-C-RN-M-30250-R.020
	1/4	.020	3/8	4	2-1/2	.237	3	82753	82754	H45AL-C-RN-ML-30250-R.020
5/16	5/16	.020	7/16	4	1-1/8	.296	3	28165	28167	H45AL-C-RN-R-30312-R.020
	5/16	.020	7/16	4	2-1/8	.296	3	28180	28182	H45AL-C-RN-M-30312-R.020
3/8	3/8	.020	1/2	4	1-1/8	.356	3	28210	28212	H45AL-C-RN-R-30375-R.020
	3/8	.020	1/2	4	1-5/8	.356	3	82755	82756	H45AL-C-RN-A-30375-R.020
	3/8	.020	1/2	4	2-1/8	.356	3	28225	28227	H45AL-C-RN-M-30375-R.020
	3/8	.020	1/2	5	2-1/2	.356	3	82757	82758	H45AL-C-RN-ML-30375-R.020
1/2	1/2	.030	5/8	4	1-3/8	.475	3	28285	28287	H45AL-C-RN-R-30500-R.030
	1/2	.030	5/8	4	1-3/4	.475	3	81301	81302	H45AL-C-RN-A-30500-R.030
	1/2	.030	5/8	4	2-1/4	.475	3	28300	28302	H45AL-C-RN-M-30500-R.030
	1/2	.030	5/8	5	2-3/4	.475	3	86614	86615	H45AL-C-RN-ML-30500-R.030 new
	1/2	.030	5/8	6	3-3/8	.475	3	28315	28317	H45AL-C-RN-L-30500-R.030
	1/2	.030	5/8	6	4-1/4	.475	3	28325	28327	H45AL-C-RN-X-30500-R.030
	1/2	.060	5/8	4	1-3/8	.475	3	86622	86623	H45AL-C-RN-R-30500-R.060 new
	1/2	.060	5/8	4	1-3/4	.475	3	86624	86625	H45AL-C-RN-A-30500-R.060 new
	1/2	.060	5/8	4	2-1/4	.475	3	86616	86617	H45AL-C-RN-M-30500-R.060 new
	1/2	.060	5/8	5	2-3/4	.475	3	86634	86635	H45AL-C-RN-ML-30500-R.060 new
	1/2	.060	5/8	6	3-3/8	.475	3	86618	86619	H45AL-C-RN-L-30500-R.060 new
	1/2	.060	5/8	6	4-1/4	.475	3	86620	86621	H45AL-C-RN-X-30500-R.060 new
5/8	5/8	.030	3/4	6	2-3/8	.593	3	28360	28362	H45AL-C-RN-M-30625-R.030 new
	5/8	.030	3/4	6	3-3/8	.593	3	28375	28377	H45AL-C-RN-L-30625-R.030 new
	5/8	.030	3/4	6	4-1/8	.593	3	86626	86627	H45AL-C-RN-LX-30625-R.030 new
3/4	3/4	.030	1	4	2	.712	3	28405	28407	H45AL-C-RN-R-30750-R.030
	3/4	.030	1	6	2-1/2	.712	3	28420	28422	H45AL-C-RN-M-30750-R.030
	3/4	.030	1	6	3	.712	3	81303	81304	H45AL-C-RN-ML-30750-R.030
	3/4	.030	1	6	3-3/8	.712	3	28435	28437	H45AL-C-RN-L-30750-R.030
	3/4	.030	1	6	4-3/8	.712	3	28445	28447	H45AL-C-RN-X-30750-R.030
	3/4	.060	1	4	2	.712	3	86628	86629	H45AL-C-RN-R-30750-R.060 new
	3/4	.060	1	6	2-1/2	.712	3	86630	86631	H45AL-C-RN-M-30750-R.060 new
	3/4	.060	1	6	3-3/8	.712	3	86632	86633	H45AL-C-RN-L-30750-R.060 new

*.0003 max TIR

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H45AL-C-RN-3



New Items! 3 FLUTE - CORNER RADIUS

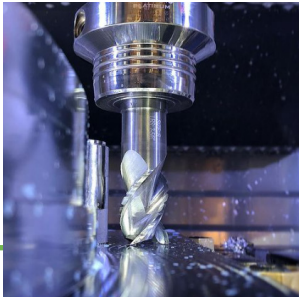
45° Helix - Chipbreaker Rougher - Reduced Neck (cont.)

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Cutter Dia.*	Shank Dia.	Corner Radius	Length of Cut	OAL	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	R ^{+0.02"} _{-.002"}	L ₂ ^{+0.032"} _{-.000"}	L ₁ ^{+0.062"} _{-.062"}	L ₃					
new new new 1	1	.030	1-1/4	5	2-5/8	.950	3	28465	28467	H45AL-C-RN-R-31000-R.030
	1	.030	1-1/4	6	3-3/8	.950	3	28480	28482	H45AL-C-RN-M-31000-R.030
	1	.030	1-1/4	7	4-3/8	.950	3	28495	28497	H45AL-C-RN-L-31000-R.030

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@nunevprecision



Follow Helical Tools on Instagram and See How We Help You Run Faster. Push Harder. Machine Smarter.

SKU: [28465](#)
 Coating: uncoated
 Cutter Dia: 1"
 Length of Cut: 1-1/4"
 Radius: .030"
 Reach (LBS): 2-5/8"

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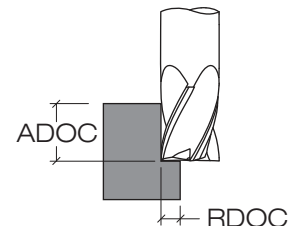
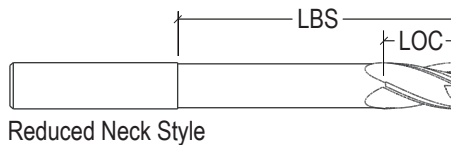
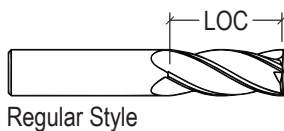
H45AL-C-3 / H45AL-C-RN-3

Material Guide	SFM	Inches per Tooth (IPT)													
		1/8		3/16		1/4		3/8		1/2		3/4		1	
		Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
WROUGHT ALUMINUM ALLOY 2014, 5062, 6061, 7050, 7075, 7475	2100	.0007	.0015	.0011	.0022	.0014	.0029	.0021	.0043	.0028	.0056	.0040	.0081	.0051	.0103
CAST ALUMINUM ALLOY 319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0011	.0023	.0017	.0034	.0022	.0045	.0033	.0067	.0044	.0088	.0062	.0125	.0080	.0160
COPPER ALLOY Cu-ETP, CuBe2, CuZn30, CuZn-36Pb3, CuZn10, CuSn5	770	.0008	.0015	.0011	.0023	.0015	.0030	.0022	.0045	.0029	.0059	.0042	.0084	.0053	.0107

MILLING PROCESS	ADOC	RDOC
Slot (Full Slotting)	Non-Reached	100%-150% Diameter
	Reached	Up to Max LOC
Rgh (Traditional Roughing)	Non-Reached	100%-150% Diameter
	Reached	Up to Max LOC

NOTES:

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Key: LOC=Length of Cut

ADOC=Axial Depth of Cut

RDOC=Radial Depth of Cut

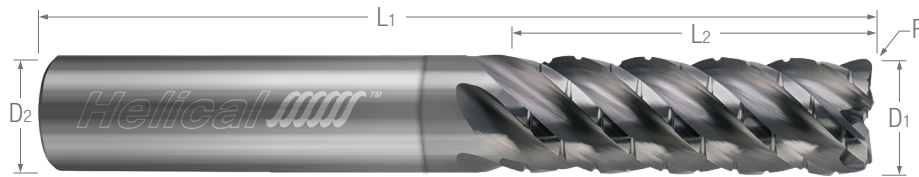
5 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch - For High Efficiency Milling



HVAL-C-5

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of aerospace aluminum alloys with excellent performance in other non-ferrous alloys
- Excellent tool life and maximum material removal rates proven through extensive testing
- Engineered with variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Nplus* coating for maximum performance in abrasive aluminums and extended tool life in a wide variety of non-ferrous alloys
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	OAL L1 ^{+0.062"} / _{-.062"}	Flutes	Uncoated	<i>Nplus</i> Coated	Tool Description
1/8	1/4	.010	1/4	2-1/2	5	84197	84198	HVAL-C-020-50125-R.010
	1/4	.010	3/8	2-1/2	5	84199	84200	HVAL-C-030-50125-R.010
	1/4	.010	1/2	2-1/2	5	84201	84202	HVAL-C-040-50125-R.010
	1/4	.030	1/4	2-1/2	5	84203	84204	HVAL-C-020-50125-R.030
	1/4	.030	3/8	2-1/2	5	84205	84206	HVAL-C-030-50125-R.030
	1/4	.030	1/2	2-1/2	5	84207	84208	HVAL-C-040-50125-R.030
3/16	1/4	.010	3/8	2-1/2	5	84209	84210	HVAL-C-020-50187-R.010
	1/4	.010	3/4	2-1/2	5	84211	84212	HVAL-C-040-50187-R.010
	1/4	.010	1	2-1/2	5	84213	84214	HVAL-C-053-50187-R.010
	1/4	.030	3/8	2-1/2	5	84215	84216	HVAL-C-020-50187-R.030
	1/4	.030	3/4	2-1/2	5	84217	84218	HVAL-C-040-50187-R.030
	1/4	.030	1	2-1/2	5	84219	84220	HVAL-C-053-50187-R.030
1/4	1/4	.010	1/2	2-1/2	5	84221	84222	HVAL-C-020-50250-R.010
	1/4	.010	3/4	2-1/2	5	84223	84224	HVAL-C-030-50250-R.010
	1/4	.010	1	3	5	84225	84226	HVAL-C-040-50250-R.010
	1/4	.030	1/2	2-1/2	5	84227	84228	HVAL-C-020-50250-R.030
	1/4	.030	3/4	2-1/2	5	84229	84230	HVAL-C-030-50250-R.030
	1/4	.030	1	3	5	84231	84232	HVAL-C-040-50250-R.030
3/8	3/8	.010	3/4	2-1/2	5	84233	84234	HVAL-C-020-50375-R.010
	3/8	.010	1	3	5	84235	84236	HVAL-C-026-50375-R.010
	3/8	.010	1-1/2	3-1/2	5	84237	84238	HVAL-C-040-50375-R.010
	3/8	.030	3/4	2-1/2	5	84239	84240	HVAL-C-020-50375-R.030
	3/8	.030	1	3	5	84241	84242	HVAL-C-026-50375-R.030
	3/8	.030	1-1/2	3-1/2	5	84243	84244	HVAL-C-040-50375-R.030

*.0003 max TIR

continued on next page

HVAL-C-5



5 FLUTE - CORNER RADIUS Chipbreaker Rougher - Variable Pitch - For High Efficiency Milling (cont.)

Roughers

continued from previous page

Cutter Dia.* D1 ^{+0.003"} -0.002"	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} -0.002"	Length of Cut L2 ^{+0.032"} -0.000"	OAL L1 ^{+0.062"} -0.062"	Flutes	Uncoated	Nplus Coated	Tool Description
1/2	1/2	.010	1	3	5	84245	84246	HVAL-C-020-50500-R.010
	1/2	.010	1-1/4	3	5	84247	84248	HVAL-C-025-50500-R.010
	1/2	.010	1-5/8	4	5	84249	84250	HVAL-C-032-50500-R.010
	1/2	.010	2	4	5	84251	84252	HVAL-C-040-50500-R.010
	1/2	.030	1	3	5	84253	84254	HVAL-C-020-50500-R.030
	1/2	.030	1-1/4	3	5	84255	84256	HVAL-C-025-50500-R.030
	1/2	.030	1-5/8	4	5	84257	84258	HVAL-C-032-50500-R.030
	1/2	.030	2	4	5	84259	84260	HVAL-C-040-50500-R.030
	1/2	.060	1	3	5	84261	84262	HVAL-C-020-50500-R.060
	1/2	.060	1-1/4	3	5	84263	84264	HVAL-C-025-50500-R.060
	1/2	.060	1-5/8	4	5	84265	84266	HVAL-C-032-50500-R.060
	1/2	.060	2	4	5	84267	84268	HVAL-C-040-50500-R.060
	1/2	.125	1	3	5	84269	84270	HVAL-C-020-50500-R.125
	1/2	.125	1-1/4	3	5	84271	84272	HVAL-C-025-50500-R.125
	1/2	.125	1-5/8	4	5	84273	84274	HVAL-C-032-50500-R.125
	1/2	.125	2	4	5	84275	84276	HVAL-C-040-50500-R.125
3/4	3/4	.030	1-5/8	4	5	84277	84278	HVAL-C-021-50750-R.030
	3/4	.030	2-1/4	5	5	84279	84280	HVAL-C-030-50750-R.030
	3/4	.060	1-5/8	4	5	84281	84282	HVAL-C-021-50750-R.060
	3/4	.060	2-1/4	5	5	84283	84284	HVAL-C-030-50750-R.060
	3/4	.125	1-5/8	4	5	84285	84286	HVAL-C-021-50750-R.125
	3/4	.125	2-1/4	5	5	84287	84288	HVAL-C-030-50750-R.125

*.0003 max TIR

HVAL-C-5																
Material Guide		SFM	Inches per Tooth (IPT)													
			1/8		3/16		1/4		3/8		1/2		3/4		1	
			HEM	Rgh	HEM	Rgh	HEM	Rgh	HEM	Rgh	HEM	Rgh	HEM	Rgh	HEM	Rgh
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0018	.0013	.0023	.0020	.0030	.0026	.0045	.0039	.0059	.0051	.0084	.0073	.0107	.0094
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0023	.0021	.0035	.0031	.0047	.0041	.0070	.0061	.0091	.0080	.0131	.0114	.0167	.0145
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0018	.0014	.0023	.0021	.0031	.0028	.0047	.0041	.0061	.0053	.0087	.0076	.0112	.0097

MILLING PROCESS	ADOC	RDOC
HEM (High Efficiency Milling)	Up to Max LOC	Up to 10% Diameter
Rgh (Traditional Roughing)	125%-200% Diameter	30%-40% Diameter

NOTES

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

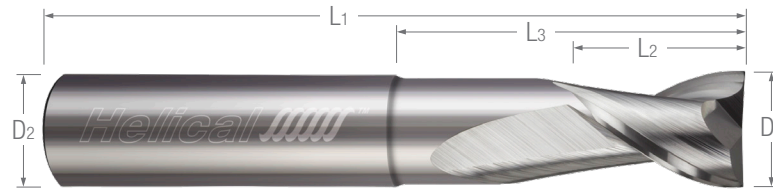
2 FLUTE - SQUARE

High Balance - Reduced Neck



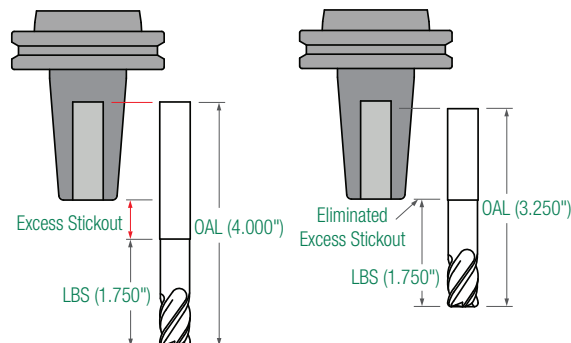
HMG-RN-2

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for high performance in Makino MAG machining centers capable of elevated RPMs and feed rates
- Precision balanced for high velocity machining in aluminum (up to 33,000 RPM)
- Shank length designed for optimal use in high performance tool holders, providing reduced excess stickout and increased rigidity
- Excellent performance in High Efficiency Milling (HEM)
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Tool Description
3/8	3/8	1/2	2-1/4	1-1/8	.356	2	59968	HMG-RN-030-20375
	3/8	1/2	2-3/4	1-1/2	.356	2	59971	HMG-RN-040-20375
	3/8	1/2	3-1/4	1-3/4	.356	2	59974	HMG-RN-046-20375
	3/8	1/2	3-1/4	2	.356	2	59977	HMG-RN-053-20375
1/2	1/2	5/8	2-3/4	1-3/8	.475	2	59980	HMG-RN-027-20500
	1/2	5/8	3-1/4	1-3/4	.475	2	59983	HMG-RN-035-20500
	1/2	5/8	3-3/4	2	.475	2	59986	HMG-RN-040-20500
	1/2	5/8	3-3/4	2-1/4	.475	2	59989	HMG-RN-045-20500
	1/2	5/8	4-1/4	2-1/2	.475	2	59992	HMG-RN-050-20500
	1/2	5/8	4-1/4	2-3/4	.475	2	59995	HMG-RN-055-20500
	1/2	5/8	4-3/4	3	.475	2	59998	HMG-RN-060-20500
3/4	3/4	1	4	2	.712	2	60001	HMG-RN-026-20750
	3/4	1	4-1/2	2-1/2	.712	2	60004	HMG-RN-033-20750
	3/4	1	5	3	.712	2	60007	HMG-RN-040-20750
	3/4	1	5	3-3/8	.712	2	60010	HMG-RN-045-20750
1	1	1-1/4	4-1/4	2-3/8	.950	2	60013	HMG-RN-023-21000
	1	1-1/4	4-1/4	2-5/8	.950	2	60016	HMG-RN-026-21000
	1	1-1/4	4-3/4	3	.950	2	60019	HMG-RN-030-21000

*.0003 max TIR



Shank length designed for optimal use in high performance tool holders, providing reduced excess stickout and increased rigidity.

HMG-RN-2

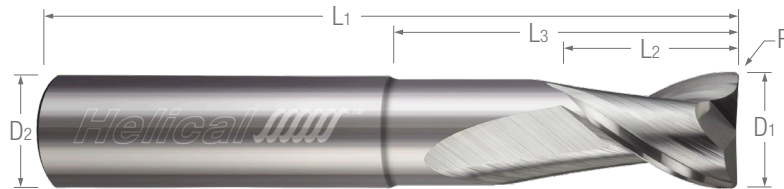


2 FLUTE - CORNER RADIUS

High Balance - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for high performance in Makino MAG machining centers capable of elevated RPMs and feed rates
- Precision balanced for high velocity machining in aluminum (up to 33,000 RPM)
- Shank length designed for optimal use in high performance tool holders, providing reduced excess stickout and increased rigidity
- Excellent performance in High Efficiency Milling (HEM)
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA

See page 22
for shank length
benefits



Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	LOC L2 $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L1 $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Tool Description
3/8	3/8	.030	1/2	2-1/4	1-1/8	.356	2	59969	HMG-RN-030-20375-R.030
	3/8	.030	1/2	2-3/4	1-1/2	.356	2	59972	HMG-RN-040-20375-R.030
	3/8	.030	1/2	3-1/4	1-3/4	.356	2	59975	HMG-RN-046-20375-R.030
	3/8	.030	1/2	3-1/4	2	.356	2	59978	HMG-RN-053-20375-R.030
	3/8	.060	1/2	2-1/4	1-1/8	.356	2	59970	HMG-RN-030-20375-R.060
	3/8	.060	1/2	2-3/4	1-1/2	.356	2	59973	HMG-RN-040-20375-R.060
	3/8	.060	1/2	3-1/4	1-3/4	.356	2	59976	HMG-RN-046-20375-R.060
	3/8	.060	1/2	3-1/4	2	.356	2	59979	HMG-RN-053-20375-R.060
	3/8	.125	3/8	3-1/4	1-3/4	.356	2	84578	HMG-RNS-046-20375-R.125
1/2	1/2	.030	5/8	2-3/4	1-3/8	.475	2	59981	HMG-RN-027-20500-R.030
	1/2	.030	5/8	3-1/4	1-3/4	.475	2	59984	HMG-RN-035-20500-R.030
	1/2	.030	5/8	3-3/4	2	.475	2	59987	HMG-RN-040-20500-R.030
	1/2	.030	5/8	3-3/4	2-1/4	.475	2	59990	HMG-RN-045-20500-R.030
	1/2	.030	5/8	4-1/4	2-1/2	.475	2	59993	HMG-RN-050-20500-R.030
	1/2	.030	5/8	4-1/4	2-3/4	.475	2	59996	HMG-RN-055-20500-R.030
	1/2	.030	5/8	4-3/4	3	.475	2	59999	HMG-RN-060-20500-R.030
	1/2	.060	5/8	2-3/4	1-3/8	.475	2	59982	HMG-RN-027-20500-R.060
	1/2	.060	5/8	3-1/4	1-3/4	.475	2	59985	HMG-RN-035-20500-R.060
	1/2	.060	5/8	3-3/4	2	.475	2	59988	HMG-RN-040-20500-R.060
	1/2	.060	5/8	3-3/4	2-1/4	.475	2	59991	HMG-RN-045-20500-R.060
	1/2	.060	5/8	4-1/4	2-1/2	.475	2	59994	HMG-RN-050-20500-R.060
	1/2	.060	5/8	4-1/4	2-3/4	.475	2	59997	HMG-RN-055-20500-R.060
	1/2	.060	5/8	4-3/4	3	.475	2	60000	HMG-RN-060-20500-R.060
1/2	.125	1/2	4	2-1/2	.475	2	84579	HMG-RNS-050-20500-R.125	
3/4	3/4	.030	1	4	2	.712	2	60002	HMG-RN-026-20750-R.030
	3/4	.030	1	4-1/2	2-1/2	.712	2	60005	HMG-RN-033-20750-R.030
	3/4	.030	1	5	3	.712	2	60008	HMG-RN-040-20750-R.030
	3/4	.030	1	5	3-3/8	.712	2	60011	HMG-RN-045-20750-R.030
	3/4	.060	1	4	2	.712	2	60003	HMG-RN-026-20750-R.060
	3/4	.060	1	4-1/2	2-1/2	.712	2	60006	HMG-RN-033-20750-R.060
	3/4	.060	1	5	3	.712	2	60009	HMG-RN-040-20750-R.060
	3/4	.060	1	5	3-3/8	.712	2	60012	HMG-RN-045-20750-R.060

*.0003 max TIR

continued on next page

2 FLUTE - CORNER RADIUS

High Balance - Reduced Neck (cont.)



HMG-RN-2

continued from previous page

Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	LOC L2 $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L1 $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Tool Description
1	1	.030	1-1/4	4-1/4	2-3/8	.950	2	60014	HMG-RN-023-21000-R.030
	1	.030	1-1/4	4-1/4	2-5/8	.950	2	60017	HMG-RN-026-21000-R.030
	1	.030	1-1/4	4-3/4	3	.950	2	60020	HMG-RN-030-21000-R.030
	1	.060	1-1/4	4-1/4	2-3/8	.950	2	60015	HMG-RN-023-21000-R.060
	1	.060	1-1/4	4-1/4	2-5/8	.950	2	60018	HMG-RN-026-21000-R.060
	1	.060	1-1/4	4-3/4	3	.950	2	60021	HMG-RN-030-21000-R.060

*.0003 max TIR

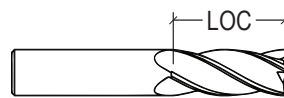
2 Flute

Material Guide		SFM	Inches per Tooth (IPT)																				
			1/8			3/16			1/4			3/8			1/2			3/4			1		
			Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0007	.0015	.0016	.0011	.0022	.0018	.0014	.0029	.0021	.0021	.0043	.0024	.0028	.0056	.0028	.0040	.0081	.0033	.0051	.0103	.0041
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0011	.0023	.0020	.0017	.0034	.0023	.0022	.0045	.0026	.0033	.0067	.0030	.0044	.0087	.0035	.0062	.0125	.0042	.0079	.0160	.0051
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0008	.0015	.0017	.0011	.0023	.0019	.0015	.0030	.0021	.0022	.0045	.0024	.0029	.0059	.0028	.0042	.0084	.0034	.0053	.0107	.0041

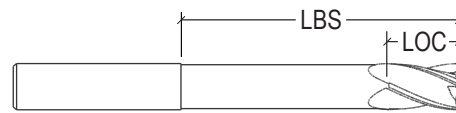
MILLING PROCESS	ADOC	RDOC
Slot (Full Slotting)	Up to Max LOC	100% Diameter
Rgh (Traditional Roughing)	Up to Max LOC	35%-50% Diameter
Fin (Finishing)	Up to Max LOC	4%-6% Diameter

NOTES:

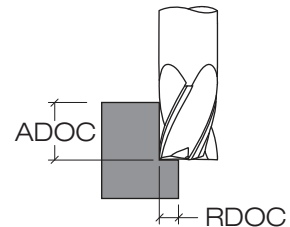
IPT values shown are for 4xD reach tools, and should be adjusted for longer or shorter reaches. For tools with reaches greater than 4xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Regular Style



Reduced Neck Style



Key: LOC=Length of Cut

ADOC=Axial Depth of Cut

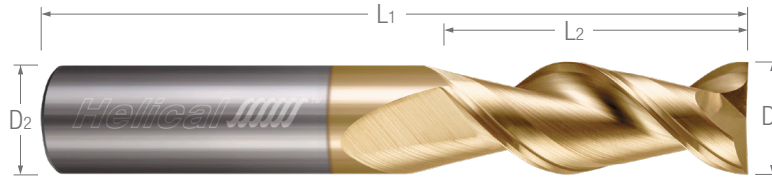
RDOC=Radial Depth of Cut

H45AL-2

2 FLUTE - SQUARE

45° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- Cylindrically ground to maintain edge strength
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



2 Flute

Cutter Diameter* D ₁ (h6)	Shank Diameter D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} _{-0.000"}	Overall Length L ₁ ^{+0.062"} _{-0.062"}	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	1/4	1-1/2	2	00015	00017	H45AL-S-20125
	1/8	3/8	2	2	00030	00032	H45AL-SR-20125
	1/8	1/2	2-1/2	2	00045	00047	H45AL-R-20125
	1/8	5/8	2-1/2	2	83405	83406	H45AL-M-20125
	1/8	3/4	2-1/2	2	00060	00062	H45AL-L-20125
	1/8	7/8	2-1/2	2	83407	83408	H45AL-LX-20125
3/16	3/16	5/16	2	2	00090	00092	H45AL-S-20187
	3/16	7/16	2	2	83409	83410	H45AL-SR-20187
	3/16	9/16	2-1/2	2	00105	00107	H45AL-R-20187
	3/16	3/4	2-1/2	2	00120	00122	H45AL-M-20187
	3/16	1	2-1/2	2	81311	81312	H45AL-ML-20187
1/4	1/4	3/8	2	2	00150	00152	H45AL-S-20250
	1/4	1/2	2-1/2	2	00155	00157	H45AL-SR-20250
	1/4	3/4	2-1/2	2	00165	00167	H45AL-R-20250
	1/4	1	3	2	00180	00182	H45AL-M-20250
	1/4	1-1/4	3	2	00195	00197	H45AL-L-20250
	1/4	1-3/4	4	2	00210	00212	H45AL-X-20250
5/16	5/16	7/16	2	2	00240	00242	H45AL-S-20312
	5/16	13/16	2-1/2	2	00255	00257	H45AL-R-20312
	5/16	1	3	2	00270	00272	H45AL-M-20312
	5/16	1-1/4	3	2	00285	00287	H45AL-L-20312
	5/16	2-1/8	4	2	00300	00302	H45AL-X-20312
3/8	3/8	1/2	2	2	00330	00332	H45AL-S-20375
	3/8	3/4	2-1/2	2	81313	81314	H45AL-SR-20375
	3/8	1	3	2	00345	00347	H45AL-R-20375
	3/8	1-1/4	3-1/2	2	00360	00362	H45AL-M-20375
	3/8	1-1/2	4	2	00375	00377	H45AL-L-20375
	3/8	2	4	2	00390	00392	H45AL-LX-20375
	3/8	2-1/2	5	2	00405	00407	H45AL-X-20375
1/2	1/2	5/8	2-1/2	2	00435	00437	H45AL-S-20500
	1/2	1	3	2	00450	00452	H45AL-SR-20500
	1/2	1-1/4	3	2	00465	00467	H45AL-R-20500
	1/2	1-5/8	4	2	00480	00482	H45AL-M-20500
	1/2	2	4	2	00495	00497	H45AL-L-20500
	1/2	2-1/2	5	2	00510	00512	H45AL-LX-20500
	1/2	3-1/8	6	2	00525	00527	H45AL-X-20500

*.0003 max TIR

2 FLUTE - SQUARE

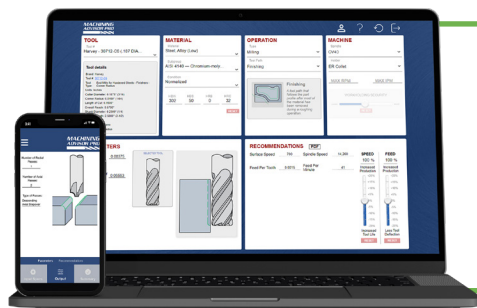
45° Helix (cont.)

H45AL-2

continued from previous page

Cutter Diameter* D ₁ (h6)	Shank Diameter D ₂ (h6)	Length of Cut L ₂ $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length L ₁ $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Uncoated	Zplus Coated	Tool Description
5/8	5/8	3/4	3	2	00555	00557	H45AL-S-20625
	5/8	1-5/8	3-1/2	2	00570	00572	H45AL-R-20625
	5/8	2-1/8	4	2	00585	00587	H45AL-M-20625
	5/8	2-1/2	5	2	00600	00602	H45AL-L-20625
	5/8	3-3/4	6	2	00615	00617	H45AL-X-20625
3/4	3/4	1	4	2	00645	00647	H45AL-S-20750
	3/4	1-5/8	4	2	00660	00662	H45AL-R-20750
	3/4	2	5	2	81315	81316	H45AL-A-20750
	3/4	2-1/4	5	2	00675	00677	H45AL-M-20750
	3/4	3-1/4	6	2	00690	00692	H45AL-L-20750
	3/4	4	7	2	00705	00707	H45AL-X-20750
1	1	2	5	2	00750	00752	H45AL-R-21000
	1	2-5/8	6	2	00765	00767	H45AL-M-21000
	1	3-1/4	6	2	00780	00782	H45AL-L-21000
	1	4-1/8	7	2	00795	00797	H45AL-X-21000

* .0003 max TIR



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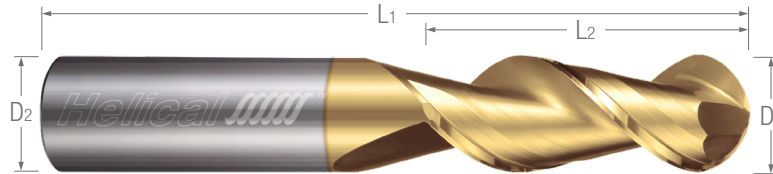


H45AL-2

2 FLUTE - BALL

45° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- Cylindrically ground to maintain edge strength
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}				
1/8	1/8	1/4	1-1/2	2	17015	17017	H45AL-S-20125-BN
	1/8	3/8	2	2	17030	17032	H45AL-SR-20125-BN
	1/8	1/2	2-1/2	2	17045	17047	H45AL-R-20125-BN
	1/8	5/8	2-1/2	2	83411	83412	H45AL-M-20125-BN
	1/8	3/4	2-1/2	2	81317	81318	H45AL-L-20125-BN
3/16	3/16	5/16	2	2	17090	17092	H45AL-S-20187-BN
	3/16	7/16	2	2	83413	83414	H45AL-SR-20187-BN
	3/16	9/16	2-1/2	2	17105	17107	H45AL-R-20187-BN
	3/16	3/4	2-1/2	2	81319	81320	H45AL-M-20187-BN
	3/16	1	2-1/2	2	83415	83416	H45AL-ML-20187-BN
1/4	1/4	3/8	2	2	17150	17152	H45AL-S-20250-BN
	1/4	1/2	2-1/2	2	17155	17157	H45AL-SR-20250-BN
	1/4	3/4	2-1/2	2	17165	17167	H45AL-R-20250-BN
	1/4	1	3	2	81321	81322	H45AL-M-20250-BN
	1/4	1-1/4	3	2	83417	83418	H45AL-L-20250-BN
5/16	5/16	7/16	2	2	17240	17242	H45AL-S-20312-BN
	5/16	13/16	2-1/2	2	17255	17257	H45AL-R-20312-BN
3/8	3/8	1/2	2	2	17330	17332	H45AL-S-20375-BN
	3/8	3/4	2-1/2	2	83419	83420	H45AL-SR-20375-BN
	3/8	1	3	2	17345	17347	H45AL-R-20375-BN
	3/8	1-1/4	3-1/2	2	83421	83422	H45AL-M-20375-BN
	3/8	1-1/2	3-1/2	2	81323	81324	H45AL-L-20375-BN
1/2	1/2	5/8	2-1/2	2	17435	17437	H45AL-S-20500-BN
	1/2	1	3	2	81325	81326	H45AL-SR-20500-BN
	1/2	1-1/4	3	2	17465	17467	H45AL-R-20500-BN
	1/2	1-5/8	4	2	83423	83424	H45AL-M-20500-BN
	1/2	2	4	2	83425	83426	H45AL-L-20500-BN
5/8	5/8	3/4	3	2	17555	17557	H45AL-S-20625-BN
3/4	3/4	1	4	2	17645	17647	H45AL-S-20750-BN
	3/4	1-5/8	4	2	17660	17662	H45AL-R-20750-BN
	3/4	2-1/4	5	2	83427	83428	H45AL-M-20750-BN
1	1	2	5	2	17750	17752	H45AL-R-21000-BN

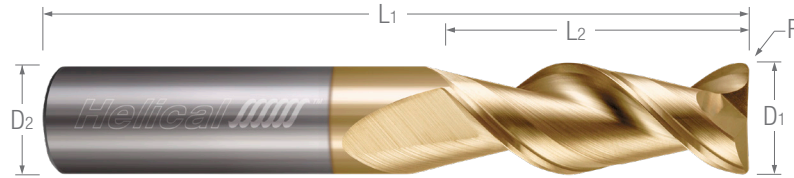
* .0003 max TIR

2 FLUTE - CORNER RADIUS

H45AL-2

45° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- Cylindrically ground to maintain edge strength
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia* D ₁ (h6)	Shank Diameter D ₂ (h6)	Corner Radius R $\begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut L ₂ $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length L ₁ $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Uncoated	<i>Zplus</i> Coated	Tool Description
1/8	1/8	.010	3/8	2	2	82329	82330	H45AL-SR-20125-R.010
	1/8	.010	1/2	2-1/2	2	82331	82332	H45AL-R-20125-R.010
	1/8	.010	3/4	2-1/2	2	82333	82334	H45AL-L-20125-R.010
3/16	3/16	.010	5/16	2	2	82335	82336	H45AL-S-20187-R.010
	3/16	.010	9/16	2-1/2	2	82337	82338	H45AL-R-20187-R.010
	3/16	.010	3/4	2-1/2	2	82339	82340	H45AL-M-20187-R.010
1/4	1/4	.010	1/2	2-1/2	2	82341	82342	H45AL-SR-20250-R.010
	1/4	.010	3/4	2-1/2	2	82343	82344	H45AL-R-20250-R.010
	1/4	.010	1	3	2	82345	82346	H45AL-M-20250-R.010
	1/4	.030	1/2	2-1/2	2	82347	82348	H45AL-SR-20250-R.030
	1/4	.030	3/4	2-1/2	2	82349	82350	H45AL-R-20250-R.030
3/8	1/4	.030	1	3	2	82351	82352	H45AL-M-20250-R.030
	3/8	.030	1/2	2	2	82353	82354	H45AL-S-20375-R.030
	3/8	.030	1	3	2	82355	82356	H45AL-R-20375-R.030
	3/8	.030	1-1/4	3-1/2	2	82357	82358	H45AL-M-20375-R.030
	3/8	.060	1/2	2	2	82359	82360	H45AL-S-20375-R.060
	3/8	.060	1	3	2	82361	82362	H45AL-R-20375-R.060
1/2	3/8	.060	1-1/4	3-1/2	2	82363	82364	H45AL-M-20375-R.060
	1/2	.030	1	3	2	82365	82366	H45AL-SR-20500-R.030
	1/2	.030	1-1/4	3	2	82367	82368	H45AL-R-20500-R.030
	1/2	.030	1-5/8	4	2	82369	82370	H45AL-M-20500-R.030
	1/2	.030	2	4	2	82371	82372	H45AL-L-20500-R.030
	1/2	.060	1	3	2	82373	82374	H45AL-SR-20500-R.060
	1/2	.060	1-1/4	3	2	82375	82376	H45AL-R-20500-R.060
	1/2	.060	1-5/8	4	2	82377	82378	H45AL-M-20500-R.060
3/4	1/2	.060	2	4	2	82379	82380	H45AL-L-20500-R.060
	3/4	.030	1-5/8	4	2	82381	82382	H45AL-R-20750-R.030
	3/4	.030	2-1/4	5	2	82383	82384	H45AL-M-20750-R.030
	3/4	.060	1-5/8	4	2	82385	82386	H45AL-R-20750-R.060
	3/4	.060	2-1/4	5	2	82387	82388	H45AL-M-20750-R.060

*.0003 max TIR

H45AL-RN-2

2 FLUTE - SQUARE
45° Helix - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- Cylindrically ground to maintain edge strength
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	LOC L ₂ ^{+0.032"} _{-.000"}	OAL L ₁ ^{+0.062"} _{-.062"}	Reach (LBS) L ₃	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	5/32	3	1/2	.118	2	02015	02017	H45AL-RN-R-20125
	1/8	5/32	3	3/4	.118	2	02030	02032	H45AL-RN-M-20125
	1/8	5/32	3	1	.118	2	81327	81328	H45AL-RN-L-20125
3/16	3/16	7/32	3	1/2	.178	2	02060	02062	H45AL-RN-R-20187
	3/16	7/32	3	3/4	.178	2	02075	02077	H45AL-RN-M-20187
	3/16	7/32	3	1	.178	2	81329	81330	H45AL-RN-ML-20187
1/4	1/4	3/8	4	3/4	.237	2	02105	02107	H45AL-RN-S-20250
	1/4	3/8	4	1-1/8	.237	2	02120	02122	H45AL-RN-R-20250
	1/4	3/8	4	1-5/8	.237	2	81331	81332	H45AL-RN-A-20250
	1/4	3/8	4	2-1/8	.237	2	02135	02137	H45AL-RN-M-20250
	1/4	3/8	4	2-1/2	.237	2	81333	81334	H45AL-RN-ML-20250
5/16	5/16	7/16	4	1-1/8	.296	2	02165	02167	H45AL-RN-R-20312
	5/16	7/16	4	2-1/8	.296	2	02180	02182	H45AL-RN-M-20312
	5/16	7/16	6	3-1/8	.296	2	02190	02192	H45AL-RN-L-20312
3/8	3/8	1/2	4	1-1/8	.356	2	02210	02212	H45AL-RN-R-20375
	3/8	1/2	4	1-5/8	.356	2	81335	81336	H45AL-RN-A-20375
	3/8	1/2	4	2-1/8	.356	2	02225	02227	H45AL-RN-M-20375
	3/8	1/2	5	2-1/2	.356	2	81337	81338	H45AL-RN-ML-20375
	3/8	1/2	6	3-1/8	.356	2	02235	02237	H45AL-RN-L-20375
	3/8	1/2	6	4	.356	2	02245	02247	H45AL-RN-X-20375
1/2	1/2	5/8	4	1-3/8	.475	2	02285	02287	H45AL-RN-R-20500
	1/2	5/8	4	1-3/4	.475	2	81339	81340	H45AL-RN-A-20500
	1/2	5/8	4	2-1/4	.475	2	02300	02302	H45AL-RN-M-20500
	1/2	5/8	4-1/2	2-3/4	.475	2	81341	81342	H45AL-RN-ML-20500
	1/2	5/8	6	3-3/8	.475	2	02315	02317	H45AL-RN-L-20500
	1/2	5/8	6	4-1/4	.475	2	02325	02327	H45AL-RN-X-20500
5/8	5/8	3/4	4	1-5/8	.593	2	02345	02347	H45AL-RN-R-20625
3/4	3/4	1	4	2	.712	2	02405	02407	H45AL-RN-R-20750
	3/4	1	6	2-1/2	.712	2	02420	02422	H45AL-RN-M-20750
	3/4	1	6	3-3/8	.712	2	02435	02437	H45AL-RN-L-20750
	3/4	1	6	4-3/8	.712	2	02445	02447	H45AL-RN-X-20750
1	1	1-1/4	5	2-5/8	.950	2	02465	02467	H45AL-RN-R-21000
	1	1-1/4	6	3-3/8	.950	2	02480	02482	H45AL-RN-M-21000
	1	1-1/4	7	4-3/8	.950	2	02495	02497	H45AL-RN-L-21000

*.0003 max TIR



2 FLUTE - BALL

H45AL-RN-2

45° Helix - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- Cylindrically ground to maintain edge strength
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} -0.000"	Overall Length L ₁ ^{+0.062"} -0.062"	Reach (LBS) L ₃	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	5/32	3	1/2	.118	2	18015	18017	H45AL-RN-R-20125-BN
	1/8	5/32	3	3/4	.118	2	18030	18032	H45AL-RN-M-20125-BN
	1/8	5/32	3	1	.118	2	81343	81344	H45AL-RN-L-20125-BN
3/16	3/16	7/32	3	1/2	.178	2	18060	18062	H45AL-RN-R-20187-BN
	3/16	7/32	3	3/4	.178	2	18075	18077	H45AL-RN-M-20187-BN
	3/16	7/32	3	1	.178	2	81345	81346	H45AL-RN-ML-20187-BN
1/4	1/4	3/8	4	3/4	.237	2	18105	18107	H45AL-RN-S-20250-BN
	1/4	3/8	4	1-1/8	.237	2	18120	18122	H45AL-RN-R-20250-BN
	1/4	3/8	4	1-5/8	.237	2	81347	81348	H45AL-RN-A-20250-BN
	1/4	3/8	4	2-1/8	.237	2	18135	18137	H45AL-RN-M-20250-BN
	1/4	3/8	4	2-1/2	.237	2	81349	81350	H45AL-RN-ML-20250-BN
5/16	5/16	7/16	4	1-1/8	.296	2	18165	18167	H45AL-RN-R-20312-BN
	5/16	7/16	4	2-1/8	.296	2	18180	18182	H45AL-RN-M-20312-BN
	5/16	7/16	6	3-1/8	.296	2	18190	18192	H45AL-RN-L-20312-BN
3/8	3/8	1/2	4	1-1/8	.356	2	18210	18212	H45AL-RN-R-20375-BN
	3/8	1/2	4	1-5/8	.356	2	81351	81352	H45AL-RN-A-20375-BN
	3/8	1/2	4	2-1/8	.356	2	18225	18227	H45AL-RN-M-20375-BN
	3/8	1/2	5	2-1/2	.356	2	81353	81354	H45AL-RN-ML-20375-BN
	3/8	1/2	6	3-1/8	.356	2	18235	18237	H45AL-RN-L-20375-BN
	3/8	1/2	6	4	.356	2	18245	18247	H45AL-RN-X-20375-BN
1/2	1/2	5/8	4	1-3/8	.475	2	18285	18287	H45AL-RN-R-20500-BN
	1/2	5/8	4	1-3/4	.475	2	81355	81356	H45AL-RN-A-20500-BN
	1/2	5/8	4	2-1/4	.475	2	18300	18302	H45AL-RN-M-20500-BN
	1/2	5/8	4-1/2	2-3/4	.475	2	81357	81358	H45AL-RN-ML-20500-BN
	1/2	5/8	6	3-3/8	.475	2	18315	18317	H45AL-RN-L-20500-BN
	1/2	5/8	6	4-1/4	.475	2	18325	18327	H45AL-RN-X-20500-BN
3/4	3/4	1	4	2	.712	2	18405	18407	H45AL-RN-R-20750-BN
	3/4	1	6	2-1/2	.712	2	18420	18422	H45AL-RN-M-20750-BN
	3/4	1	6	3-3/8	.712	2	18435	18437	H45AL-RN-L-20750-BN
	3/4	1	6	4-3/8	.712	2	18445	18447	H45AL-RN-X-20750-BN
1	1	1-1/4	5	2-5/8	.950	2	18465	18467	H45AL-RN-R-21000-BN
	1	1-1/4	6	3-3/8	.950	2	18480	18482	H45AL-RN-M-21000-BN
	1	1-1/4	7	4-3/8	.950	2	18495	18497	H45AL-RN-L-21000-BN

*.0003 max TIR

H45AL-RN-2

SPEEDS & FEEDS

45° Helix

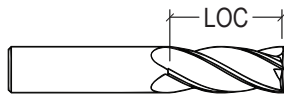
2 Flute

H45AL-2 / H45AL-RN-2

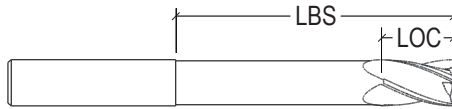
Material Guide		SFM	Inches per Tooth (IPT)																				
			1/8			3/16			1/4			3/8			1/2			3/4			1		
			Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0007	.0014	.0018	.0010	.0021	.0021	.0014	.0028	.0023	.0020	.0042	.0027	.0027	.0055	.0032	.0038	.0078	.0037	.0048	.0100	.0045
			.0011	.0023	.0023	.0016	.0033	.0026	.0022	.0044	.0029	.0032	.0066	.0034	.0042	.0086	.0039	.0060	.0124	.0047	.0077	.0157	.0057
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0007	.0015	.0019	.0011	.0022	.0021	.0014	.0029	.0024	.0021	.0044	.0027	.0028	.0057	.0032	.0040	.0082	.0038	.0051	.0104	.0047
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0007	.0015	.0019	.0011	.0022	.0021	.0014	.0029	.0024	.0021	.0044	.0027	.0028	.0057	.0032	.0040	.0082	.0038	.0051	.0104	.0047

MILLING PROCESS	STYLE	ADOC	RDOC
Slot (Full Slotting)	Non-Reached	Up to 200% Diameter	100% Diameter
	Reached	Up to Max LOC	100% Diameter
Rgh (Traditional Roughing)	Non-Reached	125%-200% Diameter	30%-50% Diameter
	Reached	Up to Max LOC	30%-50% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

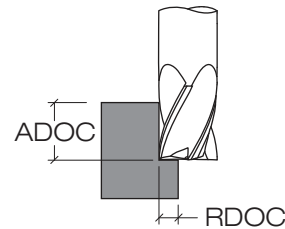
NOTES:
IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Regular Style



Reduced Neck Style



Key: LOC=Length of Cut

ADOC=Axial Depth of Cut

RDOC=Radial Depth of Cut

@gomanufacturing



Follow Helical Tools on Instagram and See How We Help You Run Faster. Push Harder. Machine Smarter.

SKU: 82141
Coating: uncoated
Cutter Dia: 1/2"
Length of Cut: 1-5/8"
Radius: .010"

@helicaltools

Tag us and share what you are working on @helicaltools

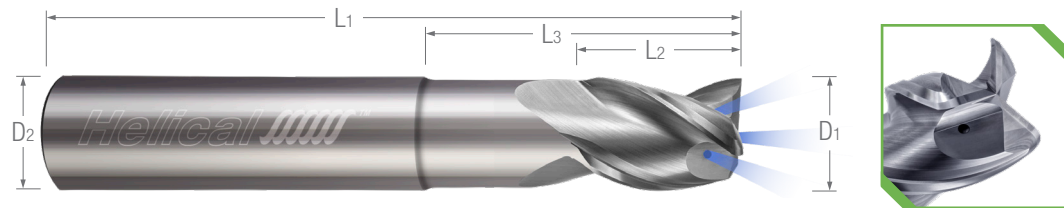
3 FLUTE - SQUARE



HMGC-RN-3

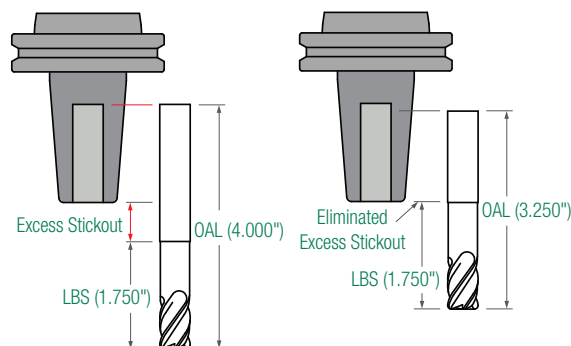
Coolant Through - High Balance - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for high performance in Makino MAG machining centers capable of elevated RPMs and feed rates
- Precision balanced for high velocity machining in aluminum (up to 33,000 RPM)
- Shank length designed for optimal use in high performance tool holders, providing reduced excess stickout and increased rigidity
- Excellent performance in High Efficiency Milling (HEM)
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased MRR
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Unique "3 teeth-to-center" end geometry for ramping applications
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA



Cutter Dia.*	Shank Dia.	Length of Cut	Overall Length	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Tool Description
D ₁ (h6)	D ₂ (h6)	L ₂ ^{+0.032"} _{-.000"}	L ₁ ^{+0.062"} _{-.062"}	L ₃				
3/8	3/8	1/2	2-1/4	1-1/8	.356	3	60022	HMGC-RN-030-30375
	3/8	1/2	2-3/4	1-1/2	.356	3	60025	HMGC-RN-040-30375
	3/8	1/2	3-1/4	1-3/4	.356	3	60028	HMGC-RN-046-30375
	3/8	1/2	3-1/4	2	.356	3	60031	HMGC-RN-053-30375
1/2	1/2	5/8	2-3/4	1-3/8	.475	3	60034	HMGC-RN-027-30500
	1/2	5/8	3-1/4	1-3/4	.475	3	60037	HMGC-RN-035-30500
	1/2	5/8	3-3/4	2	.475	3	60040	HMGC-RN-040-30500
	1/2	5/8	3-3/4	2-1/4	.475	3	60043	HMGC-RN-045-30500
	1/2	5/8	4-1/4	2-1/2	.475	3	60046	HMGC-RN-050-30500
	1/2	5/8	4-1/4	2-3/4	.475	3	60049	HMGC-RN-055-30500
	1/2	5/8	4-3/4	3	.475	3	60052	HMGC-RN-060-30500
3/4	3/4	1	4	2	.712	3	60055	HMGC-RN-026-30750
	3/4	1	4-1/2	2-1/2	.712	3	60058	HMGC-RN-033-30750
	3/4	1	5	3	.712	3	60061	HMGC-RN-040-30750
	3/4	1	5	3-3/8	.712	3	60064	HMGC-RN-045-30750
1	1	1-1/4	4-1/4	2-3/8	.950	3	60067	HMGC-RN-023-31000
	1	1-1/4	4-1/4	2-5/8	.950	3	60070	HMGC-RN-026-31000
	1	1-1/4	4-3/4	3	.950	3	60073	HMGC-RN-030-31000

*.0003 max TIR



Shank length designed for optimal use in high performance tool holders, providing reduced excess stickout and increased rigidity.

HMGC-RN-3

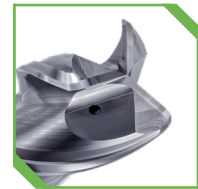
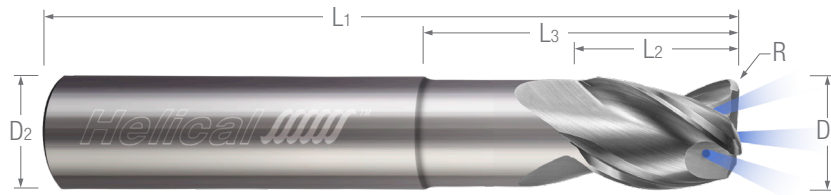


3 FLUTE - CORNER RADIUS

Coolant Through - High Balance - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for high performance in Makino MAG machining centers capable of elevated RPMs and feed rates
- Precision balanced for high velocity machining in aluminum (up to 33,000 RPM)
- Shank length designed for optimal use in high performance tool holders, providing reduced excess stickout and increased rigidity
- Excellent performance in High Efficiency Milling (HEM)
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased MRR
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Unique "3 teeth-to-center" end geometry for ramping applications
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA

See page 32
for shank
length benefits



3 Flute

Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	LOC L2 $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L1 $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Tool Description
3/8	3/8	.030	1/2	2-1/4	1-1/8	.356	3	60023	HMGC-RN-030-30375-R.030
	3/8	.030	1/2	2-3/4	1-1/2	.356	3	60026	HMGC-RN-040-30375-R.030
	3/8	.030	1/2	3-1/4	1-3/4	.356	3	60029	HMGC-RN-046-30375-R.030
	3/8	.030	1/2	3-1/4	2	.356	3	60032	HMGC-RN-053-30375-R.030
	3/8	.060	1/2	2-1/4	1-1/8	.356	3	60024	HMGC-RN-030-30375-R.060
	3/8	.060	1/2	2-3/4	1-1/2	.356	3	60027	HMGC-RN-040-30375-R.060
	3/8	.060	1/2	3-1/4	1-3/4	.356	3	60030	HMGC-RN-046-30375-R.060
	3/8	.060	1/2	3-1/4	2	.356	3	60033	HMGC-RN-053-30375-R.060
1/2	1/2	.030	5/8	2-3/4	1-3/8	.475	3	60035	HMGC-RN-027-30500-R.030
	1/2	.030	5/8	3-1/4	1-3/4	.475	3	60038	HMGC-RN-035-30500-R.030
	1/2	.030	5/8	3-3/4	2	.475	3	60041	HMGC-RN-040-30500-R.030
	1/2	.030	5/8	3-3/4	2-1/4	.475	3	60044	HMGC-RN-045-30500-R.030
	1/2	.030	5/8	4-1/4	2-1/2	.475	3	60047	HMGC-RN-050-30500-R.030
	1/2	.030	5/8	4-1/4	2-3/4	.475	3	60050	HMGC-RN-055-30500-R.030
	1/2	.030	5/8	4-3/4	3	.475	3	60053	HMGC-RN-060-30500-R.030
	1/2	.060	5/8	2-3/4	1-3/8	.475	3	60036	HMGC-RN-027-30500-R.060
	1/2	.060	5/8	3-1/4	1-3/4	.475	3	60039	HMGC-RN-035-30500-R.060
	1/2	.060	5/8	3-3/4	2	.475	3	60042	HMGC-RN-040-30500-R.060
	1/2	.060	5/8	3-3/4	2-1/4	.475	3	60045	HMGC-RN-045-30500-R.060
	1/2	.060	5/8	4-1/4	2-1/2	.475	3	60048	HMGC-RN-050-30500-R.060
	1/2	.060	5/8	4-1/4	2-3/4	.475	3	60051	HMGC-RN-055-30500-R.060
	1/2	.060	5/8	4-3/4	3	.475	3	60054	HMGC-RN-060-30500-R.060
3/4	3/4	.030	1	4	2	.712	3	60056	HMGC-RN-026-30750-R.030
	3/4	.030	1	4-1/2	2-1/2	.712	3	60059	HMGC-RN-033-30750-R.030
	3/4	.030	1	5	3	.712	3	60062	HMGC-RN-040-30750-R.030
	3/4	.030	1	5	3-3/8	.712	3	60065	HMGC-RN-045-30750-R.030
	3/4	.060	1	4	2	.712	3	60057	HMGC-RN-026-30750-R.060
	3/4	.060	1	4-1/2	2-1/2	.712	3	60060	HMGC-RN-033-30750-R.060
	3/4	.060	1	5	3	.712	3	60063	HMGC-RN-040-30750-R.060
	3/4	.060	1	5	3-3/8	.712	3	60066	HMGC-RN-045-30750-R.060
	3/4	.190	1	4-1/2	3	.712	3	84580	HMGC-RN-040-30750-R.190

*.0003 max TIR

continued on next page

3 FLUTE - CORNER RADIUS



HMGC-RN-3

Coolant Through - High Balance - Reduced Neck (cont.)

continued from previous page

Cutter Dia.*	Shank Dia.	Corner Radius	LOC	OAL	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Tool Description
D ₁ (h6)	D ₂ (h6)	R ^{+0.002"} _{-.002"}	L ₂ ^{+0.032"} _{-.000"}	L ₁ ^{+0.062"} _{-.062"}	L ₃				
1	1	.030	1-1/4	4-1/4	2-3/8	.950	3	60068	HMGC-RN-023-31000-R.030
	1	.030	1-1/4	4-1/4	2-5/8	.950	3	60071	HMGC-RN-026-31000-R.030
	1	.030	1-1/4	4-3/4	3	.950	3	60074	HMGC-RN-030-31000-R.030
	1	.060	1-1/4	4-1/4	2-3/8	.950	3	60069	HMGC-RN-023-31000-R.060
	1	.060	1-1/4	4-1/4	2-5/8	.950	3	60072	HMGC-RN-026-31000-R.060
	1	.060	1-1/4	4-3/4	3	.950	3	60075	HMGC-RN-030-31000-R.060
	1	.120	1	4-1/4	2	.950	3	84581	HMGC-RNS-020-31000-R.120

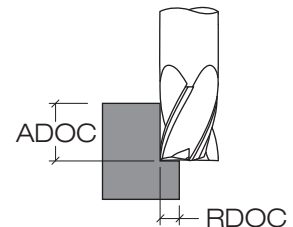
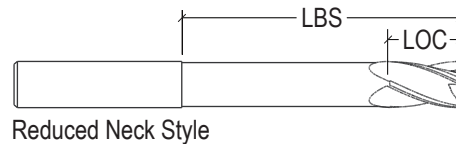
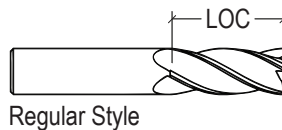
*.0003 max TIR

3 Flute

HMGC-RN-3																							
Material Guide		SFM	Inches per Tooth (IPT)																				
			1/8			3/16			1/4			3/8			1/2			3/4			1		
			Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0007	.0015	.0016	.0011	.0022	.0018	.0014	.0029	.0021	.0021	.0043	.0024	.0028	.0056	.0028	.0040	.0080	.0033	.0051	.0102	.0040
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0011	.0023	.0020	.0017	.0034	.0023	.0022	.0045	.0026	.0033	.0066	.0030	.0043	.0087	.0035	.0062	.0124	.0041	.0079	.0158	.0050
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0008	.0015	.0017	.0011	.0023	.0019	.0015	.0030	.0021	.0022	.0044	.0024	.0029	.0058	.0028	.0041	.0083	.0034	.0053	.0106	.0041

MILLING PROCESS	ADOC	RDOC
Slot (Full Slotting)	Up to Max LOC	100% Diameter
Rgh (Traditional Roughing)	Up to Max LOC	35%-50% Diameter
Fin (Finishing)	Up to Max LOC	4%-6% Diameter

NOTES:
IPT values shown are for 4xD reach tools, and should be adjusted for longer or shorter reaches. For tools with reaches greater than 4xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Key: LOC=Length of Cut ADOC=Axial Depth of Cut RDOC=Radial Depth of Cut

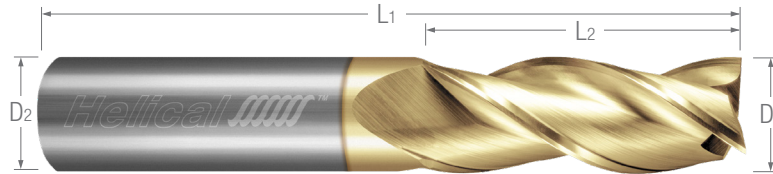
H35AL-3



3 FLUTE - SQUARE

35° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for tough roughing applications with 3 flutes and 35° helix
- Cylindrically ground to maintain edge strength
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}				
1/8	1/8	1/4	1-1/2	3	01015	01017	H35AL-S-30125
	1/8	3/8	2	3	01030	01032	H35AL-SR-30125
	1/8	1/2	2-1/2	3	01045	01047	H35AL-R-30125
	1/8	5/8	2-1/2	3	81359	81360	H35AL-M-30125
	1/8	3/4	2-1/2	3	81361	81362	H35AL-L-30125
	1/8	7/8	2-1/2	3	83429	83430	H35AL-LX-30125
3/16	3/16	5/16	2	3	01090	01092	H35AL-S-30187
	3/16	7/16	2	3	83431	83432	H35AL-SR-30187
	3/16	9/16	2-1/2	3	01105	01107	H35AL-R-30187
	3/16	3/4	2-1/2	3	81363	81364	H35AL-M-30187
	3/16	1	2-1/2	3	81365	81366	H35AL-L-30187
	3/16	1-3/16	3	3	83433	83434	H35AL-LX-30187
1/4	1/4	3/8	2	3	01150	01152	H35AL-S-30250
	1/4	1/2	2-1/2	3	01155	01157	H35AL-SR-30250
	1/4	5/8	2-1/2	3	01165	01167	H35AL-R-30250
	1/4	1	3	3	01180	01182	H35AL-M-30250
	1/4	1-1/4	3	3	01195	01197	H35AL-L-30250
	1/4	1-1/2	3	3	81367	81368	H35AL-LX-30250
	1/4	1-3/4	4	3	81369	81370	H35AL-X-30250
5/16	5/16	7/16	2	3	01240	01242	H35AL-S-30312
	5/16	5/8	2-1/2	3	01255	01257	H35AL-R-30312
	5/16	1	3	3	01270	01272	H35AL-M-30312
	5/16	1-1/4	3	3	01285	01287	H35AL-L-30312
	5/16	1-9/16	4	3	83435	83436	H35AL-LX-30312
	5/16	2-1/8	4	3	01300	01302	H35AL-X-30312
3/8	3/8	1/2	2	3	01330	01332	H35AL-S-30375
	3/8	3/4	2-1/2	3	81371	81372	H35AL-SR-30375
	3/8	1	3	3	01345	01347	H35AL-R-30375
	3/8	1-1/4	3-1/2	3	01360	01362	H35AL-M-30375
	3/8	1-1/2	4	3	01375	01377	H35AL-L-30375
	3/8	2	4	3	01390	01392	H35AL-LX-30375
	3/8	2-1/2	5	3	01405	01407	H35AL-X-30375

*.0003 max TIR

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Speeds & Feeds on Page 43

3 FLUTE - SQUARE

35° Helix (cont.)



H35AL-3

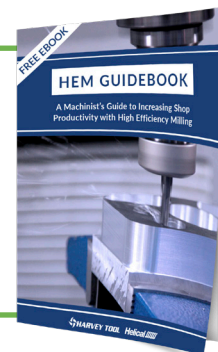
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Cutter Diameter* D1 (h6)	Shank Diameter D2 (h6)	Length of Cut L2 $^{+0.032''}$ $_{-0.000''}$	Overall Length L1 $^{+0.062''}$ $_{-0.062''}$	Flutes	Uncoated	Zplus Coated	Tool Description
1/2	1/2	5/8	2-1/2	3	01435	01437	H35AL-S-30500
	1/2	1	3	3	01450	01452	H35AL-SR-30500
	1/2	1-1/4	3	3	01465	01467	H35AL-R-30500
	1/2	1-5/8	4	3	01480	01482	H35AL-M-30500
	1/2	2	4	3	01495	01497	H35AL-L-30500
	1/2	2-1/2	5	3	01510	01512	H35AL-LX-30500
	1/2	3-1/8	6	3	01525	01527	H35AL-X-30500
	1/2	3-5/8	6	3	83437	83438	H35AL-Y-30500
5/8	5/8	3/4	3	3	01555	01557	H35AL-S-30625
	5/8	1-1/4	3-1/2	3	83439	83440	H35AL-SR-30625
	5/8	1-5/8	3-1/2	3	01570	01572	H35AL-R-30625
	5/8	2-1/8	4	3	01585	01587	H35AL-M-30625
	5/8	2-1/2	5	3	01600	01602	H35AL-L-30625
	5/8	3-1/4	6	3	01610	01612	H35AL-LX-30625
	5/8	3-3/4	6	3	01615	01617	H35AL-X-30625
3/4	3/4	1	4	3	01645	01647	H35AL-S-30750
	3/4	1-5/8	4	3	01660	01662	H35AL-R-30750
	3/4	2-1/4	5	3	01675	01677	H35AL-M-30750
	3/4	2-3/4	5	3	81373	81374	H35AL-ML-30750
	3/4	3-1/4	6	3	01690	01692	H35AL-L-30750
	3/4	4	6-1/2	3	01705	01707	H35AL-X-30750
1	1	1-1/4	4	3	01735	01737	H35AL-S-31000
	1	2	5	3	01750	01752	H35AL-R-31000
	1	2-5/8	6	3	01765	01767	H35AL-M-31000
	1	3-1/4	6	3	01780	01782	H35AL-L-31000
	1	4-1/4	7	3	01795	01797	H35AL-X-31000

*.0003 max TIR

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MH35AL-3

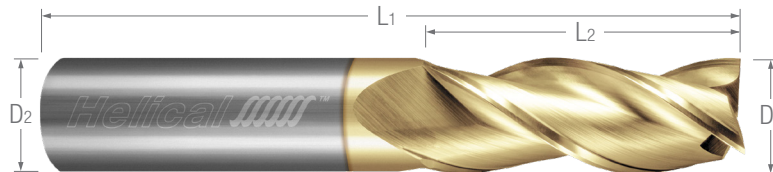
METRIC



3 FLUTE - SQUARE - METRIC

35° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for tough roughing applications with 3 flutes and 35° helix
- Cylindrically ground to maintain edge strength
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Uncoated	Zplus Coated	Tool Description
					D ₁ (h6)	D ₂ (h6)	
6 mm	6.00 mm	9.00 mm	63 mm	3	59690	59691	MH35AL-015-30600
	6.00 mm	12.00 mm	63 mm	3	59726	59727	MH35AL-020-30600
	6.00 mm	18.00 mm	63 mm	3	59794	59795	MH35AL-030-30600
8 mm	8.00 mm	12.00 mm	63 mm	3	59696	59697	MH35AL-015-30800
	8.00 mm	16.00 mm	63 mm	3	59732	59733	MH35AL-020-30800
	8.00 mm	24.00 mm	75 mm	3	59800	59801	MH35AL-030-30800
10 mm	10.00 mm	15.00 mm	63 mm	3	59702	59703	MH35AL-015-31000
	10.00 mm	20.00 mm	63 mm	3	59738	59739	MH35AL-020-31000
	10.00 mm	25.00 mm	75 mm	3	59766	59767	MH35AL-025-31000
12 mm	12.00 mm	18.00 mm	75 mm	3	59708	59709	MH35AL-015-31200
	12.00 mm	24.00 mm	75 mm	3	59744	59745	MH35AL-020-31200
	12.00 mm	30.00 mm	75 mm	3	59772	59773	MH35AL-025-31200
16 mm	16.00 mm	24.00 mm	89 mm	3	59714	59715	MH35AL-015-31600
	16.00 mm	32.00 mm	89 mm	3	59750	59751	MH35AL-020-31600
	16.00 mm	40.00 mm	89 mm	3	59778	59779	MH35AL-025-31600
20 mm	20.00 mm	30.00 mm	89 mm	3	59720	59721	MH35AL-015-32000
	20.00 mm	40.00 mm	100 mm	3	59756	59757	MH35AL-020-32000
	20.00 mm	50.00 mm	125 mm	3	59784	59785	MH35AL-025-32000
25 mm	25.00 mm	50.00 mm	125 mm	3	59762	59763	MH35AL-020-32500
	25.00 mm	64.00 mm	125 mm	3	59790	59791	MH35AL-025-32500

* .008 mm max TIR



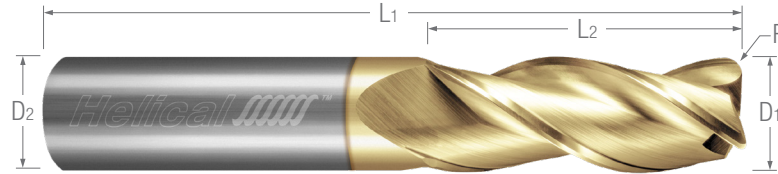
3 FLUTE - CORNER RADIUS



H35AL-3

35° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for tough roughing applications with 3 flutes and 35° helix
- Cylindrically ground to maintain edge strength
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Diameter* D1 (h6)	Shank Diameter D2 (h6)	Corner Radius R <small>+0.002* -0.002*</small>	Length of Cut L2 <small>+0.032* -0.000*</small>	Overall Length L1 <small>+0.062* -0.062*</small>	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	3	59000	59001	H35AL-S-30125-R.010
	1/8	.010	3/8	2	3	59008	59009	H35AL-SR-30125-R.010
	1/8	.010	1/2	2-1/2	3	82759	82760	H35AL-R-30125-R.010
	1/8	.015	1/4	1-1/2	3	59002	59003	H35AL-S-30125-R.015
	1/8	.015	3/8	2	3	59010	59011	H35AL-SR-30125-R.015
	1/8	.015	1/2	2-1/2	3	82761	82762	H35AL-R-30125-R.015
	1/8	.020	1/4	1-1/2	3	59004	59005	H35AL-S-30125-R.020
	1/8	.020	3/8	2	3	59012	59013	H35AL-SR-30125-R.020
	1/8	.020	1/2	2-1/2	3	82763	82764	H35AL-R-30125-R.020
	1/8	.030	1/4	1-1/2	3	59006	59007	H35AL-S-30125-R.030
	1/8	.030	3/8	2	3	59014	59015	H35AL-SR-30125-R.030
1/8	.030	1/2	2-1/2	3	82765	82766	H35AL-R-30125-R.030	
3/16	3/16	.010	5/16	2	3	59016	59017	H35AL-S-30187-R.010
	3/16	.010	9/16	2-1/2	3	59024	59025	H35AL-R-30187-R.010
	3/16	.010	3/4	2-1/2	3	82767	82768	H35AL-M-30187-R.010
	3/16	.015	5/16	2	3	59018	59019	H35AL-S-30187-R.015
	3/16	.015	9/16	2-1/2	3	59026	59027	H35AL-R-30187-R.015
	3/16	.015	3/4	2-1/2	3	82769	82770	H35AL-M-30187-R.015
	3/16	.020	5/16	2	3	59020	59021	H35AL-S-30187-R.020
	3/16	.020	9/16	2-1/2	3	59028	59029	H35AL-R-30187-R.020
	3/16	.020	3/4	2-1/2	3	82771	82772	H35AL-M-30187-R.020
	3/16	.030	5/16	2	3	59022	59023	H35AL-S-30187-R.030
	3/16	.030	9/16	2-1/2	3	59030	59031	H35AL-R-30187-R.030
3/16	.030	3/4	2-1/2	3	82773	82774	H35AL-M-30187-R.030	
1/4	1/4	.010	3/8	2	3	59032	59033	H35AL-S-30250-R.010
	1/4	.010	5/8	2-1/2	3	59042	59043	H35AL-R-30250-R.010
	1/4	.010	1	3	3	59052	59053	H35AL-M-30250-R.010
	1/4	.010	1-1/4	3	3	82775	82776	H35AL-L-30250-R.010
	1/4	.015	3/8	2	3	59034	59035	H35AL-S-30250-R.015
	1/4	.015	5/8	2-1/2	3	59044	59045	H35AL-R-30250-R.015
	1/4	.015	1	3	3	59054	59055	H35AL-M-30250-R.015
	1/4	.015	1-1/4	3	3	82777	82778	H35AL-L-30250-R.015
	1/4	.020	3/8	2	3	59036	59037	H35AL-S-30250-R.020
	1/4	.020	5/8	2-1/2	3	59046	59047	H35AL-R-30250-R.020
	1/4	.020	1	3	3	59056	59057	H35AL-M-30250-R.020
	1/4	.020	1-1/4	3	3	82779	82780	H35AL-L-30250-R.020
	1/4	.030	3/8	2	3	59038	59039	H35AL-S-30250-R.030
	1/4	.030	5/8	2-1/2	3	59048	59049	H35AL-R-30250-R.030
1/4	.030	1	3	3	59058	59059	H35AL-M-30250-R.030	
1/4	.030	1-1/4	3	3	82781	82782	H35AL-L-30250-R.030	

* .0003 max TIR

continued on next page



H35AL-3



3 FLUTE - CORNER RADIUS

35° Helix (cont.)

continued from previous page

Cutter Diameter* D ₁ (h6)	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002" -0.002"}	Length of Cut L ₂ ^{+0.032" -0.000"}	Overall Length L ₁ ^{+0.062" -0.062"}	Flutes	Uncoated	Zplus Coated	Tool Description
1/4	1/4	.060	3/8	2	3	59040	59041	H35AL-S-30250-R.060
	1/4	.060	5/8	2-1/2	3	59050	59051	H35AL-R-30250-R.060
	1/4	.060	1	3	3	59060	59061	H35AL-M-30250-R.060
	1/4	.060	1-1/4	3	3	82783	82784	H35AL-L-30250-R.060
5/16	5/16	.020	7/16	2	3	59062	59063	H35AL-S-30312-R.020
	5/16	.020	5/8	2-1/2	3	59068	59069	H35AL-R-30312-R.020
	5/16	.020	1	3	3	59074	59075	H35AL-M-30312-R.020
	5/16	.030	7/16	2	3	59064	59065	H35AL-S-30312-R.030
	5/16	.030	5/8	2-1/2	3	59070	59071	H35AL-R-30312-R.030
	5/16	.030	1	3	3	59076	59077	H35AL-M-30312-R.030
	5/16	.060	7/16	2	3	59066	59067	H35AL-S-30312-R.060
	5/16	.060	5/8	2-1/2	3	59072	59073	H35AL-R-30312-R.060
3/8	3/8	.010	1/2	2	3	59080	59081	H35AL-S-30375-R.010
	3/8	.010	1	3	3	59090	59091	H35AL-R-30375-R.010
	3/8	.010	1-1/4	3-1/2	3	59100	59101	H35AL-M-30375-R.010
	3/8	.010	1-1/2	4	3	82785	82786	H35AL-L-30375-R.010
	3/8	.015	1/2	2	3	59082	59083	H35AL-S-30375-R.015
	3/8	.015	1	3	3	59092	59093	H35AL-R-30375-R.015
	3/8	.015	1-1/4	3-1/2	3	59102	59103	H35AL-M-30375-R.015
	3/8	.020	1/2	2	3	59084	59085	H35AL-S-30375-R.020
	3/8	.020	1	3	3	59094	59095	H35AL-R-30375-R.020
	3/8	.020	1-1/4	3-1/2	3	59104	59105	H35AL-M-30375-R.020
	3/8	.030	1/2	2	3	59086	59087	H35AL-S-30375-R.030
	3/8	.030	1	3	3	59096	59097	H35AL-R-30375-R.030
	3/8	.030	1-1/4	3-1/2	3	59106	59107	H35AL-M-30375-R.030
	3/8	.030	1-1/2	4	3	82787	82788	H35AL-L-30375-R.030
	3/8	.060	1/2	2	3	59088	59089	H35AL-S-30375-R.060
	3/8	.060	1	3	3	59098	59099	H35AL-R-30375-R.060
3/8	.060	1-1/4	3-1/2	3	59108	59109	H35AL-M-30375-R.060	
3/8	.060	1-1/2	4	3	82789	82790	H35AL-L-30375-R.060	
1/2	1/2	.010	5/8	2-1/2	3	59110	59111	H35AL-S-30500-R.010
	1/2	.010	1	3	3	59124	59125	H35AL-SR-30500-R.010
	1/2	.010	1-1/4	3	3	59138	59139	H35AL-R-30500-R.010
	1/2	.010	1-5/8	4	3	59152	59153	H35AL-M-30500-R.010
	1/2	.015	5/8	2-1/2	3	59112	59113	H35AL-S-30500-R.015
	1/2	.015	1	3	3	59126	59127	H35AL-SR-30500-R.015
	1/2	.015	1-1/4	3	3	59140	59141	H35AL-R-30500-R.015
	1/2	.015	1-5/8	4	3	59154	59155	H35AL-M-30500-R.015
	1/2	.020	5/8	2-1/2	3	59114	59115	H35AL-S-30500-R.020
	1/2	.020	1	3	3	59128	59129	H35AL-SR-30500-R.020
	1/2	.020	1-1/4	3	3	59142	59143	H35AL-R-30500-R.020
	1/2	.020	1-5/8	4	3	59156	59157	H35AL-M-30500-R.020
	1/2	.020	2	4	3	82791	82792	H35AL-L-30500-R.020
	1/2	.030	5/8	2-1/2	3	59116	59117	H35AL-S-30500-R.030
	1/2	.030	1	3	3	59130	59131	H35AL-SR-30500-R.030
	1/2	.030	1-1/4	3	3	59144	59145	H35AL-R-30500-R.030
	1/2	.030	1-5/8	4	3	59158	59159	H35AL-M-30500-R.030
	1/2	.030	2	4	3	82793	82794	H35AL-L-30500-R.030
	1/2	.060	5/8	2-1/2	3	59118	59119	H35AL-S-30500-R.060
	1/2	.060	1	3	3	59132	59133	H35AL-SR-30500-R.060
1/2	.060	1-1/4	3	3	59146	59147	H35AL-R-30500-R.060	
1/2	.060	1-5/8	4	3	59160	59161	H35AL-M-30500-R.060	
1/2	.060	2	4	3	82795	82796	H35AL-L-30500-R.060	

*.0003 max TIR

continued on next page

3 FLUTE - CORNER RADIUS



H35AL-3

35° Helix (cont.)

continued from previous page

Cutter Diameter* D ₁ (h6)	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.02"} -0.02"	Length of Cut L ₂ ^{+0.032"} -0.000"	Overall Length L ₁ ^{+0.062"} -0.062"	Flutes	Uncoated	Zplus Coated	Tool Description
1/2	1/2	.090	5/8	2-1/2	3	59120	59121	H35AL-S-30500-R.090
	1/2	.090	1	3	3	59134	59135	H35AL-SR-30500-R.090
	1/2	.090	1-1/4	3	3	59148	59149	H35AL-R-30500-R.090
	1/2	.090	1-5/8	4	3	59162	59163	H35AL-M-30500-R.090
	1/2	.125	5/8	2-1/2	3	59122	59123	H35AL-S-30500-R.125
	1/2	.125	1	3	3	59136	59137	H35AL-SR-30500-R.125
	1/2	.125	1-1/4	3	3	59150	59151	H35AL-R-30500-R.125
	1/2	.125	1-5/8	4	3	59164	59165	H35AL-M-30500-R.125
5/8	5/8	.020	3/4	3	3	59166	59167	H35AL-S-30625-R.020
	5/8	.020	1-5/8	3-1/2	3	59174	59175	H35AL-R-30625-R.020
	5/8	.020	2-1/8	4	3	59182	59183	H35AL-M-30625-R.020
	5/8	.020	2-1/2	5	3	59190	59191	H35AL-L-30625-R.020
	5/8	.030	3/4	3	3	59168	59169	H35AL-S-30625-R.030
	5/8	.030	1-5/8	3-1/2	3	59176	59177	H35AL-R-30625-R.030
	5/8	.030	2-1/8	4	3	59184	59185	H35AL-M-30625-R.030
	5/8	.030	2-1/2	5	3	59192	59193	H35AL-L-30625-R.030
	5/8	.060	3/4	3	3	59170	59171	H35AL-S-30625-R.060
	5/8	.060	1-5/8	3-1/2	3	59178	59179	H35AL-R-30625-R.060
	5/8	.060	2-1/8	4	3	59186	59187	H35AL-M-30625-R.060
	5/8	.060	2-1/2	5	3	59194	59195	H35AL-L-30625-R.060
	5/8	.125	3/4	3	3	59172	59173	H35AL-S-30625-R.125
	5/8	.125	1-5/8	3-1/2	3	59180	59181	H35AL-R-30625-R.125
	5/8	.125	2-1/8	4	3	59188	59189	H35AL-M-30625-R.125
	5/8	.125	2-1/2	5	3	59196	59197	H35AL-L-30625-R.125
3/4	3/4	.030	1-5/8	4	3	59198	59199	H35AL-R-30750-R.030
	3/4	.030	2-1/4	5	3	59210	59211	H35AL-M-30750-R.030
	3/4	.030	3-1/4	6	3	59222	59223	H35AL-L-30750-R.030
	3/4	.030	4	6-1/2	3	82799	82800	H35AL-X-30750-R.030
	3/4	.060	1-5/8	4	3	59200	59201	H35AL-R-30750-R.060
	3/4	.060	2-1/4	5	3	59212	59213	H35AL-M-30750-R.060
	3/4	.060	3-1/4	6	3	59224	59225	H35AL-L-30750-R.060
	3/4	.060	4	6-1/2	3	82801	82802	H35AL-X-30750-R.060
	3/4	.090	1-5/8	4	3	59202	59203	H35AL-R-30750-R.090
	3/4	.090	2-1/4	5	3	59214	59215	H35AL-M-30750-R.090
	3/4	.090	3-1/4	6	3	59226	59227	H35AL-L-30750-R.090
	3/4	.125	1-5/8	4	3	59204	59205	H35AL-R-30750-R.125
	3/4	.125	2-1/4	5	3	59216	59217	H35AL-M-30750-R.125
	3/4	.125	3-1/4	6	3	59228	59229	H35AL-L-30750-R.125
	3/4	.125	4	6-1/2	3	82803	82804	H35AL-X-30750-R.125
	3/4	.190	1-5/8	4	3	59206	59207	H35AL-R-30750-R.190
	3/4	.190	2-1/4	5	3	59218	59219	H35AL-M-30750-R.190
	3/4	.190	3-1/4	6	3	59230	59231	H35AL-L-30750-R.190
	3/4	.250	1-5/8	4	3	59208	59209	H35AL-R-30750-R.250
	3/4	.250	2-1/4	5	3	59220	59221	H35AL-M-30750-R.250
3/4	.250	3-1/4	6	3	59232	59233	H35AL-L-30750-R.250	
3/4	.250	4	6-1/2	3	82805	82806	H35AL-X-30750-R.250	
1	1	.030	2	5	3	59234	59235	H35AL-R-31000-R.030
	1	.030	3-1/4	6	3	59242	59243	H35AL-L-31000-R.030
	1	.060	2	5	3	59236	59237	H35AL-R-31000-R.060
	1	.060	3-1/4	6	3	59244	59245	H35AL-L-31000-R.060
	1	.125	2	5	3	59238	59239	H35AL-R-31000-R.125
	1	.125	3-1/4	6	3	59246	59247	H35AL-L-31000-R.125
	1	.250	2	5	3	59240	59241	H35AL-R-31000-R.250
1	.250	3-1/4	6	3	59248	59249	H35AL-L-31000-R.250	

* .0003 max TIR

3 Flute

MH35AL-3

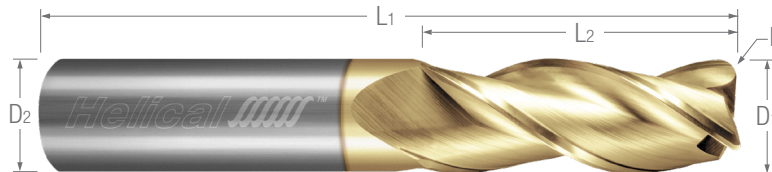
METRIC



3 FLUTE - CORNER RADIUS - METRIC

35° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for tough roughing applications with 3 flutes and 35° helix
- Cylindrically ground to maintain edge strength
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D ₁ (h6)	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.05 mm} / _{-0.05 mm}	LOC L ₂ ^{+0.80 mm} / _{-0.00 mm}	Overall Length L ₁ ^{+1.60 mm} / _{-1.60 mm}	Flutes	Uncoated	Zplus Coated	Tool Description
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	3	59692	59693	MH35AL-015-30600-R0.50
	6.00 mm	.50 mm	12.00 mm	63 mm	3	59728	59729	MH35AL-020-30600-R0.50
	6.00 mm	.50 mm	18.00 mm	63 mm	3	59796	59797	MH35AL-030-30600-R0.50
	6.00 mm	1.00 mm	9.00 mm	63 mm	3	59694	59695	MH35AL-015-30600-R1.00
	6.00 mm	1.00 mm	12.00 mm	63 mm	3	59730	59731	MH35AL-020-30600-R1.00
	6.00 mm	1.00 mm	18.00 mm	63 mm	3	59798	59799	MH35AL-030-30600-R1.00
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	3	59698	59699	MH35AL-015-30800-R0.50
	8.00 mm	.50 mm	16.00 mm	63 mm	3	59734	59735	MH35AL-020-30800-R0.50
	8.00 mm	.50 mm	24.00 mm	75 mm	3	59802	59803	MH35AL-030-30800-R0.50
	8.00 mm	1.00 mm	12.00 mm	63 mm	3	59700	59701	MH35AL-015-30800-R1.00
	8.00 mm	1.00 mm	16.00 mm	63 mm	3	59736	59737	MH35AL-020-30800-R1.00
	8.00 mm	1.00 mm	24.00 mm	75 mm	3	59804	59805	MH35AL-030-30800-R1.00
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	3	59704	59705	MH35AL-015-31000-R0.50
	10.00 mm	.50 mm	20.00 mm	63 mm	3	59740	59741	MH35AL-020-31000-R0.50
	10.00 mm	.50 mm	25.00 mm	75 mm	3	59768	59769	MH35AL-025-31000-R0.50
	10.00 mm	1.00 mm	15.00 mm	63 mm	3	59706	59707	MH35AL-015-31000-R1.00
	10.00 mm	1.00 mm	20.00 mm	63 mm	3	59742	59743	MH35AL-020-31000-R1.00
	10.00 mm	1.00 mm	25.00 mm	75 mm	3	59770	59771	MH35AL-025-31000-R1.00
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	3	59710	59711	MH35AL-015-31200-R0.50
	12.00 mm	.50 mm	24.00 mm	75 mm	3	59746	59747	MH35AL-020-31200-R0.50
	12.00 mm	.50 mm	30.00 mm	75 mm	3	59774	59775	MH35AL-025-31200-R0.50
	12.00 mm	1.00 mm	18.00 mm	75 mm	3	59712	59713	MH35AL-015-31200-R1.00
	12.00 mm	1.00 mm	24.00 mm	75 mm	3	59748	59749	MH35AL-020-31200-R1.00
	12.00 mm	1.00 mm	30.00 mm	75 mm	3	59776	59777	MH35AL-025-31200-R1.00
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	3	59716	59717	MH35AL-015-31600-R0.50
	16.00 mm	.50 mm	32.00 mm	89 mm	3	59752	59753	MH35AL-020-31600-R0.50
	16.00 mm	.50 mm	40.00 mm	89 mm	3	59780	59781	MH35AL-025-31600-R0.50
	16.00 mm	1.00 mm	24.00 mm	89 mm	3	59718	59719	MH35AL-015-31600-R1.00
	16.00 mm	1.00 mm	32.00 mm	89 mm	3	59754	59755	MH35AL-020-31600-R1.00
	16.00 mm	1.00 mm	40.00 mm	89 mm	3	59782	59783	MH35AL-025-31600-R1.00
20 mm	20.00 mm	.50 mm	30.00 mm	89 mm	3	59722	59723	MH35AL-015-32000-R0.50
	20.00 mm	.50 mm	40.00 mm	100 mm	3	59758	59759	MH35AL-020-32000-R0.50
	20.00 mm	.50 mm	50.00 mm	125 mm	3	59786	59787	MH35AL-025-32000-R0.50
	20.00 mm	1.00 mm	30.00 mm	89 mm	3	59724	59725	MH35AL-015-32000-R1.00
	20.00 mm	1.00 mm	40.00 mm	100 mm	3	59760	59761	MH35AL-020-32000-R1.00
	20.00 mm	1.00 mm	50.00 mm	125 mm	3	59788	59789	MH35AL-025-32000-R1.00
25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	3	59764	59765	MH35AL-020-32500-R1.00
	25.00 mm	1.00 mm	64.00 mm	125 mm	3	59792	59793	MH35AL-025-32500-R1.00

* .008 mm max TIR

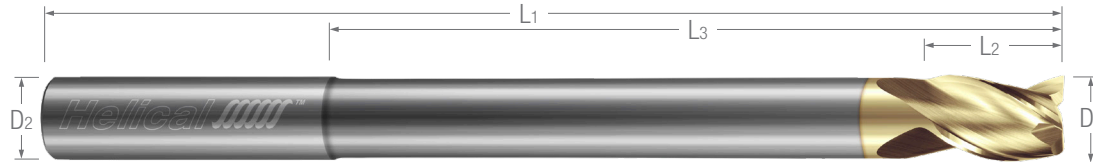
3 FLUTE - SQUARE

35° Helix - Reduced Neck



H35AL-RN-3

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for tough roughing applications with 3 flutes and 35° helix
- Cylindrically ground to maintain edge strength
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Dia.*	Shank Dia.	LOC	OAL	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
D1 (h6)	D2 (h6)	L2 ^{+0.032"} _{-.000"}	L1 ^{+0.062"} _{-.062"}	L3					
1/8	1/8	5/32	3	1/2	.118	3	04015	04017	H35AL-RN-R-30125
	1/8	5/32	3	5/8	.118	3	81375	81376	H35AL-RN-A-30125
	1/8	5/32	3	3/4	.118	3	04030	04032	H35AL-RN-M-30125
	1/8	5/32	3	1	.118	3	81377	81378	H35AL-RN-L-30125
	1/8	5/32	3	1-1/4	.118	3	83441	83442	H35AL-RN-LX-30125
3/16	3/16	7/32	3	1/2	.178	3	04060	04062	H35AL-RN-R-30187
	3/16	7/32	3	5/8	.178	3	81379	81380	H35AL-RN-A-30187
	3/16	7/32	3	3/4	.178	3	04075	04077	H35AL-RN-M-30187
	3/16	7/32	3	1	.178	3	81381	81382	H35AL-RN-ML-30187
	3/16	7/32	3	1-5/16	.178	3	83443	83444	H35AL-RN-LX-30187
1/4	1/4	3/8	4	3/4	.237	3	04105	04107	H35AL-RN-S-30250
	1/4	3/8	4	1-1/8	.237	3	04120	04122	H35AL-RN-R-30250
	1/4	3/8	4	1-5/8	.237	3	81383	81384	H35AL-RN-A-30250
	1/4	3/8	4	2-1/8	.237	3	04135	04137	H35AL-RN-M-30250
	1/4	3/8	4	2-1/2	.237	3	81385	81386	H35AL-RN-ML-30250
	1/4	3/8	4-1/2	3	.237	3	83445	83446	H35AL-RN-L-30250
5/16	5/16	7/16	4	1-1/8	.296	3	04165	04167	H35AL-RN-R-30312
	5/16	7/16	4	1-3/4	.296	3	83447	83448	H35AL-RN-A-30312
	5/16	7/16	4	2-1/8	.296	3	04180	04182	H35AL-RN-M-30312
	5/16	7/16	6	3-1/8	.296	3	04190	04192	H35AL-RN-L-30312
	5/16	7/16	6	4	.296	3	04200	04202	H35AL-RN-X-30312
3/8	3/8	1/2	4	1-1/8	.356	3	04210	04212	H35AL-RN-R-30375
	3/8	1/2	4	1-5/8	.356	3	81387	81388	H35AL-RN-A-30375
	3/8	1/2	4	2-1/8	.356	3	04225	04227	H35AL-RN-M-30375
	3/8	1/2	5	2-1/2	.356	3	81389	81390	H35AL-RN-ML-30375
	3/8	1/2	6	3-1/8	.356	3	04235	04237	H35AL-RN-L-30375
	3/8	1/2	6	3-1/2	.356	3	83449	83450	H35AL-RN-LX-30375
	3/8	1/2	6	4	.356	3	04245	04247	H35AL-RN-X-30375
1/2	1/2	5/8	4	1-3/8	.475	3	04285	04287	H35AL-RN-R-30500
	1/2	5/8	4	1-3/4	.475	3	81391	81392	H35AL-RN-A-30500
	1/2	5/8	4	2-1/4	.475	3	04300	04302	H35AL-RN-M-30500
	1/2	5/8	4-1/2	2-3/4	.475	3	81393	81394	H35AL-RN-ML-30500
	1/2	5/8	6	3-3/8	.475	3	04315	04317	H35AL-RN-L-30500
	1/2	5/8	6	4-1/4	.475	3	04325	04327	H35AL-RN-X-30500
	1/2	5/8	7	5	.475	3	83451	83452	H35AL-RN-Y-30500

* .0003 max TIR

continued on next page



H35AL-RN-3



3 FLUTE - SQUARE

35° Helix - Reduced Neck (cont.)

continued from previous page

Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	LOC L2 ^{+0.032"} -0.000"	OAL L1 ^{+0.062"} -0.062"	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
5/8	5/8	3/4	4	1-5/8	.593	3	04345	04347	H35AL-RN-R-30625
	5/8	3/4	6	2-3/8	.593	3	04360	04362	H35AL-RN-M-30625
	5/8	3/4	6	3-3/8	.593	3	04375	04377	H35AL-RN-L-30625
3/4	3/4	1	4	2	.712	3	04405	04407	H35AL-RN-R-30750
	3/4	1	6	2-1/2	.712	3	04420	04422	H35AL-RN-M-30750
	3/4	1	6	2-7/8	.712	3	81395	81396	H35AL-RN-ML-30750
	3/4	1	6	3-3/8	.712	3	04435	04437	H35AL-RN-L-30750
	3/4	1	6	4-3/8	.712	3	04445	04447	H35AL-RN-X-30750
1	1	1-1/4	5	2-5/8	.950	3	04465		H35AL-RN-R-31000
	1	1-1/4	6	3-3/8	.950	3	04480		H35AL-RN-M-31000
	1	1-1/4	7	4-3/8	.950	3	04495		H35AL-RN-L-31000

* .0003 max TIR

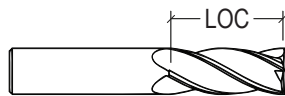
3 Flute

H35AL-3 / H35AL-RN-3

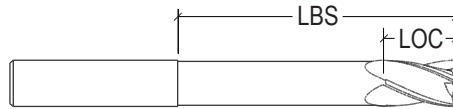
Material Guide		SFM	Inches per Tooth (IPT)																				
			1/8			3/16			1/4			3/8			1/2			3/4			1		
			Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0007	.0013	.0016	.0011	.0019	.0018	.0014	.0026	.0020	.0021	.0038	.0023	.0027	.0050	.0027	.0039	.0072	.0033	.0050	.0091	.0039
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0011	.0020	.0020	.0017	.0030	.0022	.0022	.0040	.0025	.0033	.0059	.0029	.0043	.0078	.0034	.0061	.0111	.0040	.0078	.0142	.0049
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0008	.0014	.0016	.0011	.0020	.0018	.0015	.0027	.0021	.0022	.0040	.0024	.0029	.0052	.0028	.0041	.0074	.0033	.0052	.0095	.0040

MILLING PROCESS	STYLE	ADOC	RDOC
Slot (Full Slotting)	Non-Reached	75%-125% Diameter	100% Diameter
	Reached	Up to Max LOC	100% Diameter
Rgh (Traditional Roughing)	Non-Reached	125%-200% Diameter	30%-40% Diameter
	Reached	Up to Max LOC	30%-40% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

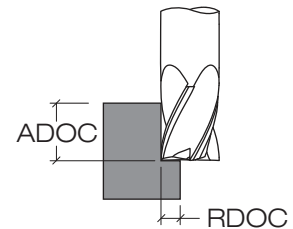
NOTES:
IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Regular Style



Reduced Neck Style



Key: LOC=Length of Cut

ADOC=Axial Depth of Cut

RDOC=Radial Depth of Cut

3 FLUTE - CORNER RADIUS

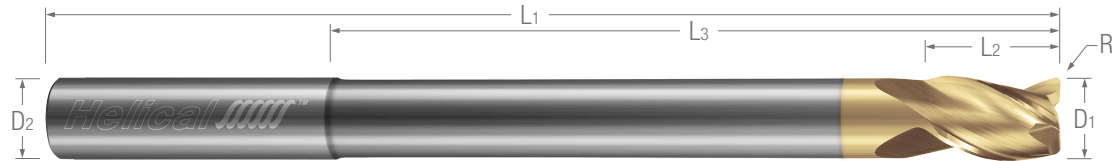
New!



H35AL-RN-3

35° Helix - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed for tough roughing applications with 3 flutes and 35° helix
- Cylindrically ground to maintain edge strength
- Excellent performance in High Efficiency Milling (HEM)
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Dia.*	Shank Dia.	Corner Radius	Length of Cut	Overall Length	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description	
D1 (h6)	D2 (h6)	R ^{+0.02"} / _{-.002"}	L2 ^{+0.02"} / _{-.000"}	L1 ^{+0.02"} / _{-.002"}	L3						
1/8	1/8	.010	5/32	3	1/2	.118	3	86636	86637	H35AL-RN-R-30125-R.010	new
	1/8	.010	5/32	3	5/8	.118	3	86638	86639	H35AL-RN-A-30125-R.010	new
	1/8	.010	5/32	3	3/4	.118	3	86640	86641	H35AL-RN-M-30125-R.010	new
	1/8	.010	5/32	3	1	.118	3	86642	86643	H35AL-RN-L-30125-R.010	new
	1/8	.030	5/32	3	1/2	.118	3	86644	86645	H35AL-RN-R-30125-R.030	new
	1/8	.030	5/32	3	5/8	.118	3	86646	86647	H35AL-RN-A-30125-R.030	new
	1/8	.030	5/32	3	3/4	.118	3	86648	86649	H35AL-RN-M-30125-R.030	new
	1/8	.030	5/32	3	1	.118	3	86650	86651	H35AL-RN-L-30125-R.030	new
3/16	3/16	.010	7/32	3	1/2	.178	3	86652	86653	H35AL-RN-R-30187-R.010	new
	3/16	.010	7/32	3	5/8	.178	3	86654	86655	H35AL-RN-A-30187-R.010	new
	3/16	.010	7/32	3	3/4	.178	3	86656	86657	H35AL-RN-M-30187-R.010	new
	3/16	.010	7/32	3	1	.178	3	86658	86659	H35AL-RN-ML-30187-R.010	new
	3/16	.030	7/32	3	1/2	.178	3	86660	86661	H35AL-RN-R-30187-R.030	new
	3/16	.030	7/32	3	5/8	.178	3	86662	86663	H35AL-RN-A-30187-R.030	new
	3/16	.030	7/32	3	3/4	.178	3	86664	86665	H35AL-RN-M-30187-R.030	new
	3/16	.030	7/32	3	1	.178	3	86666	86667	H35AL-RN-ML-30187-R.030	new
1/4	1/4	.010	3/8	4	3/4	.237	3	86668	86669	H35AL-RN-S-30250-R.010	new
	1/4	.010	3/8	4	1-1/8	.237	3	86670	86671	H35AL-RN-R-30250-R.010	new
	1/4	.010	3/8	4	1-5/8	.237	3	86672	86673	H35AL-RN-A-30250-R.010	new
	1/4	.010	3/8	4	2-1/8	.237	3	86674	86675	H35AL-RN-M-30250-R.010	new
	1/4	.010	3/8	4	2-1/2	.237	3	86676	86677	H35AL-RN-ML-30250-R.010	new
	1/4	.030	3/8	4	3/4	.237	3	86678	86679	H35AL-RN-S-30250-R.030	new
	1/4	.030	3/8	4	1-1/8	.237	3	86680	86681	H35AL-RN-R-30250-R.030	new
	1/4	.030	3/8	4	1-5/8	.237	3	86682	86683	H35AL-RN-A-30250-R.030	new
	1/4	.030	3/8	4	2-1/8	.237	3	86684	86685	H35AL-RN-M-30250-R.030	new
1/4	.030	3/8	4	2-1/2	.237	3	86686	86687	H35AL-RN-ML-30250-R.030	new	

*.0003 max TIR

continued on next page

H35AL-RN-3



New!

3 FLUTE - CORNER RADIUS

35° Helix - Reduced Neck (cont.)

continued from previous page

	Cutter Dia.*	Shank Dia.	Corner Radius	Length of Cut	Overall Length	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description	
	D ₁ (h6)	D ₂ (h6)	R $\begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	L ₂ $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	L ₁ $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	L ₃						
new	3/8	3/8	.010	1/2	4	1-1/8	.356	3	86688	86689	H35AL-RN-R-30375-R.010	
new		3/8	.010	1/2	4	1-5/8	.356	3	86690	86691	H35AL-RN-A-30375-R.010	
new		3/8	.010	1/2	4	2-1/8	.356	3	86692	86693	H35AL-RN-M-30375-R.010	
new		3/8	.010	1/2	5	2-1/2	.356	3	86694	86695	H35AL-RN-ML-30375-R.010	
new		3/8	.010	1/2	6	3-1/8	.356	3	86696	86697	H35AL-RN-L-30375-R.010	
new		3/8	.030	1/2	4	1-1/8	.356	3	86698	86699	H35AL-RN-R-30375-R.030	
new		3/8	.030	1/2	4	1-5/8	.356	3	86700	86701	H35AL-RN-A-30375-R.030	
new		3/8	.030	1/2	4	2-1/8	.356	3	86702	86703	H35AL-RN-M-30375-R.030	
new		3/8	.030	1/2	5	2-1/2	.356	3	86704	86705	H35AL-RN-ML-30375-R.030	
new		3/8	.030	1/2	6	3-1/8	.356	3	86706	86707	H35AL-RN-L-30375-R.030	
new		1/2	1/2	.030	5/8	4	1-3/8	.475	3	86708	86709	H35AL-RN-R-30500-R.030
new			1/2	.030	5/8	4	1-3/4	.475	3	86710	86711	H35AL-RN-A-30500-R.030
new	1/2		.030	5/8	4	2-1/4	.475	3	86712	86713	H35AL-RN-M-30500-R.030	
new	1/2		.030	5/8	4-1/2	2-3/4	.475	3	86714	86715	H35AL-RN-ML-30500-R.030	
new	1/2		.030	5/8	6	3-3/8	.475	3	86716	86717	H35AL-RN-L-30500-R.030	
new	1/2		.030	5/8	6	4-1/4	.475	3	86718	86719	H35AL-RN-X-30500-R.030	
new	1/2		.060	5/8	4	1-3/8	.475	3	86720	86721	H35AL-RN-R-30500-R.060	
new	1/2		.060	5/8	4	1-3/4	.475	3	86722	86723	H35AL-RN-A-30500-R.060	
new	1/2		.060	5/8	4	2-1/4	.475	3	86724	86725	H35AL-RN-M-30500-R.060	
new	1/2		.060	5/8	4-1/2	2-3/4	.475	3	86726	86727	H35AL-RN-ML-30500-R.060	
new	1/2		.060	5/8	6	3-3/8	.475	3	86728	86729	H35AL-RN-L-30500-R.060	
new	1/2		.060	5/8	6	4-1/4	.475	3	86730	86731	H35AL-RN-X-30500-R.060	
new	3/4	3/4	.030	1	4	2	.712	3	86732	86733	H35AL-RN-R-30750-R.030	
new		3/4	.030	1	6	2-1/2	.712	3	86734	86735	H35AL-RN-M-30750-R.030	
new		3/4	.030	1	6	3-3/8	.712	3	86736	86737	H35AL-RN-L-30750-R.030	
new		3/4	.030	1	6	4-3/8	.712	3	86738	86739	H35AL-RN-X-30750-R.030	
new		3/4	.060	1	4	2	.712	3	86740	86741	H35AL-RN-R-30750-R.060	
new		3/4	.060	1	6	2-1/2	.712	3	86742	86743	H35AL-RN-M-30750-R.060	
new		3/4	.060	1	6	3-3/8	.712	3	86744	86745	H35AL-RN-L-30750-R.060	
new		3/4	.060	1	6	4-3/8	.712	3	86746	86747	H35AL-RN-X-30750-R.060	

*.0003 max TIR

3 FLUTE - SQUARE

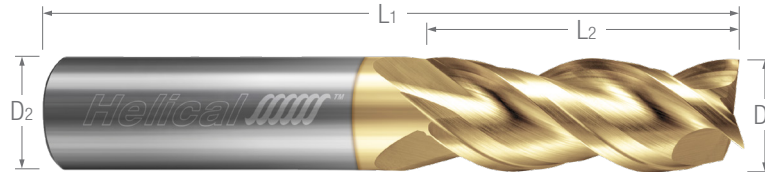
New Items!



H40ALV-3

40° Helix - Variable Pitch

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a specialized combination of features for excellent performance in roughing and finishing applications
- Unique "3 teeth-to-center" end geometry for ramping applications
- Wiper flat design leaves superior floor finish
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Uncoated tool offers an excellent option for aluminum finishing applications
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Diameter* D ₁ (h6)	Shank Diameter D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} _{-0.000"}	Overall Length L ₁ ^{+0.062"} _{-0.062"}	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	1/4	1-1/2	3	48000	48001	H40ALV-S-30125
	1/8	3/8	2	3	48010	48011	H40ALV-SR-30125
	1/8	1/2	2-1/2	3	48020	48021	H40ALV-R-30125
	1/8	5/8	2-1/2	3	82389	82390	H40ALV-M-30125
	1/8	3/4	2-1/2	3	81397	81398	H40ALV-L-30125
	1/8	7/8	2-1/2	3	83521	83522	H40ALV-LX-30125
	1/8	1	2-1/2	3	86960	86961	H40ALV-X-30125 new
3/16	3/16	3/8	2	3	48030	48031	H40ALV-S-30187
	3/16	3/4	2-1/2	3	48045	48046	H40ALV-R-30187
	3/16	1	3	3	48060	48061	H40ALV-M-30187
	3/16	1-3/16	3	3	86962	86963	H40ALV-ML-30187 new
	3/16	1-3/8	3	3	82391	82392	H40ALV-L-30187
	3/16	1-9/16	4	3	86062	86063	H40ALV-LX-30187
1/4	1/4	3/8	2	3	48075	48076	H40ALV-S-30250
	1/4	1/2	2	3	81399	81400	H40ALV-SR-30250
	1/4	3/4	2-1/2	3	48115	48116	H40ALV-R-30250
	1/4	1	3	3	48135	48136	H40ALV-M-30250
	1/4	1-1/4	3	3	81401	81402	H40ALV-L-30250
	1/4	1-1/2	3	3	81403	81404	H40ALV-LX-30250
	1/4	1-3/4	4	3	83523	83524	H40ALV-X-30250
	1/4	2	4	3	86064	86065	H40ALV-Y-30250
5/16	5/16	7/16	2	3	81405	81406	H40ALV-S-30312
	5/16	3/4	2-1/2	3	81407	81408	H40ALV-R-30312
	5/16	1	3	3	81409	81410	H40ALV-M-30312
	5/16	1-1/4	3	3	82393	82394	H40ALV-L-30312
	5/16	1-9/16	4	3	86066	86067	H40ALV-LX-30312
3/8	3/8	1/2	2	3	48235	48236	H40ALV-S-30375
	3/8	3/4	2-1/2	3	81411	81412	H40ALV-SR-30375
	3/8	1	2-1/2	3	48260	48261	H40ALV-R-30375
	3/8	1-1/4	3	3	81413	81414	H40ALV-M-30375
	3/8	1-1/2	3-1/2	3	48310	48311	H40ALV-L-30375
	3/8	2	4	3	82395	82396	H40ALV-LX-30375
	3/8	2-1/2	5	3	86068	86069	H40ALV-X-30375

* .0003 max TIR

continued on next page



H40ALV-3



New Items!

3 FLUTE - SQUARE

40° Helix - Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}				
1/2	1/2	5/8	2-1/2	3	48335	48336	H40ALV-S-30500
	1/2	1	3	3	48365	48366	H40ALV-SR-30500
	1/2	1-1/4	3	3	48395	48396	H40ALV-R-30500
	1/2	1-5/8	4	3	48425	48426	H40ALV-M-30500
	1/2	2	4	3	48455	48456	H40ALV-L-30500
	1/2	2-1/2	5	3	81415	81416	H40ALV-LX-30500
	1/2	3-1/8	6	3	82397	82398	H40ALV-X-30500
	1/2	3-5/8	6	3	86070	86071	H40ALV-Y-30500
5/8	5/8	3/4	3	3	48485	48486	H40ALV-S-30625
	5/8	1-1/4	3-1/2	3	48510	48511	H40ALV-SR-30625
	5/8	1-5/8	4	3	48535	48536	H40ALV-R-30625
	5/8	2	4	3	82399	82400	H40ALV-M-30625
	5/8	2-1/2	4	3	86964	86965	H40ALV-ML-30625
3/4	3/4	1	3	3	48585	48586	H40ALV-S-30750
	3/4	1-5/8	4	3	48620	48621	H40ALV-R-30750
	3/4	2-1/4	5	3	48655	48656	H40ALV-M-30750
	3/4	2-3/4	5	3	81417	81418	H40ALV-ML-30750
	3/4	3-1/4	6	3	83525	83526	H40ALV-L-30750
	3/4	4	6-1/2	3	86966	86967	H40ALV-LX-30750
1	1	1-1/4	4	3	48690	48691	H40ALV-S-31000
	1	2	5	3	48725	48726	H40ALV-R-31000
	1	3-1/4	6	3	48760	48761	H40ALV-M-31000
	1	4-1/4	7	3	86072	86073	H40ALV-L-31000

*.0003 max TIR

Attacking Aluminum: A Machining Guide

Are you attacking aluminum the right way? Aluminum is one of the most commonly machined materials, and is used in many different industries. But with so much popularity, competition for aluminum machining can be intense. Our "In the Loupe," blog post *Attacking Aluminum: A Machining Guide* teaches you how to gain a competitive advantage.

www.harveypformance.com/in-the-loupe/aluminum-machining-guide/

In The Loupe
MACHINISTS BLOG



SCAN TO READ

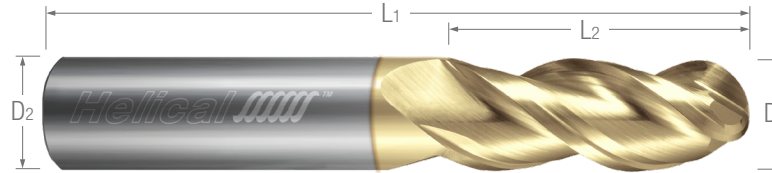
3 FLUTE - BALL New Items!



H40ALV-3

40° Helix - Variable Pitch

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a specialized combination of features for excellent performance in roughing and finishing applications
- Unique "3 teeth-to-center" end geometry for ramping applications
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Uncoated tool offers an excellent option for aluminum finishing applications
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Diameter** D ₁ (h6)	Shank Diameter D ₂ (h6)	Length of Cut L ₂ ^{+0.32"} / _{-0.000"}	Overall Length L ₁ ^{+0.62"} / _{-0.62"}	Flutes	Uncoated	<i>Zplus</i> Coated	Tool Description
1/8	1/8	1/4	1-1/2	3	49030*	49031*	H40ALV-S-30125-BN
	1/8	3/8	2	3	49035*	49036*	H40ALV-SR-30125-BN
	1/8	1/2	2-1/2	3	49040*	49041*	H40ALV-R-30125-BN
	1/8	5/8	2-1/2	3	82453*	82454*	H40ALV-M-30125-BN
	1/8	3/4	2-1/2	3	81455*	81456*	H40ALV-L-30125-BN
	1/8	7/8	2-1/2	3	86074*	86075*	H40ALV-LX-30125-BN
	1/8	1	2-1/2	3	86968*	86969*	H40ALV-X-30125-BN new
3/16	3/16	3/8	2	3	49050*	49051*	H40ALV-S-30187-BN
	3/16	3/4	2-1/2	3	49060*	49061*	H40ALV-R-30187-BN
	3/16	1	3	3	49065*	49066*	H40ALV-M-30187-BN
	3/16	1-3/16	3	3	86970*	86971*	H40ALV-ML-30187-BN new
	3/16	1-3/8	3	3	82455*	82456*	H40ALV-L-30187-BN
	3/16	1-9/16	4	3	86076*	86077*	H40ALV-LX-30187-BN
1/4	1/4	3/8	2	3	49075	49076	H40ALV-S-30250-BN
	1/4	1/2	2	3	81457	81458	H40ALV-SR-30250-BN
	1/4	3/4	2-1/2	3	49105	49106	H40ALV-R-30250-BN
	1/4	1	3	3	49120	49121	H40ALV-M-30250-BN
	1/4	1-1/4	3	3	81459	81460	H40ALV-L-30250-BN
	1/4	1-1/2	3	3	82457	82458	H40ALV-LX-30250-BN
	1/4	1-3/4	4	3	86078	86079	H40ALV-X-30250-BN
	1/4	2	4	3	86972	86973	H40ALV-Y-30250-BN new
5/16	5/16	7/16	2	3	81461	81462	H40ALV-S-30312-BN
	5/16	3/4	2-1/2	3	81463	81464	H40ALV-R-30312-BN
	5/16	1	3	3	82459	82460	H40ALV-M-30312-BN
	5/16	1-1/4	3	3	86080	86081	H40ALV-L-30312-BN
	5/16	1-9/16	4	3	86974	86975	H40ALV-LX-30312-BN new

* 1/8 and 3/16 have 1 tooth to center ** .0003 max TIR

continued on next page



H40ALV-3


New Items! 3 FLUTE - BALL

40° Helix - Variable Pitch (cont.)

continued from previous page

Cutter Diameter** D ₁ (h6)	Shank Diameter D ₂ (h6)	Length of Cut L ₂ ^{+032"} _{-000"}	Overall Length L ₁ ^{+062"} _{-062"}	Flutes	Uncoated	Zplus Coated	Tool Description
3/8	3/8	1/2	2	3	49195	49196	H40ALV-S-30375-BN
	3/8	3/4	2-1/2	3	82461	82462	H40ALV-SR-30375-BN
	3/8	1	2-1/2	3	49210	49211	H40ALV-R-30375-BN
	3/8	1-1/4	3	3	81465	81466	H40ALV-M-30375-BN
	3/8	1-1/2	3-1/2	3	49240	49241	H40ALV-L-30375-BN
	3/8	2	4	3	82463	82464	H40ALV-LX-30375-BN
	3/8	2-1/2	5	3	86082	86083	H40ALV-X-30375-BN
1/2	1/2	5/8	2-1/2	3	49255	49256	H40ALV-S-30500-BN
	1/2	1	3	3	49270	49271	H40ALV-SR-30500-BN
	1/2	1-1/4	3	3	49285	49286	H40ALV-R-30500-BN
	1/2	1-5/8	4	3	49300	49301	H40ALV-M-30500-BN
	1/2	2	4	3	49315	49316	H40ALV-L-30500-BN
	1/2	2-1/2	5	3	82465	82466	H40ALV-LX-30500-BN
	1/2	3-1/8	6	3	86976	86977	H40ALV-X-30500-BN
5/8	5/8	3/4	3	3	49330	49331	H40ALV-S-30625-BN
	5/8	1-1/4	3-1/2	3	49345	49346	H40ALV-SR-30625-BN
	5/8	1-5/8	4	3	49360	49361	H40ALV-R-30625-BN
	5/8	2	4	3	86978	86979	H40ALV-M-30625-BN
3/4	3/4	1	3	3	49390	49391	H40ALV-S-30750-BN
	3/4	1-5/8	4	3	49405	49406	H40ALV-R-30750-BN
	3/4	2-1/4	5	3	49420	49421	H40ALV-M-30750-BN
	3/4	2-3/4	5	3	82467	82468	H40ALV-ML-30750-BN
	3/4	3-1/4	6	3	86084	86085	H40ALV-L-30750-BN
1	1	1-1/4	4	3	49435	49436	H40ALV-S-31000-BN
	1	2	5	3	49450	49451	H40ALV-R-31000-BN
	1	3-1/4	6	3	49465	49466	H40ALV-M-31000-BN
	1	4-1/4	7	3	86086	86087	H40ALV-L-31000-BN

new

new

3 Flute

* 1/8 and 3/16 have 1 tooth to center ** .0003 max TIR

3 FLUTE - CORNER RADIUS

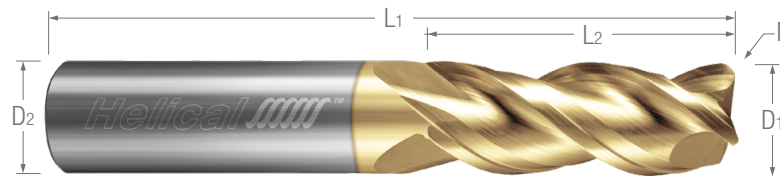
New Items!



H40ALV-3

40° Helix - Variable Pitch

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a specialized combination of features for excellent performance in roughing and finishing applications
- Unique "3 teeth-to-center" end geometry for ramping applications
- Wiper flat design leaves superior floor finish
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Uncoated tool offers an excellent option for aluminum finishing applications
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Dia.** D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	Length of Cut L2 $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L1 $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	3	82401	82402	H40ALV-S-30125-R.010
	1/8	.010	3/8	2	3	82403	82404	H40ALV-SR-30125-R.010
	1/8	.010	1/2	2-1/2	3	82405	82406	H40ALV-R-30125-R.010
	1/8	.010	5/8	2-1/2	3	86088	86089	H40ALV-M-30125-R.010
	1/8	.015	1/4	1-1/2	3	48005	48006	H40ALV-S-30125-R.015
	1/8	.015	3/8	2	3	48015	48016	H40ALV-SR-30125-R.015
	1/8	.015	1/2	2-1/2	3	48025	48026	H40ALV-R-30125-R.015
	1/8	.015	5/8	2-1/2	3	82407	82408	H40ALV-M-30125-R.015
	1/8	.015	3/4	2-1/2	3	86980	86981	H40ALV-L-30125-R.015 new
	1/8	.020	1/4	1-1/2	3	86090	86091	H40ALV-S-30125-R.020
	1/8	.020	3/8	2	3	86092	86093	H40ALV-SR-30125-R.020
	1/8	.020	1/2	2-1/2	3	86094	86095	H40ALV-R-30125-R.020
	1/8	.030	1/4	1-1/2	3	81419*	81420*	H40ALV-S-30125-R.030
	1/8	.030	3/8	2	3	81421*	81422*	H40ALV-SR-30125-R.030
	1/8	.030	1/2	2-1/2	3	81423*	81424*	H40ALV-R-30125-R.030
	1/8	.030	5/8	2-1/2	3	82409*	82410*	H40ALV-M-30125-R.030
1/8	.030	3/4	2-1/2	3	86096*	86097*	H40ALV-L-30125-R.030	
1/8	.030	7/8	2-1/2	3	86982*	86983*	H40ALV-LX-30125-R.030 new	
3/16	3/16	.010	3/8	2	3	86098	86099	H40ALV-S-30187-R.010
	3/16	.010	3/4	2-1/2	3	86100	86101	H40ALV-R-30187-R.010
	3/16	.010	1	3	3	86102	86103	H40ALV-M-30187-R.010
	3/16	.015	3/8	2	3	48035	48036	H40ALV-S-30187-R.015
	3/16	.015	3/4	2-1/2	3	48050	48051	H40ALV-R-30187-R.015
	3/16	.015	1	3	3	48065	48066	H40ALV-M-30187-R.015
	3/16	.015	1-3/8	3	3	82411	82412	H40ALV-L-30187-R.015
	3/16	.020	3/8	2	3	86104	86105	H40ALV-S-30187-R.020
	3/16	.020	3/4	2-1/2	3	86106	86107	H40ALV-R-30187-R.020
	3/16	.020	1	3	3	86108	86109	H40ALV-M-30187-R.020
	3/16	.030	3/8	2	3	48040	48041	H40ALV-S-30187-R.030
	3/16	.030	3/4	2-1/2	3	48055	48056	H40ALV-R-30187-R.030
	3/16	.030	1	3	3	48070	48071	H40ALV-M-30187-R.030
	3/16	.030	1-3/8	3	3	82413	82414	H40ALV-L-30187-R.030

* Wiper flats not included if corner radius exceeds 20% of tool diameter. ** .0003 max TIR

continued on next page



H40ALV-3



New Items!

3 FLUTE - CORNER RADIUS

40° Helix - Variable Pitch (cont.)

continued from previous page

Cutter Dia.**	Shank Dia.	Corner Radius	Length of Cut	OAL	Flutes	Uncoated	Zplus Coated	Tool Description			
D ₁ (h6)	D ₂ (h6)	R ^{+0.002*} -0.002*	L ₂ ^{+0.032*} -0.000*	L ₁ ^{+0.062*} -0.062*							
new new	1/4	1/4	.010	3/8	2	3	82415	82416	H40ALV-S-30250-R.010		
		1/4	.010	1/2	2	3	86110	86111	H40ALV-SR-30250-R.010		
		1/4	.010	3/4	2-1/2	3	82417	82418	H40ALV-R-30250-R.010		
		1/4	.010	1	3	3	82419	82420	H40ALV-M-30250-R.010		
		1/4	.010	1-1/4	3	3	86984	86985	H40ALV-L-30250-R.010		
		1/4	.010	1-1/2	3	3	86986	86987	H40ALV-LX-30250-R.010		
		1/4	.015	3/8	2	3	48080	48081	H40ALV-S-30250-R.015		
		1/4	.015	1/2	2	3	81425	81426	H40ALV-SR-30250-R.015		
		1/4	.015	3/4	2-1/2	3	48120	48121	H40ALV-R-30250-R.015		
		1/4	.015	1	3	3	48140	48141	H40ALV-M-30250-R.015		
		1/4	.015	1-1/4	3	3	82421	82422	H40ALV-L-30250-R.015		
		1/4	.015	1-1/2	3	3	86988	86989	H40ALV-LX-30250-R.015		
		1/4	.020	3/8	2	3	86112	86113	H40ALV-S-30250-R.020		
		1/4	.020	1/2	2	3	86114	86115	H40ALV-SR-30250-R.020		
		1/4	.020	3/4	2-1/2	3	86116	86117	H40ALV-R-30250-R.020		
		1/4	.020	1	3	3	86118	86119	H40ALV-M-30250-R.020		
		1/4	.020	1-1/4	3	3	86990	86991	H40ALV-L-30250-R.020		
		1/4	.020	1-1/2	3	3	86992	86993	H40ALV-LX-30250-R.020		
		new	1/4	1/4	.030	3/8	2	3	48085	48086	H40ALV-S-30250-R.030
				1/4	.030	1/2	2	3	81427	81428	H40ALV-SR-30250-R.030
1/4	.030			3/4	2-1/2	3	48125	48126	H40ALV-R-30250-R.030		
1/4	.030			1	3	3	48145	48146	H40ALV-M-30250-R.030		
1/4	.030			1-1/4	3	3	82423	82424	H40ALV-L-30250-R.030		
1/4	.030			1-1/2	3	3	86994	86995	H40ALV-LX-30250-R.030		
1/4	.060			3/8	2	3	48090*	48091*	H40ALV-S-30250-R.060		
1/4	.060			1/2	2	3	81429*	81430*	H40ALV-SR-30250-R.060		
new	1/4	1/4	.060	3/4	2-1/2	3	48130*	48131*	H40ALV-R-30250-R.060		
		1/4	.060	1	3	3	48150*	48151*	H40ALV-M-30250-R.060		
		1/4	.060	1-1/4	3	3	82425*	82426*	H40ALV-L-30250-R.060		
		1/4	.060	1-1/2	3	3	86996*	86997*	H40ALV-LX-30250-R.060		
new new	5/16	5/16	.010	7/16	2	3	86120	86121	H40ALV-S-30312-R.010		
		5/16	.010	3/4	2-1/2	3	86122	86123	H40ALV-R-30312-R.010		
		5/16	.010	1	3	3	86124	86125	H40ALV-M-30312-R.010		
		5/16	.010	1-1/4	T	3	86998	86999	H40ALV-L-30312-R.010		
		5/16	.030	7/16	2	3	86126	86127	H40ALV-S-30312-R.030		
		5/16	.030	3/4	2-1/2	3	86128	86129	H40ALV-R-30312-R.030		
		5/16	.030	1	3	3	86130	86131	H40ALV-M-30312-R.030		
		5/16	.030	1-1/4	3	3	87000	87001	H40ALV-L-30312-R.030		
		5/16	.060	7/16	2	3	86132	86133	H40ALV-S-30312-R.060		
		5/16	.060	3/4	2-1/2	3	86134	86135	H40ALV-R-30312-R.060		
new	5/16	5/16	.060	1	3	3	86136	86137	H40ALV-M-30312-R.060		
		5/16	.060	1-1/4	3	3	87002	87003	H40ALV-L-30312-R.060		
new new	3/8	3/8	.010	1/2	2	3	81431	81432	H40ALV-S-30375-R.010		
		3/8	.010	3/4	2-1/2	3	83527	83528	H40ALV-SR-30375-R.010		
		3/8	.010	1	2-1/2	3	81433	81434	H40ALV-R-30375-R.010		
		3/8	.010	1-1/4	3	3	87004	87005	H40ALV-M-30375-R.010		
		3/8	.010	1-1/2	3-1/2	3	81435	81436	H40ALV-L-30375-R.010		
		3/8	.010	2	4	3	87006	87007	H40ALV-LX-30375-R.010		
		3/8	.015	1/2	2	3	48240	48241	H40ALV-S-30375-R.015		
		3/8	.015	3/4	2-1/2	3	81437	81438	H40ALV-SR-30375-R.015		
		3/8	.015	1	2-1/2	3	48265	48266	H40ALV-R-30375-R.015		
		3/8	.015	1-1/4	3	3	87008	87009	H40ALV-M-30375-R.015		
new	3/8	3/8	.015	1-1/2	3-1/2	3	48315	48316	H40ALV-L-30375-R.015		
		3/8	.015	2	4	3	82427	82428	H40ALV-LX-30375-R.015		

* Wiper flats not included if corner radius exceeds 20% of tool diameter. ** .0003 max TIR

continued on next page

3 FLUTE - CORNER RADIUS

New Items!



H40ALV-3

40° Helix - Variable Pitch (cont.)

continued from previous page

Cutter Dia.** D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	Length of Cut L2 $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L1 $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Flutes	Uncoated	Zplus Coated	Tool Description	
3/8	3/8	.020	1/2	2	3	86138	86139	H40ALV-S-30375-R.020	
	3/8	.020	3/4	2-1/2	3	87010	87011	H40ALV-SR-30375-R.020	new
	3/8	.020	1	2-1/2	3	86140	86141	H40ALV-R-30375-R.020	
	3/8	.020	1-1/4	3	3	87012	87013	H40ALV-M-30375-R.020	new
	3/8	.020	1-1/2	3-1/2	3	86142	86143	H40ALV-L-30375-R.020	
	3/8	.020	2	4	3	87014	87015	H40ALV-LX-30375-R.020	new
	3/8	.030	1/2	2	3	48245	48246	H40ALV-S-30375-R.030	
	3/8	.030	3/4	2-1/2	3	81439	81440	H40ALV-SR-30375-R.030	
	3/8	.030	1	2-1/2	3	48270	48271	H40ALV-R-30375-R.030	
	3/8	.030	1-1/4	3	3	87016	87017	H40ALV-M-30375-R.030	new
	3/8	.030	1-1/2	3-1/2	3	48320	48321	H40ALV-L-30375-R.030	
	3/8	.030	2	4	3	82429	82430	H40ALV-LX-30375-R.030	
	3/8	.060	1/2	2	3	48250	48251	H40ALV-S-30375-R.060	
	3/8	.060	3/4	2-1/2	3	81441	81442	H40ALV-SR-30375-R.060	
	3/8	.060	1	2-1/2	3	48275	48276	H40ALV-R-30375-R.060	
	3/8	.060	1-1/4	3	3	87018	87019	H40ALV-M-30375-R.060	new
	3/8	.060	1-1/2	3-1/2	3	48325	48326	H40ALV-L-30375-R.060	
	3/8	.060	2	4	3	82431	82432	H40ALV-LX-30375-R.060	
	3/8	.090	1/2	2	3	48255*	48256*	H40ALV-S-30375-R.090	
	3/8	.090	3/4	2-1/2	3	81443*	81444*	H40ALV-SR-30375-R.090	
	3/8	.090	1	2-1/2	3	48280*	48281*	H40ALV-R-30375-R.090	
	3/8	.090	1-1/4	3	3	87020*	87021*	H40ALV-M-30375-R.090	new
	3/8	.090	1-1/2	3-1/2	3	48330*	48331*	H40ALV-L-30375-R.090	
	3/8	.090	2	4	3	82433*	82434*	H40ALV-LX-30375-R.090	
	3/8	.125	1/2	2	3	83529*	83530*	H40ALV-S-30375-R.125	
	3/8	.125	3/4	2-1/2	3	83531*	83532*	H40ALV-SR-30375-R.125	
	3/8	.125	1	2-1/2	3	83533*	83534*	H40ALV-R-30375-R.125	
	3/8	.125	1-1/4	3	3	87022*	87023*	H40ALV-M-30375-R.125	new
	3/8	.125	1-1/2	3-1/2	3	83535*	83536*	H40ALV-L-30375-R.125	
	3/8	.125	2	4	3	83537*	83538*	H40ALV-LX-30375-R.125	
1/2	1/2	.010	5/8	2-1/2	3	81445	81446	H40ALV-S-30500-R.010	
	1/2	.010	1	3	3	81447	81448	H40ALV-SR-30500-R.010	
	1/2	.010	1-1/4	3	3	81449	81450	H40ALV-R-30500-R.010	
	1/2	.010	1-5/8	4	3	81451	81452	H40ALV-M-30500-R.010	
	1/2	.010	2	4	3	81453	81454	H40ALV-L-30500-R.010	
	1/2	.010	2-1/2	5	3	87024	87025	H40ALV-LX-30500-R.010	new
	1/2	.015	5/8	2-1/2	3	48340	48341	H40ALV-S-30500-R.015	
	1/2	.015	1	3	3	48370	48371	H40ALV-SR-30500-R.015	
	1/2	.015	1-1/4	3	3	48400	48401	H40ALV-R-30500-R.015	
	1/2	.015	1-5/8	4	3	48430	48431	H40ALV-M-30500-R.015	
	1/2	.015	2	4	3	48460	48461	H40ALV-L-30500-R.015	
	1/2	.015	2-1/2	5	3	82435	82436	H40ALV-LX-30500-R.015	
	1/2	.015	3-1/8	6	3	87028	87029	H40ALV-X-30500-R.015	new
	1/2	.020	5/8	2-1/2	3	83539	83540	H40ALV-S-30500-R.020	
	1/2	.020	1	3	3	83541	83542	H40ALV-SR-30500-R.020	
	1/2	.020	1-1/4	3	3	83543	83544	H40ALV-R-30500-R.020	
	1/2	.020	1-5/8	4	3	83545	83546	H40ALV-M-30500-R.020	
	1/2	.020	2	4	3	83547	83548	H40ALV-L-30500-R.020	
1/2	.020	2-1/2	5	3	87026	87027	H40ALV-LX-30500-R.020	new	

* Wiper flats not included if corner radius exceeds 20% of tool diameter. ** .0003 max TIR

continued on next page

3 Flute

H40ALV-3



New Items!

3 FLUTE - CORNER RADIUS

40° Helix - Variable Pitch (cont.)

continued from previous page

Cutter Dia.**	Shank Dia.	Corner Radius	Length of Cut	OAL	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	R ^{+0.002"} _{-0.002"}	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}				
new	1/2	.030	5/8	2-1/2	3	48345	48346	H40ALV-S-30500-R.030
		.030	1	3	3	48375	48376	H40ALV-SR-30500-R.030
		.030	1-1/4	3	3	48405	48406	H40ALV-R-30500-R.030
		.030	1-5/8	4	3	48435	48436	H40ALV-M-30500-R.030
		.030	2	4	3	48465	48466	H40ALV-L-30500-R.030
		.030	2-1/2	5	3	82437	82438	H40ALV-LX-30500-R.030
		.030	3-1/8	6	3	87030	87031	H40ALV-X-30500-R.030
		.060	5/8	2-1/2	3	48350	48351	H40ALV-S-30500-R.060
		.060	1	3	3	48380	48381	H40ALV-SR-30500-R.060
		.060	1-1/4	3	3	48410	48411	H40ALV-R-30500-R.060
		.060	1-5/8	4	3	48440	48441	H40ALV-M-30500-R.060
		.060	2	4	3	48470	48471	H40ALV-L-30500-R.060
		.060	2-1/2	5	3	82439	82440	H40ALV-LX-30500-R.060
		.060	3-1/8	6	3	87032	87033	H40ALV-X-30500-R.060
		.090	5/8	2-1/2	3	48355	48356	H40ALV-S-30500-R.090
		.090	1	3	3	48385	48386	H40ALV-SR-30500-R.090
		.090	1-1/4	3	3	48415	48416	H40ALV-R-30500-R.090
		.090	1-5/8	4	3	48445	48446	H40ALV-M-30500-R.090
		.090	2	4	3	48475	48476	H40ALV-L-30500-R.090
		.090	2-1/2	5	3	82441	82442	H40ALV-LX-30500-R.090
.125	5/8	2-1/2	3	48360*	48361*	H40ALV-S-30500-R.125		
.125	1	3	3	48390*	48391*	H40ALV-SR-30500-R.125		
.125	1-1/4	3	3	48420*	48421*	H40ALV-R-30500-R.125		
.125	1-5/8	4	3	48450*	48451*	H40ALV-M-30500-R.125		
.125	2	4	3	48480*	48481*	H40ALV-L-30500-R.125		
.125	2-1/2	5	3	82443*	82444*	H40ALV-LX-30500-R.125		
.125	3-1/8	6	3	87034*	87035*	H40ALV-X-30500-R.125		
new new new new	5/8	.015	3/4	3	3	87036	87037	H40ALV-S-30625-R.015
		.015	1-1/4	3-1/2	3	87038	87039	H40ALV-SR-30625-R.015
		.015	1-5/8	4	3	87040	87041	H40ALV-R-30625-R.015
		.015	2	4	3	87042	87043	H40ALV-M-30625-R.015
		.030	3/4	3	3	48490	48491	H40ALV-S-30625-R.030
		.030	1-1/4	3-1/2	3	48515	48516	H40ALV-SR-30625-R.030
		.030	1-5/8	4	3	48540	48541	H40ALV-R-30625-R.030
		.030	2	4	3	82445	82446	H40ALV-M-30625-R.030
		.060	3/4	3	3	48495	48496	H40ALV-S-30625-R.060
		.060	1-1/4	3-1/2	3	48520	48521	H40ALV-SR-30625-R.060
		.060	1-5/8	4	3	48545	48546	H40ALV-R-30625-R.060
		.060	2	4	3	87044	87045	H40ALV-M-30625-R.060
		.090	3/4	3	3	48500	48501	H40ALV-S-30625-R.090
		.090	1-1/4	3-1/2	3	48525	48526	H40ALV-SR-30625-R.090
		.090	1-5/8	4	3	48550	48551	H40ALV-R-30625-R.090
		.090	2	4	3	87046	87047	H40ALV-M-30625-R.090
		.125	3/4	3	3	48505	48506	H40ALV-S-30625-R.125
		.125	1-1/4	3-1/2	3	48530	48531	H40ALV-SR-30625-R.125
		.125	1-5/8	4	3	48555	48556	H40ALV-R-30625-R.125
		.125	2	4	3	82447	82448	H40ALV-M-30625-R.125

* Wiper flats not included if corner radius exceeds 20% of tool diameter. ** .0003 max TIR

continued on next page

3 FLUTE - CORNER RADIUS

New Items!



H40ALV-3

40° Helix - Variable Pitch (cont.)

continued from previous page

Cutter Dia.** D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R <small>+0.02" -0.02"</small>	Length of Cut L2 <small>+0.032" -0.000"</small>	OAL L1 <small>+0.062" -0.062"</small>	Flutes	Uncoated	Zplus Coated	Tool Description
3/4	3/4	.015	1	3	3	83549	83550	H40ALV-S-30750-R.015
	3/4	.015	1-5/8	4	3	83551	83552	H40ALV-R-30750-R.015
	3/4	.015	2-1/4	5	3	83553	83554	H40ALV-M-30750-R.015
	3/4	.015	2-3/4	5	3	87048	87049	H40ALV-ML-30750-R.015 new
	3/4	.020	1	3	3	87050	87051	H40ALV-S-30750-R.020 new
	3/4	.020	1-5/8	4	3	87052	87053	H40ALV-R-30750-R.020 new
	3/4	.020	2-1/4	5	3	87054	87055	H40ALV-M-30750-R.020 new
	3/4	.020	2-3/4	5	3	87056	87057	H40ALV-ML-30750-R.020 new
	3/4	.030	1	3	3	48590	48591	H40ALV-S-30750-R.030
	3/4	.030	1-5/8	4	3	48625	48626	H40ALV-R-30750-R.030
	3/4	.030	2-1/4	5	3	48660	48661	H40ALV-M-30750-R.030
	3/4	.030	2-3/4	5	3	82449	82450	H40ALV-ML-30750-R.030
	3/4	.060	1	3	3	48595	48596	H40ALV-S-30750-R.060
	3/4	.060	1-5/8	4	3	48630	48631	H40ALV-R-30750-R.060
	3/4	.060	2-1/4	5	3	48665	48666	H40ALV-M-30750-R.060
	3/4	.060	2-3/4	5	3	86144	86145	H40ALV-ML-30750-R.060
	3/4	.090	1	3	3	48600	48601	H40ALV-S-30750-R.090
	3/4	.090	1-5/8	4	3	48635	48636	H40ALV-R-30750-R.090
	3/4	.090	2-1/4	5	3	48670	48671	H40ALV-M-30750-R.090
	3/4	.125	1	3	3	48605	48606	H40ALV-S-30750-R.125
	3/4	.125	1-5/8	4	3	48640	48641	H40ALV-R-30750-R.125
	3/4	.125	2-1/4	5	3	48675	48676	H40ALV-M-30750-R.125
	3/4	.125	2-3/4	5	3	82451	82452	H40ALV-ML-30750-R.125
	3/4	.190	1	3	3	48610*	48611*	H40ALV-S-30750-R.190
	3/4	.190	1-5/8	4	3	48645*	48646*	H40ALV-R-30750-R.190
	3/4	.190	2-1/4	5	3	48680*	48681*	H40ALV-M-30750-R.190
	3/4	.250	1	3	3	48615*	48616*	H40ALV-S-30750-R.250
	3/4	.250	1-5/8	4	3	48650*	48651*	H40ALV-R-30750-R.250
3/4	.250	2-1/4	5	3	48685*	48686*	H40ALV-M-30750-R.250	
3/4	.250	2-3/4	5	3	87058*	87059*	H40ALV-ML-30750-R.250 new	
1	1	.030	1-1/4	4	3	48695	48696	H40ALV-S-31000-R.030
	1	.030	2	5	3	48730	48731	H40ALV-R-31000-R.030
	1	.030	3-1/4	6	3	48765	48766	H40ALV-M-31000-R.030
	1	.060	1-1/4	4	3	48700	48701	H40ALV-S-31000-R.060
	1	.060	2	5	3	48735	48736	H40ALV-R-31000-R.060
	1	.060	3-1/4	6	3	48770	48771	H40ALV-M-31000-R.060
	1	.125	1-1/4	4	3	48710	48711	H40ALV-S-31000-R.125
	1	.125	2	5	3	48745	48746	H40ALV-R-31000-R.125
	1	.125	3-1/4	6	3	48780	48781	H40ALV-M-31000-R.125
	1	.250	1-1/4	4	3	48720*	48721*	H40ALV-S-31000-R.250
	1	.250	2	5	3	48755*	48756*	H40ALV-R-31000-R.250
	1	.250	3-1/4	6	3	48790*	48791*	H40ALV-M-31000-R.250

* Wiper flats not included if corner radius exceeds 20% of tool diameter. ** .0003 max TIR

3 Flute

H40ALV-RN-3



New Items!

3 FLUTE - SQUARE

40° Helix - Variable Pitch - Reduced Neck

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a specialized combination of features for excellent performance in roughing and finishing applications
- Unique "3 teeth-to-center" end geometry for ramping applications
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Wiper flat design leaves superior floor finish
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Uncoated tool offers an excellent option for aluminum finishing applications
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	LOC L2 $\begin{smallmatrix} +.032^* \\ -.000^* \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +.062^* \\ -.062^* \end{smallmatrix}$	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	5/32	2-1/2	1/2	.118	3	46010	46011	H40ALV-RN-R-30125
	1/8	5/32	3	3/4	.118	3	46020	46021	H40ALV-RN-M-30125
	1/8	5/32	3	1	.118	3	81467	81468	H40ALV-RN-L-30125
	1/8	5/32	3	1-1/4	.118	3	82469	82470	H40ALV-RN-LX-30125
	1/8	5/32	3	1-1/2	.118	3	83555	83556	H40ALV-RN-X-30125
3/16	3/16	7/32	2-1/2	1/2	.178	3	46045	46046	H40ALV-RN-R-30187
	3/16	7/32	3	3/4	.178	3	46060	46061	H40ALV-RN-M-30187
	3/16	7/32	3	1	.178	3	81469	81470	H40ALV-RN-ML-30187
	3/16	7/32	3	1-5/16	.178	3	82471	82472	H40ALV-RN-LX-30187
	3/16	7/32	3	1-1/2	.178	3	83557	83558	H40ALV-RN-X-30187
1/4	1/4	3/8	2-1/2	3/4	.237	3	46075	46076	H40ALV-RN-S-30250
	1/4	3/8	3	1-1/8	.237	3	46095	46096	H40ALV-RN-R-30250
	1/4	3/8	3	1-3/8	.237	3	82473	82474	H40ALV-RN-RA-30250
	1/4	3/8	3	1-5/8	.237	3	81471	81472	H40ALV-RN-A-30250
	1/4	3/8	4	1-7/8	.237	3	82475	82476	H40ALV-RN-AM-30250
	1/4	3/8	4	2-1/8	.237	3	81473	81474	H40ALV-RN-M-30250
	1/4	3/8	4	2-1/2	.237	3	82477	82478	H40ALV-RN-ML-30250
	1/4	3/8	4-1/2	3	.237	3	83559	83560	H40ALV-RN-L-30250
5/16	5/16	7/16	4	1-1/8	.296	3	86500	86501	H40ALV-RN-S-30312
	5/16	7/16	4	1-3/4	.296	3	86502	86503	H40ALV-RN-R-30312
	5/16	7/16	4	2-1/8	.296	3	86504	86505	H40ALV-RN-M-30312
3/8	3/8	1/2	3	1-1/8	.356	3	46220	46221	H40ALV-RN-R-30375
	3/8	1/2	3	1-5/8	.356	3	81475	81476	H40ALV-RN-A-30375
	3/8	1/2	4	2-1/8	.356	3	46245	46246	H40ALV-RN-M-30375
	3/8	1/2	5	2-1/2	.356	3	81477	81478	H40ALV-RN-ML-30375
	3/8	1/2	6	3-1/8	.356	3	82479	82480	H40ALV-RN-LX-30375
	3/8	1/2	6	4	.356	3	83561	83562	H40ALV-RN-X-30375

new
new
new

*.0003 max TIR

continued on next page



Speeds & Feeds on Page 62

3 FLUTE - SQUARE New Items!



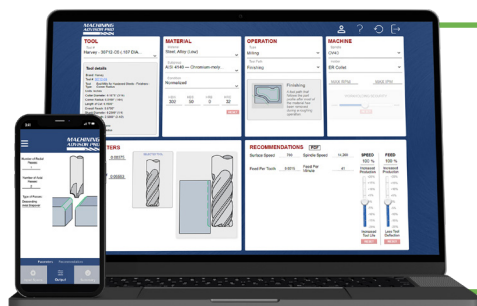
H40ALV-RN-3

40° Helix - Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	LOC L ₂ ^{+0.032"} -0.000"	Overall Length L ₁ ^{+0.062"} -0.062"	Reach (LBS) L ₃	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
1/2	1/2	5/8	3	1-3/8	.475	3	46300	46301	H40ALV-RN-R-30500
	1/2	5/8	3-1/2	1-3/4	.475	3	81479	81480	H40ALV-RN-A-30500
	1/2	5/8	4	2-1/4	.475	3	46330	46331	H40ALV-RN-M-30500
	1/2	5/8	4-1/2	2-3/4	.475	3	81481	81482	H40ALV-RN-ML-30500
	1/2	5/8	5	3-3/8	.475	3	46360	46361	H40ALV-RN-L-30500
	1/2	5/8	6	3-3/4	.475	3	81483	81484	H40ALV-RN-LX-30500
	1/2	5/8	6	4-1/4	.475	3	46390	46391	H40ALV-RN-X-30500
	1/2	5/8	7	5	.475	3	82481	82482	H40ALV-RN-Y-30500
	1/2	5/8	8	6	.475	3	86506	86507	H40ALV-RN-Z-30500 new
5/8	5/8	3/4	4	2-3/8	.593	3	46470	46471	H40ALV-RN-M-30625
	5/8	3/4	6	3-3/8	.593	3	46495	46496	H40ALV-RN-L-30625
	5/8	3/4	6	4-1/8	.593	3	83563	83564	H40ALV-RN-X-30625
3/4	3/4	1	4	2	.712	3	46555	46556	H40ALV-RN-R-30750
	3/4	1	5	2-1/2	.712	3	81485	81486	H40ALV-RN-A-30750
	3/4	1	6	3-3/8	.712	3	46590	46591	H40ALV-RN-M-30750
	3/4	1	7	4-1/8	.712	3	81487	81488	H40ALV-RN-ML-30750
	3/4	1	7	5	.712	3	46625	46626	H40ALV-RN-L-30750
	3/4	1	10	6	.712	3	82483	82484	H40ALV-RN-LX-30750
	3/4	1	10	7-1/2	.712	3	86508	86509	H40ALV-RN-X-30750 new
1	1	1-1/4	5	2-5/8	.950	3	46695	46696	H40ALV-RN-R-31000
	1	1-1/4	6	3-3/8	.950	3	46730	46731	H40ALV-RN-M-31000
	1	1-1/4	7	4-3/8	.950	3	46765	46766	H40ALV-RN-L-31000
	1	1-1/4	9	6	.950	3	46800	46801	H40ALV-RN-LX-31000
	1	1-1/4	12-1/2	9-1/2	.950	3	86510	86511	H40ALV-RN-X-31000 new

* .0003 max TIR



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H40ALV-RN-3



New Items!

3 FLUTE - BALL

40° Helix - Variable Pitch - Reduced Neck

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- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Uncoated tool offers an excellent option for aluminum finishing applications
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.**	Shank Dia.	Length of Cut	Overall Length	Reach (LBS)	Neck Dia.	Flutes			Tool Description
							Uncoated	<i>Zplus</i> Coated	
D ₁ (h6)	D ₂ (h6)	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}	L ₃					
1/8	1/8	5/32	2-1/2	1/2	.118	3	47040*	47041*	H40ALV-RN-R-30125-BN
	1/8	5/32	3	3/4	.118	3	47045*	47046*	H40ALV-RN-M-30125-BN
	1/8	5/32	3	1	.118	3	81533*	81534*	H40ALV-RN-L-30125-BN
	1/8	5/32	3	1-1/4	.118	3	82485*	82486*	H40ALV-RN-LX-30125-BN
	1/8	5/32	3	1-1/2	.118	3	83565*	83566*	H40ALV-RN-X-30125-BN
3/16	3/16	7/32	2-1/2	1/2	.178	3	47060*	47061*	H40ALV-RN-R-30187-BN
	3/16	7/32	3	3/4	.178	3	47065*	47066*	H40ALV-RN-M-30187-BN
	3/16	7/32	3	1	.178	3	81535*	81536*	H40ALV-RN-ML-30187-BN
	3/16	7/32	3	1-5/16	.178	3	82487*	82488*	H40ALV-RN-LX-30187-BN
	3/16	7/32	3	1-1/2	.178	3	83567*	83568*	H40ALV-RN-X-30187-BN
1/4	1/4	3/8	2-1/2	3/4	.237	3	47075	47076	H40ALV-RN-S-30250-BN
	1/4	3/8	3	1-1/8	.237	3	47090	47091	H40ALV-RN-R-30250-BN
	1/4	3/8	3	1-3/8	.237	3	82489	82490	H40ALV-RN-RA-30250-BN
	1/4	3/8	3	1-5/8	.237	3	81537	81538	H40ALV-RN-A-30250-BN
	1/4	3/8	4	1-7/8	.237	3	82491	82492	H40ALV-RN-AM-30250-BN
	1/4	3/8	4	2-1/8	.237	3	81539	81540	H40ALV-RN-M-30250-BN
	1/4	3/8	4	2-1/2	.237	3	82493	82494	H40ALV-RN-ML-30250-BN
	1/4	3/8	4-1/2	3	.237	3	83569	83570	H40ALV-RN-L-30250-BN
new new new 5/16	5/16	7/16	4	1-1/8	.296	3	86512	86513	H40ALV-RN-S-30312-BN
	5/16	7/16	4	1-3/4	.296	3	86514	86515	H40ALV-RN-R-30312-BN
	5/16	7/16	4	2-1/8	.296	3	86516	86517	H40ALV-RN-M-30312-BN
3/8	3/8	1/2	3	1-1/8	.356	3	47180	47181	H40ALV-RN-R-30375-BN
	3/8	1/2	3	1-5/8	.356	3	81541	81542	H40ALV-RN-A-30375-BN
	3/8	1/2	4	2-1/8	.356	3	47195	47196	H40ALV-RN-M-30375-BN
	3/8	1/2	5	2-1/2	.356	3	81543	81544	H40ALV-RN-ML-30375-BN
	3/8	1/2	6	3-1/8	.356	3	82495	82496	H40ALV-RN-LX-30375-BN
	3/8	1/2	6	4	.356	3	86518	86519	H40ALV-RN-X-30375-BN
	new	3/8	1/2	6	4	.356	3	86518	86519

* 1/8 & 3/16 have one tooth to center ** .0003 max TIR

continued on next page

3 FLUTE - BALL

New Items!



H40ALV-RN-3

40° Helix - Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.** D ₁ (h6)	Shank Dia. D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} _{-0.000"}	Overall Length L ₁ ^{+0.062"} _{-0.062"}	Reach (LBS) L ₃	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
1/2	1/2	5/8	3	1-3/8	.475	3	47225	47226	H40ALV-RN-R-30500-BN
	1/2	5/8	3-1/2	1-3/4	.475	3	81545	81546	H40ALV-RN-A-30500-BN
	1/2	5/8	4	2-1/4	.475	3	47240	47241	H40ALV-RN-M-30500-BN
	1/2	5/8	4-1/2	2-3/4	.475	3	81547	81548	H40ALV-RN-ML-30500-BN
	1/2	5/8	5	3-3/8	.475	3	47255	47256	H40ALV-RN-L-30500-BN
	1/2	5/8	6	3-3/4	.475	3	81549	81550	H40ALV-RN-LX-30500-BN
	1/2	5/8	6	4-1/4	.475	3	47270	47271	H40ALV-RN-X-30500-BN
	1/2	5/8	7	5	.475	3	82497	82498	H40ALV-RN-Y-30500-BN
5/8	5/8	3/4	4	1-5/8	.593	3	47300	47301	H40ALV-RN-R-30625-BN
	5/8	3/4	4	2-3/8	.593	3	47315	47316	H40ALV-RN-M-30625-BN
	5/8	3/4	6	3-3/8	.593	3	47330	47331	H40ALV-RN-L-30625-BN
3/4	3/4	1	4	2	.712	3	47360	47361	H40ALV-RN-R-30750-BN
	3/4	1	5	2-1/2	.712	3	83571	83572	H40ALV-RN-A-30750-BN
	3/4	1	6	3-3/8	.712	3	47375	47376	H40ALV-RN-M-30750-BN
	3/4	1	7	4-1/8	.712	3	83573	83574	H40ALV-RN-ML-30750-BN
	3/4	1	7	5	.712	3	47390	47391	H40ALV-RN-L-30750-BN
1	1	1-1/4	5	2-5/8	.950	3	47420	47421	H40ALV-RN-R-31000-BN
	1	1-1/4	6	3-3/8	.950	3	47435	47436	H40ALV-RN-M-31000-BN
	1	1-1/4	7	4-3/8	.950	3	47450	47451	H40ALV-RN-L-31000-BN
	1	1-1/4	9	6	.950	3	47465	47466	H40ALV-RN-LX-31000-BN
	1	1-1/4	12-1/2	9-1/2	.950	3	47480	47481	H40ALV-RN-X-31000-BN

new

* 1/8 & 3/16 have one tooth to center ** .0003 max TIR

Speeds & Feeds 101

In The Loupe
MACHINISTS BLOG

Every machinist should know the basics when it comes to speeds and feeds, or the cutting variables used in every milling operation, as proper running parameters are critical to the outcome of your part. In our "In the Loupe" post *Speeds and Feeds 101*, learn how to calculate speeds and feeds, determine your tool's efficiency via Material Removal Rate (MRR), and much more.



SCAN TO READ

www.harveyperformance.com/in-the-loupe/speeds-and-feeds-101/

H40ALV-RN-3



New Items!

3 FLUTE - CORNER RADIUS

40° Helix - Variable Pitch - Reduced Neck

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- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.**	Shank Dia.	Corner Radius	LOC	OAL	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	R ^{+0.002"} _{-0.002"}	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}	L ₃					
new new new 1/8	1/8	.010	5/32	2-1/2	1/2	.118	3	86522	86523	H40ALV-RN-R-30125-R.010
	1/8	.010	5/32	3	3/4	.118	3	86526	86527	H40ALV-RN-M-30125-R.010
	1/8	.010	5/32	3	1	.118	3	86530	86531	H40ALV-RN-L-30125-R.010
	1/8	.015	5/32	2-1/2	1/2	.118	3	46015	46016	H40ALV-RN-R-30125-R.015
	1/8	.015	5/32	3	3/4	.118	3	46025	46026	H40ALV-RN-M-30125-R.015
	1/8	.015	5/32	3	1	.118	3	82807	82808	H40ALV-RN-L-30125-R.015
	1/8	.030	5/32	2-1/2	1/2	.118	3	86524*	86525*	H40ALV-RN-R-30125-R.030
	1/8	.030	5/32	3	3/4	.118	3	86528*	86529*	H40ALV-RN-M-30125-R.030
	1/8	.030	5/32	3	1	.118	3	86532*	86533*	H40ALV-RN-L-30125-R.030
new new new 3/16	3/16	.010	7/32	2-1/2	1/2	.178	3	86534	86535	H40ALV-RN-R-30187-R.010
	3/16	.010	7/32	3	3/4	.178	3	86536	86537	H40ALV-RN-M-30187-R.010
	3/16	.010	7/32	3	1	.178	3	86538	86539	H40ALV-RN-ML-30187-R.010
	3/16	.015	7/32	2-1/2	1/2	.178	3	46050	46051	H40ALV-RN-R-30187-R.015
	3/16	.015	7/32	3	3/4	.178	3	46065	46066	H40ALV-RN-M-30187-R.015
	3/16	.015	7/32	3	1	.178	3	82809	82810	H40ALV-RN-ML-30187-R.015
	3/16	.030	7/32	2-1/2	1/2	.178	3	46055	46056	H40ALV-RN-R-30187-R.030
	3/16	.030	7/32	3	3/4	.178	3	46070	46071	H40ALV-RN-M-30187-R.030
	3/16	.030	7/32	3	1	.178	3	82811	82812	H40ALV-RN-ML-30187-R.030
1/4	1/4	.015	3/8	2-1/2	3/4	.237	3	46080	46081	H40ALV-RN-S-30250-R.015
	1/4	.015	3/8	3	1-1/8	.237	3	46100	46101	H40ALV-RN-R-30250-R.015
	1/4	.015	3/8	3	1-3/8	.237	3	82813	82814	H40ALV-RN-RA-30250-R.015
	1/4	.015	3/8	3	1-5/8	.237	3	81489	81490	H40ALV-RN-A-30250-R.015
	1/4	.015	3/8	4	1-7/8	.237	3	82815	82816	H40ALV-RN-AM-30250-R.015
	1/4	.015	3/8	4	2-1/8	.237	3	81491	81492	H40ALV-RN-M-30250-R.015
	1/4	.015	3/8	4	2-1/2	.237	3	82817	82818	H40ALV-RN-ML-30250-R.015
	1/4	.030	3/8	2-1/2	3/4	.237	3	46085	46086	H40ALV-RN-S-30250-R.030
	1/4	.030	3/8	3	1-1/8	.237	3	46105	46106	H40ALV-RN-R-30250-R.030
	1/4	.030	3/8	3	1-3/8	.237	3	82819	82820	H40ALV-RN-RA-30250-R.030
	1/4	.030	3/8	3	1-5/8	.237	3	81493	81494	H40ALV-RN-A-30250-R.030
	1/4	.030	3/8	4	1-7/8	.237	3	82821	82822	H40ALV-RN-AM-30250-R.030
	1/4	.030	3/8	4	2-1/8	.237	3	81495	81496	H40ALV-RN-M-30250-R.030
	1/4	.030	3/8	4	2-1/2	.237	3	82823	82824	H40ALV-RN-ML-30250-R.030

* Wiper flats not included if corner radius exceeds 20% of tool diameter. ** .0003 max TIR

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Speeds & Feeds on Page 62

3 FLUTE - CORNER RADIUS New Items!



H40ALV-RN-3

40° Helix - Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.**	Shank Dia.	Corner Radius	LOC	OAL	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
D1 (h6)	D2 (h6)	R ^{+0.02*} _{-.002*}	L2 ^{+0.032*} _{-.000*}	L1 ^{+0.062*} _{-.062*}	L3					
1/4	1/4	.060	3/8	2-1/2	3/4	.237	3	46090*	46091*	H40ALV-RN-S-30250-R.060
	1/4	.060	3/8	3	1-1/8	.237	3	46110*	46111*	H40ALV-RN-R-30250-R.060
	1/4	.060	3/8	3	1-3/8	.237	3	82825*	82826*	H40ALV-RN-RA-30250-R.060
	1/4	.060	3/8	3	1-5/8	.237	3	81497*	81498*	H40ALV-RN-A-30250-R.060
	1/4	.060	3/8	4	1-7/8	.237	3	82827*	82828*	H40ALV-RN-AM-30250-R.060
	1/4	.060	3/8	4	2-1/8	.237	3	81499*	81500*	H40ALV-RN-M-30250-R.060
	1/4	.060	3/8	4	2-1/2	.237	3	82829*	82830*	H40ALV-RN-ML-30250-R.060
5/16	5/16	.030	7/16	4	1-1/8	.296	3	86540	86541	H40ALV-RN-S-30312-R.030
	5/16	.030	7/16	4	1-3/4	.296	3	86544	86545	H40ALV-RN-R-30312-R.030
	5/16	.030	7/16	4	2-1/8	.296	3	86548	86549	H40ALV-RN-M-30312-R.030
	5/16	.060	7/16	4	1-1/8	.296	3	86542	86543	H40ALV-RN-S-30312-R.060
	5/16	.060	7/16	4	1-3/4	.296	3	86546	86547	H40ALV-RN-R-30312-R.060
	5/16	.060	7/16	4	2-1/8	.296	3	86550	86551	H40ALV-RN-M-30312-R.060
3/8	3/8	.015	1/2	3	1-1/8	.356	3	46225	46226	H40ALV-RN-R-30375-R.015
	3/8	.015	1/2	3	1-5/8	.356	3	81501	81502	H40ALV-RN-A-30375-R.015
	3/8	.015	1/2	4	2-1/8	.356	3	46250	46251	H40ALV-RN-M-30375-R.015
	3/8	.015	1/2	5	2-1/2	.356	3	82831	82832	H40ALV-RN-ML-30375-R.015
	3/8	.030	1/2	3	1-1/8	.356	3	46230	46231	H40ALV-RN-R-30375-R.030
	3/8	.030	1/2	3	1-5/8	.356	3	81503	81504	H40ALV-RN-A-30375-R.030
	3/8	.030	1/2	4	2-1/8	.356	3	46255	46256	H40ALV-RN-M-30375-R.030
	3/8	.030	1/2	5	2-1/2	.356	3	81505	81506	H40ALV-RN-ML-30375-R.030
	3/8	.030	1/2	6	3-1/8	.356	3	86552	86553	H40ALV-RN-LX-30375-R.030
	3/8	.060	1/2	3	1-1/8	.356	3	46235	46236	H40ALV-RN-R-30375-R.060
	3/8	.060	1/2	3	1-5/8	.356	3	81507	81508	H40ALV-RN-A-30375-R.060
	3/8	.060	1/2	4	2-1/8	.356	3	46260	46261	H40ALV-RN-M-30375-R.060
	3/8	.060	1/2	5	2-1/2	.356	3	81509	81510	H40ALV-RN-ML-30375-R.060
	3/8	.060	1/2	6	3-1/8	.356	3	86554	86555	H40ALV-RN-LX-30375-R.060
	3/8	.090	1/2	3	1-1/8	.356	3	46240*	46241*	H40ALV-RN-R-30375-R.090
	3/8	.090	1/2	3	1-5/8	.356	3	82833*	82834*	H40ALV-RN-A-30375-R.090
	3/8	.090	1/2	4	2-1/8	.356	3	46265*	46266*	H40ALV-RN-M-30375-R.090
3/8	.090	1/2	5	2-1/2	.356	3	82835*	82836*	H40ALV-RN-ML-30375-R.090	
1/2	1/2	.015	5/8	3	1-3/8	.475	3	46305	46306	H40ALV-RN-R-30500-R.015
	1/2	.015	5/8	4	2-1/4	.475	3	46335	46336	H40ALV-RN-M-30500-R.015
	1/2	.015	5/8	5	3-3/8	.475	3	46365	46366	H40ALV-RN-L-30500-R.015
	1/2	.015	5/8	6	4-1/4	.475	3	46395	46396	H40ALV-RN-X-30500-R.015
	1/2	.030	5/8	3	1-3/8	.475	3	46310	46311	H40ALV-RN-R-30500-R.030
	1/2	.030	5/8	3-1/2	1-3/4	.475	3	81511	81512	H40ALV-RN-A-30500-R.030
	1/2	.030	5/8	4	2-1/4	.475	3	46340	46341	H40ALV-RN-M-30500-R.030
	1/2	.030	5/8	4-1/2	2-3/4	.475	3	81513	81514	H40ALV-RN-ML-30500-R.030
	1/2	.030	5/8	5	3-3/8	.475	3	46370	46371	H40ALV-RN-L-30500-R.030
	1/2	.030	5/8	6	3-3/4	.475	3	82837	82838	H40ALV-RN-LX-30500-R.030
	1/2	.030	5/8	6	4-1/4	.475	3	46400	46401	H40ALV-RN-X-30500-R.030
1/2	.030	5/8	7	5	.475	3	82839	82840	H40ALV-RN-Y-30500-R.030	

* Wiper flats not included if corner radius exceeds 20% of tool diameter. **.0003 max TIR

continued on next page

3 Flute

H40ALV-RN-3



New Items!

3 FLUTE - CORNER RADIUS

40° Helix - Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.** D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} _{-0.002"}	LOC L2 ^{+0.032"} _{-0.000"}	OAL L1 ^{+0.062"} _{-0.062"}	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
new new 1/2	1/2	.060	5/8	3	1-3/8	.475	3	46315	46316	H40ALV-RN-R-30500-R.060
	1/2	.060	5/8	3-1/2	1-3/4	.475	3	81515	81516	H40ALV-RN-A-30500-R.060
	1/2	.060	5/8	4	2-1/4	.475	3	46345	46346	H40ALV-RN-M-30500-R.060
	1/2	.060	5/8	4-1/2	2-3/4	.475	3	81517	81518	H40ALV-RN-ML-30500-R.060
	1/2	.060	5/8	5	3-3/8	.475	3	46375	46376	H40ALV-RN-L-30500-R.060
	1/2	.060	5/8	6	3-3/4	.475	3	82841	82842	H40ALV-RN-LX-30500-R.060
	1/2	.060	5/8	6	4-1/4	.475	3	46405	46406	H40ALV-RN-X-30500-R.060
	1/2	.060	5/8	7	5	.475	3	82843	82844	H40ALV-RN-Y-30500-R.060
	1/2	.090	5/8	3	1-3/8	.475	3	46320	46321	H40ALV-RN-R-30500-R.090
	1/2	.090	5/8	3-1/2	1-3/4	.475	3	86556	86557	H40ALV-RN-A-30500-R.090
	1/2	.090	5/8	4	2-1/4	.475	3	46350	46351	H40ALV-RN-M-30500-R.090
	1/2	.090	5/8	4-1/2	2-3/4	.475	3	86558	86559	H40ALV-RN-ML-30500-R.090
	1/2	.090	5/8	5	3-3/8	.475	3	46380	46381	H40ALV-RN-L-30500-R.090
	1/2	.090	5/8	6	4-1/4	.475	3	46410	46411	H40ALV-RN-X-30500-R.090
	1/2	.125	5/8	3	1-3/8	.475	3	46325*	46326*	H40ALV-RN-R-30500-R.125
	1/2	.125	5/8	3-1/2	1-3/4	.475	3	81519*	81520*	H40ALV-RN-A-30500-R.125
	1/2	.125	5/8	4	2-1/4	.475	3	46355*	46356*	H40ALV-RN-M-30500-R.125
	1/2	.125	5/8	4-1/2	2-3/4	.475	3	81521*	81522*	H40ALV-RN-ML-30500-R.125
	1/2	.125	5/8	5	3-3/8	.475	3	46385*	46386*	H40ALV-RN-L-30500-R.125
	1/2	.125	5/8	6	3-3/4	.475	3	82845*	82846*	H40ALV-RN-LX-30500-R.125
1/2	.125	5/8	6	4-1/4	.475	3	46415*	46416*	H40ALV-RN-X-30500-R.125	
1/2	.125	5/8	7	5	.475	3	82847*	82848*	H40ALV-RN-Y-30500-R.125	
5/8	5/8	.030	3/4	4	2-3/8	.593	3	46475	46476	H40ALV-RN-M-30625-R.030
	5/8	.030	3/4	6	3-3/8	.593	3	46500	46501	H40ALV-RN-L-30625-R.030
	5/8	.060	3/4	4	2-3/8	.593	3	46480	46481	H40ALV-RN-M-30625-R.060
	5/8	.090	3/4	4	2-3/8	.593	3	46485	46486	H40ALV-RN-M-30625-R.090
	5/8	.125	3/4	4	2-3/8	.593	3	46490	46491	H40ALV-RN-M-30625-R.125
new 3/4	3/4	.030	1	4	2	.712	3	46560	46561	H40ALV-RN-R-30750-R.030
	3/4	.030	1	5	2-1/2	.712	3	81523	81524	H40ALV-RN-A-30750-R.030
	3/4	.030	1	6	3-3/8	.712	3	46595	46596	H40ALV-RN-M-30750-R.030
	3/4	.030	1	7	4-1/8	.712	3	81525	81526	H40ALV-RN-ML-30750-R.030
	3/4	.030	1	7	5	.712	3	46630	46631	H40ALV-RN-L-30750-R.030
	3/4	.030	1	10	6	.712	3	86560	86561	H40ALV-RN-LX-30750-R.030
	3/4	.060	1	4	2	.712	3	46565	46566	H40ALV-RN-R-30750-R.060
	3/4	.060	1	5	2-1/2	.712	3	81527	81528	H40ALV-RN-A-30750-R.060
	3/4	.060	1	6	3-3/8	.712	3	46600	46601	H40ALV-RN-M-30750-R.060
	3/4	.060	1	7	4-1/8	.712	3	81529	81530	H40ALV-RN-ML-30750-R.060
	3/4	.060	1	7	5	.712	3	46635	46636	H40ALV-RN-L-30750-R.060
	3/4	.090	1	4	2	.712	3	46570	46571	H40ALV-RN-R-30750-R.090
	3/4	.090	1	6	3-3/8	.712	3	46605	46606	H40ALV-RN-M-30750-R.090
	3/4	.125	1	4	2	.712	3	46575	46576	H40ALV-RN-R-30750-R.125
	3/4	.125	1	5	2-1/2	.712	3	81531	81532	H40ALV-RN-A-30750-R.125
	3/4	.125	1	6	3-3/8	.712	3	46610	46611	H40ALV-RN-M-30750-R.125
	3/4	.125	1	7	5	.712	3	46645	46646	H40ALV-RN-L-30750-R.125
	3/4	.190	1	4	2	.712	3	46580*	46581*	H40ALV-RN-R-30750-R.190
	3/4	.190	1	6	3-3/8	.712	3	46615*	46616*	H40ALV-RN-M-30750-R.190
	3/4	.250	1	4	2	.712	3	46585*	46586*	H40ALV-RN-R-30750-R.250
3/4	.250	1	6	3-3/8	.712	3	46620*	46621*	H40ALV-RN-M-30750-R.250	
3/4	.250	1	7	5	.712	3	46655*	46656*	H40ALV-RN-L-30750-R.250	

* Wiper flats not included if corner radius exceeds 20% of tool diameter. **.0003 max TIR

continued on next page

3 FLUTE - CORNER RADIUS New Items!



H40ALV-RN-3

40° Helix - Variable Pitch - Reduced Neck (cont.)

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Cutter Dia.** D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002^* \\ -.002^* \end{matrix}$	LOC L2 $\begin{matrix} +.032^* \\ -.000^* \end{matrix}$	OAL L1 $\begin{matrix} +.062^* \\ -.062^* \end{matrix}$	Reach (LBS) L3	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
1	1	.030	1-1/4	5	2-5/8	.950	3	46700	46701	H40ALV-RN-R-31000-R.030
	1	.030	1-1/4	6	3-3/8	.950	3	46735	46736	H40ALV-RN-M-31000-R.030
	1	.030	1-1/4	7	4-3/8	.950	3	46770	46771	H40ALV-RN-L-31000-R.030
	1	.030	1-1/4	9	6	.950	3	46805	46806	H40ALV-RN-LX-31000-R.030
	1	.060	1-1/4	5	2-5/8	.950	3	46705	46706	H40ALV-RN-R-31000-R.060
	1	.060	1-1/4	6	3-3/8	.950	3	46740	46741	H40ALV-RN-M-31000-R.060
	1	.060	1-1/4	7	4-3/8	.950	3	46775	46776	H40ALV-RN-L-31000-R.060
	1	.125	1-1/4	5	2-5/8	.950	3	46715	46716	H40ALV-RN-R-31000-R.125
	1	.125	1-1/4	6	3-3/8	.950	3	46750	46751	H40ALV-RN-M-31000-R.125
	1	.125	1-1/4	7	4-3/8	.950	3	46785	46786	H40ALV-RN-L-31000-R.125
	1	.125	1-1/4	9	6	.950	3	46820	46821	H40ALV-RN-LX-31000-R.125
	1	.250	1-1/4	5	2-5/8	.950	3	46725*	46726*	H40ALV-RN-R-31000-R.250
	1	.250	1-1/4	6	3-3/8	.950	3	46760*	46761*	H40ALV-RN-M-31000-R.250
	1	.250	1-1/4	7	4-3/8	.950	3	46795*	46796*	H40ALV-RN-L-31000-R.250
1	.250	1-1/4	9	6	.950	3	46830*	46831*	H40ALV-RN-LX-31000-R.250	

* Wiper flats not included if corner radius exceeds 20% of tool diameter. **.0003 max TIR

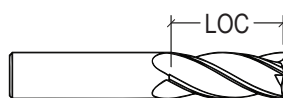
H40ALV-3 / H40ALV-RN-3

Material Guide		SFM	Inches per Tooth (IPT)																				
			1/8			3/16			1/4			3/8			1/2			3/4			1		
			Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0008	.0014	.0017	.0011	.0021	.0019	.0015	.0028	.0022	.0022	.0041	.0025	.0029	.0054	.0029	.0041	.0077	.0035	.0053	.0098	.0042
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0012	.0022	.0021	.0017	.0033	.0024	.0023	.0043	.0027	.0034	.0064	.0031	.0045	.0084	.0036	.0064	.0120	.0043	.0082	.0153	.0052
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0008	.0015	.0017	.0012	.0022	.0020	.0016	.0029	.0022	.0023	.0043	.0025	.0030	.0056	.0030	.0043	.0081	.0035	.0055	.0103	.0043

MILLING PROCESS	STYLE	ADOC	RDOC
Slot (Full Slotting)	Non-Reached	75%-125% Diameter	100% Diameter
	Reached	Up to Max LOC	100% Diameter
Rgh (Traditional Roughing)	Non-Reached	125%-200% Diameter	30%-40% Diameter
	Reached	Up to Max LOC	30%-40% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:

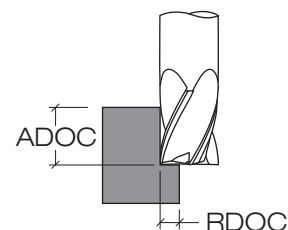
IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Regular Style



Reduced Neck Style



Key: LOC=Length of Cut

ADOC=Axial Depth of Cut

RDOC=Radial Depth of Cut

H45AL-3

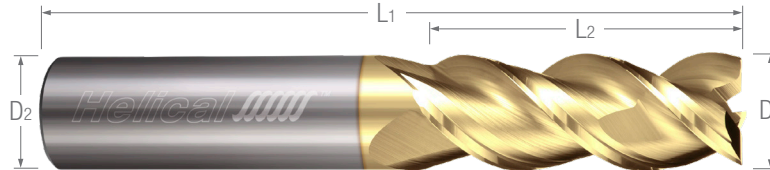


New Items!

3 FLUTE - SQUARE

45° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- Cylindrically ground to maintain edge strength
- Center cutting
- Excellent performance in High Efficiency Milling (HEM)
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 (h6)	Shank Diameter D2 (h6)	Length of Cut L2 ^{+032"} -000"	Overall Length L1 ^{+062"} -062"	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	1/4	1-1/2	3	03015	03017	H45AL-S-30125
	1/8	3/8	2	3	03030	03032	H45AL-SR-30125
	1/8	1/2	2-1/2	3	03045	03047	H45AL-R-30125
	1/8	5/8	2-1/2	3	81551	81552	H45AL-M-30125
	1/8	3/4	2-1/2	3	03060	03062	H45AL-L-30125
	1/8	7/8	2-1/2	3	82849	82850	H45AL-LX-30125
	1/8	1	2-1/2	3	87060	87061	H45AL-X-30125
3/16	3/16	5/16	2	3	03090	03092	H45AL-S-30187
	3/16	7/16	2	3	87062	87063	H45AL-SR-30187
	3/16	9/16	2-1/2	3	03105	03107	H45AL-R-30187
	3/16	3/4	2-1/2	3	03120	03122	H45AL-M-30187
	3/16	1	2-1/2	3	81553	81554	H45AL-ML-30187
	3/16	1-3/16	3	3	82851	82852	H45AL-L-30187
	3/16	1-3/8	3	3	87064	87065	H45AL-LX-30187
1/4	1/4	3/8	2	3	03150	03152	H45AL-S-30250
	1/4	1/2	2-1/2	3	03155	03157	H45AL-SR-30250
	1/4	3/4	2-1/2	3	03165	03167	H45AL-R-30250
	1/4	1	3	3	03180	03182	H45AL-M-30250
	1/4	1-1/4	3	3	03195	03197	H45AL-L-30250
	1/4	1-1/2	3	3	81555	81556	H45AL-LX-30250
	1/4	1-3/4	4	3	03210	03212	H45AL-X-30250
	1/4	2	4	3	82853	82854	H45AL-Y-30250
5/16	5/16	7/16	2	3	03240	03242	H45AL-S-30312
	5/16	13/16	2-1/2	3	03255	03257	H45AL-R-30312
	5/16	1	3	3	03270	03272	H45AL-M-30312
	5/16	1-1/4	3	3	03285	03287	H45AL-L-30312
	5/16	1-9/16	3	3	81557	81558	H45AL-LX-30312
	5/16	2-1/8	4	3	03300	03302	H45AL-X-30312
	5/16	2-1/2	4	3	87066	87067	H45AL-Y-30312

*.0003 max TIR

continued on next page



Speeds & Feeds on Page 69

3 FLUTE - SQUARE

New Items!



H45AL-3

45° Helix (cont.)

continued from previous page

Cutter Diameter* D ₁ (h6)	Shank Diameter D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} -0.000"	Overall Length L ₁ ^{+0.062"} -0.062"	Flutes	Uncoated	Zplus Coated	Tool Description
3/8	3/8	1/2	2	3	03330	03332	H45AL-S-30375
	3/8	3/4	2-1/2	3	81559	81560	H45AL-SR-30375
	3/8	1	3	3	03345	03347	H45AL-R-30375
	3/8	1-1/4	3-1/2	3	03360	03362	H45AL-M-30375
	3/8	1-1/2	4	3	03375	03377	H45AL-L-30375
	3/8	2	4	3	03390	03392	H45AL-LX-30375
	3/8	2-1/2	5	3	03405	03407	H45AL-X-30375
	3/8	3	5	3	82855	82856	H45AL-Y-30375
1/2	1/2	5/8	2-1/2	3	03435	03437	H45AL-S-30500
	1/2	1	3	3	03450	03452	H45AL-SR-30500
	1/2	1-1/4	3	3	03465	03467	H45AL-R-30500
	1/2	1-5/8	4	3	03480	03482	H45AL-M-30500
	1/2	2	4	3	03495	03497	H45AL-L-30500
	1/2	2-1/2	5	3	03510	03512	H45AL-LX-30500
	1/2	3-1/8	6	3	03525	03527	H45AL-X-30500
	1/2	3-5/8	6	3	82857	82858	H45AL-Y-30500
5/8	5/8	3/4	3	3	03555	03557	H45AL-S-30625
	5/8	1-5/8	3-1/2	3	03570	03572	H45AL-R-30625
	5/8	2-1/8	4	3	03585	03587	H45AL-M-30625
	5/8	2-1/2	5	3	03600	03602	H45AL-L-30625
	5/8	3-1/4	6	3	03610	03612	H45AL-LX-30625
	5/8	3-3/4	6	3	03615	03617	H45AL-X-30625
3/4	3/4	1	4	3	03645	03647	H45AL-S-30750
	3/4	1-5/8	4	3	03660	03662	H45AL-R-30750
	3/4	2	4	3	81561	81562	H45AL-A-30750
	3/4	2-1/4	5	3	03675	03677	H45AL-M-30750
	3/4	2-3/4	5	3	81563	81564	H45AL-ML-30750
	3/4	3-1/4	6	3	03690	03692	H45AL-L-30750
	3/4	4	6-1/2	3	03705	03707	H45AL-X-30750
	3/4	4-3/4	7	3	87068	87069	H45AL-Y-30750
1	1	2	5	3	03750	03752	H45AL-R-31000
	1	2-5/8	6	3	03765	03767	H45AL-M-31000
	1	3-1/4	6	3	03780	03782	H45AL-L-31000
	1	4-1/8	7	3	03795	03797	H45AL-X-31000

new

new

*.0003 max TIR

H45AL-3

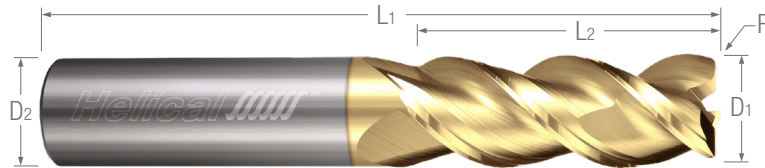


New Items!

3 FLUTE - CORNER RADIUS

45° Helix

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- Cylindrically ground to maintain edge strength
- Center cutting
- Excellent performance in High Efficiency Milling (HEM)
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 (h6)	Shank Dia. D2 (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	Length of Cut L2 $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L1 $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	3	81581	81582	H45AL-S-30125-R.010
	1/8	.010	3/8	2	3	81583	81584	H45AL-SR-30125-R.010
	1/8	.010	1/2	2-1/2	3	81585	81586	H45AL-R-30125-R.010
	1/8	.010	5/8	2-1/2	3	83575	83576	H45AL-M-30125-R.010
	1/8	.010	3/4	2-1/2	3	83577	83578	H45AL-L-30125-R.010
	1/8	.020	1/4	1-1/2	3	83579	83580	H45AL-S-30125-R.020
	1/8	.020	3/8	2	3	83581	83582	H45AL-SR-30125-R.020
	1/8	.020	1/2	2-1/2	3	83583	83584	H45AL-R-30125-R.020
	1/8	.020	5/8	2-1/2	3	87070	87071	H45AL-M-30125-R.020
	1/8	.020	3/4	2-1/2	3	87072	87073	H45AL-L-30125-R.020
	1/8	.030	1/4	1-1/2	3	83585	83586	H45AL-S-30125-R.030
	1/8	.030	3/8	2	3	83587	83588	H45AL-SR-30125-R.030
	1/8	.030	1/2	2-1/2	3	83589	83590	H45AL-R-30125-R.030
	1/8	.030	5/8	2-1/2	3	87074	87075	H45AL-M-30125-R.030
1/8	.030	3/4	2-1/2	3	87076	87077	H45AL-L-30125-R.030	
3/16	3/16	.010	5/16	2	3	83591	83592	H45AL-S-30187-R.010
	3/16	.010	9/16	2-1/2	3	83593	83594	H45AL-R-30187-R.010
	3/16	.010	3/4	2-1/2	3	83595	83596	H45AL-M-30187-R.010
	3/16	.010	1	2-1/2	3	87078	87079	H45AL-ML-30187-R.010
	3/16	.020	5/16	2	3	83597	83598	H45AL-S-30187-R.020
	3/16	.020	9/16	2-1/2	3	83599	83600	H45AL-R-30187-R.020
	3/16	.020	3/4	2-1/2	3	83601	83602	H45AL-M-30187-R.020
	3/16	.020	1	2-1/2	3	87080	87081	H45AL-ML-30187-R.020
	3/16	.030	5/16	2	3	83603	83604	H45AL-S-30187-R.030
	3/16	.030	9/16	2-1/2	3	83605	83606	H45AL-R-30187-R.030
	3/16	.030	3/4	2-1/2	3	83607	83608	H45AL-M-30187-R.030
	3/16	.030	1	2-1/2	3	87082	87083	H45AL-ML-30187-R.030

*.0003 max TIR

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Speeds & Feeds on Page 69

3 FLUTE - CORNER RADIUS

New Items!



H45AL-3

45° Helix (cont.)

continued from previous page

Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.02"} / _{-0.02"}	Length of Cut L ₂ ^{+0.032"} / _{-0.000"}	OAL L ₁ ^{+0.062"} / _{-0.062"}	Flutes	Uncoated	Zplus Coated	Tool Description
1/4	1/4	.010	1/2	2-1/2	3	81587	81588	H45AL-SR-30250-R.010
	1/4	.010	3/4	2-1/2	3	81589	81590	H45AL-R-30250-R.010
	1/4	.010	1	3	3	81591	81592	H45AL-M-30250-R.010
	1/4	.010	1-1/4	3	3	83609	83610	H45AL-L-30250-R.010
	1/4	.020	1/2	2-1/2	3	83611	83612	H45AL-SR-30250-R.020
	1/4	.020	3/4	2-1/2	3	83613	83614	H45AL-R-30250-R.020
	1/4	.020	1	3	3	83615	83616	H45AL-M-30250-R.020
	1/4	.020	1-1/4	3	3	87084	87085	H45AL-L-30250-R.020 new
	1/4	.030	1/2	2-1/2	3	81593	81594	H45AL-SR-30250-R.030
	1/4	.030	3/4	2-1/2	3	81595	81596	H45AL-R-30250-R.030
	1/4	.030	1	3	3	81597	81598	H45AL-M-30250-R.030
	1/4	.030	1-1/4	3	3	83617	83618	H45AL-L-30250-R.030
	1/4	.060	1/2	2-1/2	3	83619	83620	H45AL-SR-30250-R.060
	1/4	.060	3/4	2-1/2	3	83621	83622	H45AL-R-30250-R.060
1/4	.060	1	3	3	83623	83624	H45AL-M-30250-R.060	
1/4	.060	1-1/4	3	3	87086	87087	H45AL-L-30250-R.060 new	
5/16	5/16	.010	7/16	2	3	83625	83626	H45AL-S-30312-R.010
	5/16	.010	13/16	2-1/2	3	83627	83628	H45AL-R-30312-R.010
	5/16	.010	1	3	3	83629	83630	H45AL-M-30312-R.010
	5/16	.030	7/16	2	3	83631	83632	H45AL-S-30312-R.030
	5/16	.030	13/16	2-1/2	3	83633	83634	H45AL-R-30312-R.030
	5/16	.030	1	3	3	83635	83636	H45AL-M-30312-R.030
	5/16	.060	7/16	2	3	83637	83638	H45AL-S-30312-R.060
	5/16	.060	13/16	2-1/2	3	83639	83640	H45AL-R-30312-R.060
5/16	.060	1	3	3	83641	83642	H45AL-M-30312-R.060	
3/8	3/8	.010	1/2	2	3	83643	83644	H45AL-S-30375-R.010
	3/8	.010	1	3	3	83645	83646	H45AL-R-30375-R.010
	3/8	.010	1-1/4	3-1/2	3	83647	83648	H45AL-M-30375-R.010
	3/8	.010	1-1/2	4	3	87088	87089	H45AL-L-30375-R.010 new
	3/8	.010	2	4	3	87090	87091	H45AL-LX-30375-R.010 new
	3/8	.030	1/2	2	3	81599	81600	H45AL-S-30375-R.030
	3/8	.030	1	3	3	81601	81602	H45AL-R-30375-R.030
	3/8	.030	1-1/4	3-1/2	3	81603	81604	H45AL-M-30375-R.030
	3/8	.030	1-1/2	4	3	83649	83650	H45AL-L-30375-R.030
	3/8	.030	2	4	3	87092	87093	H45AL-LX-30375-R.030 new
	3/8	.060	1/2	2	3	81605	81606	H45AL-S-30375-R.060
	3/8	.060	1	3	3	81607	81608	H45AL-R-30375-R.060
	3/8	.060	1-1/4	3-1/2	3	81609	81610	H45AL-M-30375-R.060
	3/8	.060	1-1/2	4	3	83651	83652	H45AL-L-30375-R.060
	3/8	.060	2	4	3	87094	87095	H45AL-LX-30375-R.060 new
	3/8	.125	1/2	2	3	87096	87097	H45AL-S-30375-R.125 new
3/8	.125	1	3	3	87098	87099	H45AL-R-30375-R.125 new	
3/8	.125	1-1/4	3-1/2	3	87100	87101	H45AL-M-30375-R.125 new	

*.0003 max TIR

continued on next page

3 Flute

H45AL-3



New Items!

3 FLUTE - CORNER RADIUS

45° Helix (cont.)

continued from previous page

Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Corner Radius R $\begin{matrix} +.002'' \\ -.002'' \end{matrix}$	Length of Cut L ₂ $\begin{matrix} +.032'' \\ -.000'' \end{matrix}$	OAL L ₁ $\begin{matrix} +.062'' \\ -.062'' \end{matrix}$	Flutes	Uncoated	Zplus Coated	Tool Description
1/2	1/2	.010	1	3	3	83653	83654	H45AL-SR-30500-R.010
	1/2	.010	1-1/4	3	3	83655	83656	H45AL-R-30500-R.010
	1/2	.010	1-5/8	4	3	83657	83658	H45AL-M-30500-R.010
	1/2	.010	2	4	3	83659	83660	H45AL-L-30500-R.010
	1/2	.020	1	3	3	83661	83662	H45AL-SR-30500-R.020
	1/2	.020	1-1/4	3	3	83663	83664	H45AL-R-30500-R.020
	1/2	.020	1-5/8	4	3	83665	83666	H45AL-M-30500-R.020
	1/2	.020	2	4	3	83667	83668	H45AL-L-30500-R.020
	1/2	.030	5/8	2-1/2	3	83669	83670	H45AL-S-30500-R.030
	1/2	.030	1	3	3	81611	81612	H45AL-SR-30500-R.030
	1/2	.030	1-1/4	3	3	81613	81614	H45AL-R-30500-R.030
	1/2	.030	1-5/8	4	3	81615	81616	H45AL-M-30500-R.030
	1/2	.030	2	4	3	81617	81618	H45AL-L-30500-R.030
	1/2	.030	2-1/2	5	3	83671	83672	H45AL-LX-30500-R.030
	1/2	.060	5/8	2-1/2	3	83673	83674	H45AL-S-30500-R.060
	1/2	.060	1	3	3	81619	81620	H45AL-SR-30500-R.060
	1/2	.060	1-1/4	3	3	81621	81622	H45AL-R-30500-R.060
	1/2	.060	1-5/8	4	3	81623	81624	H45AL-M-30500-R.060
	1/2	.060	2	4	3	81625	81626	H45AL-L-30500-R.060
	1/2	.060	2-1/2	5	3	83675	83676	H45AL-LX-30500-R.060
1/2	.125	1	3	3	83677	83678	H45AL-SR-30500-R.125	
1/2	.125	1-1/4	3	3	83679	83680	H45AL-R-30500-R.125	
1/2	.125	1-5/8	4	3	83681	83682	H45AL-M-30500-R.125	
1/2	.125	2	4	3	83683	83684	H45AL-L-30500-R.125	
5/8	5/8	.030	1-5/8	3-1/2	3	83685	83686	H45AL-R-30625-R.030
	5/8	.030	2-1/8	4	3	83687	83688	H45AL-M-30625-R.030
	5/8	.030	2-1/2	5	3	83689	83690	H45AL-L-30625-R.030
	5/8	.060	1-5/8	3-1/2	3	83691	83692	H45AL-R-30625-R.060
	5/8	.060	2-1/8	4	3	83693	83694	H45AL-M-30625-R.060
	5/8	.060	2-1/2	5	3	83695	83696	H45AL-L-30625-R.060
	5/8	.125	1-5/8	3-1/2	3	83697	83698	H45AL-R-30625-R.125
	5/8	.125	2-1/8	4	3	83699	83700	H45AL-M-30625-R.125
	5/8	.125	2-1/2	5	3	83701	83702	H45AL-L-30625-R.125
3/4	3/4	.030	1-5/8	4	3	81627	81628	H45AL-R-30750-R.030
	3/4	.030	2-1/4	5	3	81629	81630	H45AL-M-30750-R.030
	3/4	.060	1-5/8	4	3	81631	81632	H45AL-R-30750-R.060
	3/4	.060	2-1/4	5	3	81633	81634	H45AL-M-30750-R.060
	3/4	.125	1-5/8	4	3	83703	83704	H45AL-R-30750-R.125
	3/4	.125	2-1/4	5	3	83705	83706	H45AL-M-30750-R.125

*.0003 max TIR

3 FLUTE - SQUARE

45° Helix - Reduced Neck



H45AL-RN-3

- Designed for outstanding performance and accelerated material removal rates in aluminum and non-ferrous materials
- Designed with a high helix for improved part finish and shearing action
- High helix for increased part finish and shearing action
- Cylindrically ground to maintain edge strength
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Excellent performance in High Efficiency Milling (HEM)
- Center cutting
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Dia.* D ₁ (h6)	Shank Dia. D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} _{-.000"}	Overall Length L ₁ ^{+0.062"} _{-.062"}	Reach (LBS) L ₃	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
1/8	1/8	5/32	3	1/2	.118	3	19015	19017	H45AL-RN-R-30125
	1/8	5/32	3	3/4	.118	3	19030	19032	H45AL-RN-M-30125
	1/8	5/32	3	1	.118	3	81565	81566	H45AL-RN-L-30125
	1/8	5/32	3	1-1/4	.118	3	83707	83708	H45AL-RN-LX-30125
3/16	3/16	7/32	3	1/2	.178	3	19060	19062	H45AL-RN-R-30187
	3/16	7/32	3	3/4	.178	3	19075	19077	H45AL-RN-M-30187
	3/16	7/32	3	1	.178	3	81567	81568	H45AL-RN-ML-30187
	3/16	7/32	3	1-5/16	.178	3	83709	83710	H45AL-RN-LX-30187
1/4	1/4	3/8	4	3/4	.237	3	19105	19107	H45AL-RN-S-30250
	1/4	3/8	4	1-1/8	.237	3	19120	19122	H45AL-RN-R-30250
	1/4	3/8	4	1-5/8	.237	3	81569	81570	H45AL-RN-A-30250
	1/4	3/8	4	2-1/8	.237	3	19135	19137	H45AL-RN-M-30250
	1/4	3/8	4	2-1/2	.237	3	81571	81572	H45AL-RN-ML-30250
	1/4	3/8	4-1/2	3	.237	3	83711	83712	H45AL-RN-L-30250
5/16	5/16	7/16	4	1-1/8	.296	3	19165	19167	H45AL-RN-R-30312
	5/16	7/16	4	1-3/4	.296	3	83713	83714	H45AL-RN-A-30312
	5/16	7/16	4	2-1/8	.296	3	19180	19182	H45AL-RN-M-30312
	5/16	7/16	6	3-1/8	.296	3	19190	19192	H45AL-RN-L-30312
3/8	3/8	1/2	4	1-1/8	.356	3	19210	19212	H45AL-RN-R-30375
	3/8	1/2	4	1-5/8	.356	3	81573	81574	H45AL-RN-A-30375
	3/8	1/2	4	2-1/8	.356	3	19225	19227	H45AL-RN-M-30375
	3/8	1/2	5	2-1/2	.356	3	83715	83716	H45AL-RN-ML-30375
	3/8	1/2	6	3-1/8	.356	3	19235	19237	H45AL-RN-L-30375
	3/8	1/2	6	4	.356	3	19245	19247	H45AL-RN-X-30375
1/2	1/2	5/8	4	1-3/8	.475	3	19285	19287	H45AL-RN-R-30500
	1/2	5/8	4	1-3/4	.475	3	81575	81576	H45AL-RN-A-30500
	1/2	5/8	4	2-1/4	.475	3	19300	19302	H45AL-RN-M-30500
	1/2	5/8	4-1/2	2-3/4	.475	3	81577	81578	H45AL-RN-ML-30500
	1/2	5/8	6	3-3/8	.475	3	19315	19317	H45AL-RN-L-30500
	1/2	5/8	6	3-3/4	.475	3	83717	83718	H45AL-RN-LX-30500
	1/2	5/8	6	4-1/4	.475	3	19325	19327	H45AL-RN-X-30500

* .0003 max TIR

continued on next page



H45AL-3



3 FLUTE - SQUARE

45° Helix - Reduced Neck (cont.)

continued from previous page

Cutter Dia.*	Shank Dia.	Length of Cut	Overall Length	Reach (LBS)	Neck Dia.	Flutes	Uncoated	Zplus Coated	Tool Description
D ₁ (h6)	D ₂ (h6)	L ₂ ^{+0.032"} _{-.000"}	L ₁ ^{+0.062"} _{-.062"}	L ₃					
3/4	3/4	1	4	2	.712	3	19405	19407	H45AL-RN-R-30750
	3/4	1	6	2-1/2	.712	3	19420	19422	H45AL-RN-M-30750
	3/4	1	6	2-7/8	.712	3	81579	81580	H45AL-RN-ML-30750
	3/4	1	6	3-3/8	.712	3	19435	19437	H45AL-RN-L-30750
	3/4	1	6	4-3/8	.712	3	19445	19447	H45AL-RN-X-30750
1	1	1-1/4	7	4-3/8	.950	3	19495	19497	H45AL-RN-L-31000

* .0003 max TIR

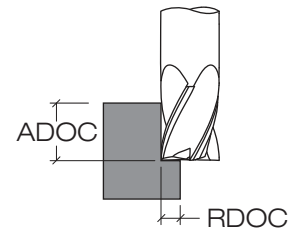
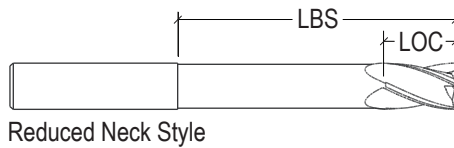
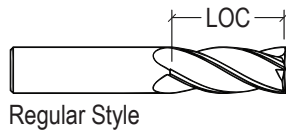
H45AL-3 / H45AL-RN-3

Material Guide		SFM	Inches per Tooth (IPT)																							
			1/8			3/16			1/4			3/8			1/2			3/4			1					
			Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin			
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0008	.0016	.0018	.0012	.0023	.0021	.0016	.0031	.0023	.0024	.0045	.0027	.0032	.0059	.0032	.0046	.0085	.0037	.0058	.0108	.0045			
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0013	.0024	.0023	.0019	.0036	.0026	.0025	.0048	.0029	.0038	.0071	.0034	.0049	.0092	.0039	.0071	.0132	.0047	.0090	.0169	.0057			
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0009	.0016	.0019	.0013	.0024	.0021	.0017	.0032	.0024	.0025	.0047	.0027	.0033	.0062	.0032	.0047	.0089	.0038	.0060	.0113	.0047			

MILLING PROCESS	STYLE	ADOC	RDOC
Slot (Full Slotting)	Non-Reached	75%-125% Diameter	100% Diameter
	Reached	Up to Max LOC	100% Diameter
Rgh (Traditional Roughing)	Non-Reached	125%-200% Diameter	30%-40% Diameter
	Reached	Up to Max LOC	30%-40% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.



Key: LOC=Length of Cut

ADOC=Axial Depth of Cut

RDOC=Radial Depth of Cut

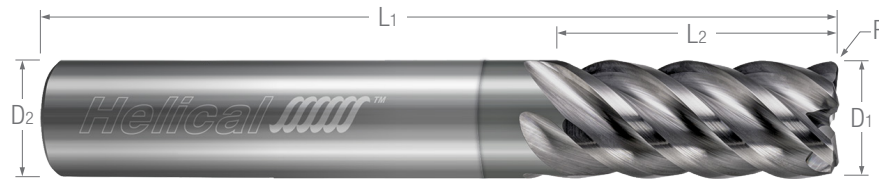
5 FLUTE - CORNER RADIUS

Variable Pitch - For High Efficiency Milling



HVAL-5

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of aerospace aluminum alloys with excellent performance in other non-ferrous alloys
- Excellent tool life and maximum material removal rates proven through extensive testing
- Engineered with variable pitch for minimized harmonics and reduced tool pressure
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Nplus* coating for maximum performance in abrasive aluminums and extended tool life in a wide variety of non-ferrous alloys
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Uncoated	<i>Nplus</i> Coated	Tool Description
1/8	1/4	.010	1/4	2-1/2	5	84105	84106	HVAL-020-50125-R.010
	1/4	.010	3/8	2-1/2	5	84107	84108	HVAL-030-50125-R.010
	1/4	.010	1/2	2-1/2	5	84109	84110	HVAL-040-50125-R.010
	1/4	.030	1/4	2-1/2	5	84111	84112	HVAL-020-50125-R.030
	1/4	.030	3/8	2-1/2	5	84113	84114	HVAL-030-50125-R.030
	1/4	.030	1/2	2-1/2	5	84115	84116	HVAL-040-50125-R.030
3/16	1/4	.010	3/8	2-1/2	5	84117	84118	HVAL-020-50187-R.010
	1/4	.010	3/4	2-1/2	5	84119	84120	HVAL-040-50187-R.010
	1/4	.010	1	2-1/2	5	84121	84122	HVAL-053-50187-R.010
	1/4	.030	3/8	2-1/2	5	84123	84124	HVAL-020-50187-R.030
	1/4	.030	3/4	2-1/2	5	84125	84126	HVAL-040-50187-R.030
	1/4	.030	1	2-1/2	5	84127	84128	HVAL-053-50187-R.030
1/4	1/4	.010	1/2	2-1/2	5	84129	84130	HVAL-020-50250-R.010
	1/4	.010	3/4	2-1/2	5	84131	84132	HVAL-030-50250-R.010
	1/4	.010	1	3	5	84133	84134	HVAL-040-50250-R.010
	1/4	.030	1/2	2-1/2	5	84135	84136	HVAL-020-50250-R.030
	1/4	.030	3/4	2-1/2	5	84137	84138	HVAL-030-50250-R.030
	1/4	.030	1	3	5	84139	84140	HVAL-040-50250-R.030
3/8	3/8	.010	3/4	2-1/2	5	84141	84142	HVAL-020-50375-R.010
	3/8	.010	1	3	5	84143	84144	HVAL-026-50375-R.010
	3/8	.010	1-1/2	3-1/2	5	84145	84146	HVAL-040-50375-R.010
	3/8	.030	3/4	2-1/2	5	84147	84148	HVAL-020-50375-R.030
	3/8	.030	1	3	5	84149	84150	HVAL-026-50375-R.030
	3/8	.030	1-1/2	3-1/2	5	84151	84152	HVAL-040-50375-R.030

* .0003 max TIR

continued on next page



5 Flute

HVAL-5



5 FLUTE - CORNER RADIUS

Variable Pitch - For High Efficiency Milling (cont.)

continued from previous page

Cutter Dia.* D1 $^{+.000}$ $_{-.002}$	Shank Dia. D2 (h6)	Corner Radius R $^{+.002}$ $_{-.002}$	Length of Cut L2 $^{+.032}$ $_{-.000}$	Overall Length L1 $^{+.062}$ $_{-.062}$	Flutes	Uncoated	Nplus Coated	Tool Description
1/2	1/2	.010	1	3	5	84153	84154	HVAL-020-50500-R.010
	1/2	.010	1-1/4	3	5	84155	84156	HVAL-025-50500-R.010
	1/2	.010	1-5/8	4	5	84157	84158	HVAL-032-50500-R.010
	1/2	.010	2	4	5	84159	84160	HVAL-040-50500-R.010
	1/2	.030	1	3	5	84161	84162	HVAL-020-50500-R.030
	1/2	.030	1-1/4	3	5	84163	84164	HVAL-025-50500-R.030
	1/2	.030	1-5/8	4	5	84165	84166	HVAL-032-50500-R.030
	1/2	.030	2	4	5	84167	84168	HVAL-040-50500-R.030
	1/2	.060	1	3	5	84169	84170	HVAL-020-50500-R.060
	1/2	.060	1-1/4	3	5	84171	84172	HVAL-025-50500-R.060
	1/2	.060	1-5/8	4	5	84173	84174	HVAL-032-50500-R.060
	1/2	.060	2	4	5	84175	84176	HVAL-040-50500-R.060
	1/2	.125	1	3	5	84177	84178	HVAL-020-50500-R.125
	1/2	.125	1-1/4	3	5	84179	84180	HVAL-025-50500-R.125
1/2	.125	1-5/8	4	5	84181	84182	HVAL-032-50500-R.125	
1/2	.125	2	4	5	84183	84184	HVAL-040-50500-R.125	
3/4	3/4	.030	1-5/8	4	5	84185	84186	HVAL-021-50750-R.030
	3/4	.030	2-1/4	5	5	84187	84188	HVAL-030-50750-R.030
	3/4	.060	1-5/8	4	5	84189	84190	HVAL-021-50750-R.060
	3/4	.060	2-1/4	5	5	84191	84192	HVAL-030-50750-R.060
	3/4	.125	1-5/8	4	5	84193	84194	HVAL-021-50750-R.125
	3/4	.125	2-1/4	5	5	84195	84196	HVAL-030-50750-R.125

*.0003 max TIR

HVAL-5

Material Guide		SFM	Inches per Tooth (IPT)																				
			1/8			3/16			1/4			3/8			1/2			3/4			1		
			HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0018	.0013	.0018	.0023	.0020	.0020	.0030	.0026	.0023	.0045	.0039	.0027	.0059	.0051	.0031	.0084	.0073	.0037	.0107	.0094	.0045
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0023	.0021	.0023	.0035	.0031	.0025	.0047	.0041	.0029	.0070	.0061	.0033	.0091	.0080	.0039	.0131	.0114	.0046	.0167	.0145	.0056
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0018	.0014	.0018	.0023	.0021	.0021	.0031	.0028	.0024	.0047	.0041	.0027	.0061	.0053	.0032	.0087	.0076	.0038	.0112	.0097	.0046

MILLING PROCESS	ADOC	RDOC
HEM (High Efficiency Milling)	Up to Max LOC	Up to 10% Diameter
Rgh (Traditional Roughing)	125%-200% Diameter	30%-40% Diameter
Fin (Finishing)	Up to Max LOC	4%-6% Diameter

NOTES:

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

MULTI-AXIS FINISHERS - 3 FLUTE

HMAF-AL-3

Lens Form

- Specially defined profile for massive reductions in cycle time and vastly improved surface finish
- Lens form with two tangential radii for finishing floors
- 3 flute geometry specifically designed for finishing in aluminum and non-ferrous alloys
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Nplus* coating for maximum performance in abrasive aluminums and extended tool life in a wide variety of non-ferrous alloys
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000"} _{-.002"}	Shank Dia. D2 (h6)	Major Radius R1	Corner Radius R3	Length of Cut L2 ^{+0.032"} _{-.000"}	Overall Length L1 ^{+0.062"} _{-.062"}	Flutes	Benefit Multiple	<i>Nplus</i> Coated	Tool Description
3/8	3/8	3/4	.020	3/8	2-1/2	3	2x	86314	HMAF-AL-30375-02-LNS
1/2	1/2	1	.030	1/2	3	3	2x	86315	HMAF-AL-30500-02-LNS
5/8	5/8	1-1/4	.035	5/8	3-1/2	3	2x	86316	HMAF-AL-30625-02-LNS
3/4	3/4	1-1/2	.045	3/4	4	3	2x	86317	HMAF-AL-30750-02-LNS

* .0005 max TIR

Multi-Axis Finishers - Technical Information - pg 220

When switching from a traditional ball end mill, the unique geometries of Multi-Axis Finishers allow for dramatically improved surface finish, while significantly reducing cycle times. Learn more about the Benefit Multiple, profile options, and how these superior tools can pay dividends at the spindle.



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HMAF-AL-3									
Material Guide		SFM	Inches per Tooth (IPT)						
			1/8	3/16	1/4	3/8	1/2	3/4	1
			Fin	Fin	Fin	Fin	Fin	Fin	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0016	.0018	.0020	.0023	.0027	.0033	.0039
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0020	.0022	.0025	.0029	.0034	.0040	.0049
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0016	.0018	.0021	.0024	.0028	.0033	.0040

STYLE	TOOLPATH	ADOC (STOCK REMOVAL)	RDOC (STEPOVER PER PASS)
HMAF-AL-3 Lens	Finishing (Fin)	.005"-.010"	.025 x Dia x Benefit Multiple

NOTE: ADOC and RDOC are recommended starting values, and should be adjusted according to your finish requirements. If converting from a ball end mill, the benefit multiple can be used to recalculate stepover pass-to-pass.

HMAF-AL-4

MULTI-AXIS FINISHERS - 4 FLUTE

Taper Form

- Specially defined profile for massive reductions in cycle time and vastly improved surface finish
- Taper form with three tangential radii offered in a variety of angles for maximum performance and optimal clearance angle for any workpiece
- 4 flute geometry specifically designed for finishing in aluminum and non-ferrous alloys
- Center cutting
- h6 shank tolerance for high precision tool holders
- Nplus coating for maximum performance in abrasive aluminums and extended tool life in a wide variety of non-ferrous alloys
- Solid carbide
- CNC ground in the USA



Ang. Per Side	Shank Dia.	Major Radius	Tip Radius	Corner Radius	Length of Cut	OAL	Flutes	Benefit Multiple	Nplus Coated	Tool Description
A1 $+0^{\circ}30'$ $-0^{\circ}30'$	D2 (h6)	R1	R2	R3	L2	L1 $+0.062''$ $-0.062''$				
15°	3/8	12	3/64	3/16	.5901	2-1/2	4	8x	86279	HMAF-AL-40375-08-T15
	3/8	27	3/64	3/16	.5902	2-1/2	4	12x	86284	HMAF-AL-40375-12-T15
	1/2	16	1/16	1/4	.7868	3	4	8x	86287	HMAF-AL-40500-08-T15
	1/2	36	1/16	1/4	.7869	3	4	12x	86292	HMAF-AL-40500-12-T15
	5/8	20	5/64	5/16	.9834	3	4	8x	86295	HMAF-AL-40625-08-T15
	5/8	45	5/64	5/16	.9836	3	4	12x	86300	HMAF-AL-40625-12-T15
	3/4	24	3/32	3/8	1.1801	4	4	8x	86303	HMAF-AL-40750-08-T15
	3/4	54	3/32	3/8	1.1803	4	4	12x	86308	HMAF-AL-40750-12-T15
30°	3/8	12	3/64	3/16	.3281	2-1/2	4	8x	86280	HMAF-AL-40375-08-T30
	3/8	27	3/64	3/16	.3281	2-1/2	4	12x	86285	HMAF-AL-40375-12-T30
	1/2	16	1/16	1/4	.4375	3	4	8x	86288	HMAF-AL-40500-08-T30
	1/2	36	1/16	1/4	.4375	3	4	12x	86293	HMAF-AL-40500-12-T30
	5/8	20	5/64	5/16	.5469	3	4	8x	86296	HMAF-AL-40625-08-T30
	5/8	45	5/64	5/16	.5469	3	4	12x	86301	HMAF-AL-40625-12-T30
	3/4	24	3/32	3/8	.6562	4	4	8x	86304	HMAF-AL-40750-08-T30
	3/4	54	3/32	3/8	.6562	4	4	12x	86309	HMAF-AL-40750-12-T30
45°	3/8	12	3/64	3/64	.1875	2-1/2	4	8x	86281	HMAF-AL-40375-08-T45
	3/8	27	3/64	3/64	.1875	2-1/2	4	12x	86286	HMAF-AL-40375-12-T45
	1/2	16	1/16	1/16	.2500	3	4	8x	86289	HMAF-AL-40500-08-T45
	1/2	36	1/16	1/16	.2500	3	4	12x	86294	HMAF-AL-40500-12-T45
	5/8	20	5/64	5/64	.3125	3	4	8x	86297	HMAF-AL-40625-08-T45
	5/8	45	5/64	5/64	.3125	3	4	12x	86302	HMAF-AL-40625-12-T45
	3/4	24	3/32	3/32	.3750	4	4	8x	86305	HMAF-AL-40750-08-T45
	3/4	54	3/32	3/32	.3750	4	4	12x	86310	HMAF-AL-40750-12-T45

* .0005 max TIR

Multi-Axis Finishers - Technical Information - pg 220

When switching from a traditional ball end mill, the unique geometries of Multi-Axis Finishers allow for dramatically improved surface finish, while significantly reducing cycle times. Learn more about the Benefit Multiple, profile options, and how these superior tools can pay dividends at the spindle.



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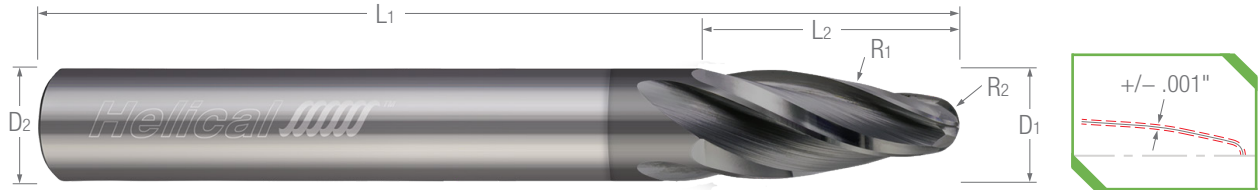


MULTI-AXIS FINISHERS - 4 FLUTE

HMAF-AL-4

Oval Form

- Specially defined profile for massive reductions in cycle time and vastly improved surface finish
- Oval form with two tangential radii for versatility in angle of approach and clearance in tight spaces
- 4 flute geometry specifically designed for finishing in aluminum and non-ferrous alloys
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Nplus* coating for maximum performance in abrasive aluminums and extended tool life in a wide variety of non-ferrous alloys
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.001} / _{-.002} "	Shank Dia. D2 (h6)	Major Radius R1	Tip Radius R2	Length of Cut L2	Overall Length L1 ^{+0.062} / _{-.062} "	Flutes	Benefit Multiple	<i>Nplus</i> Coated	Tool Description
3/8	3/8	3	3/32	.8260	2-1/2	4	4x	86267	HMAF-AL-40375-04-OVL
1/2	1/2	4	1/8	1.1013	3	4	4x	86268	HMAF-AL-40500-04-OVL
5/8	5/8	5	5/32	1.3766	3-1/2	4	4x	86269	HMAF-AL-40625-04-OVL
3/4	3/4	6	3/16	1.6519	4	4	4x	86270	HMAF-AL-40750-04-OVL

* .0005 max TIR

Multi-Axis Finishers - Technical Information - pg 220

When switching from a traditional ball end mill, the unique geometries of Multi-Axis Finishers allow for dramatically improved surface finish, while significantly reducing cycle times. Learn more about the Benefit Multiple, profile options, and how these superior tools can pay dividends at the spindle.



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HMAF-AL-4										
Material Guide		SFM	Inches per Tooth (IPT)							
			1/8	3/16	1/4	3/8	1/2	3/4	1	
			Fin	Fin	Fin	Fin	Fin	Fin	Fin	Fin
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0024	.0027	.0030	.0035	.0041	.0050	.0059	
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0030	.0033	.0038	.0044	.0051	.0060	.0074	
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0024	.0027	.0032	.0036	.0042	.0050	.0060	

STYLE	TOOLPATH	ADOC (STOCK REMOVAL)	RDOC (STEPOVER PER PASS)
HMAF-AL-4 Oval	Finishing (Fin)	.005"-.010"	.025 x Dia x Benefit Multiple
HMAF-AL-4 Taper	Finishing (Fin)	.005"-.010"	.025 x Dia x Benefit Multiple

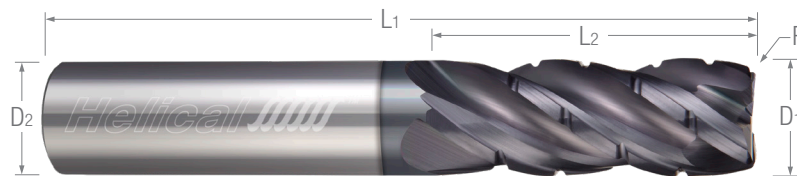
NOTE
ADOC and RDOC are recommended starting values, and should be adjusted according to your finish requirements
If converting from a ball end mill, the benefit multiple can be used to recalculate stepover pass-to-pass

HSVR-C-4

4 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- Eccentric relief for maximum edge strength
- Redesigned end geometry for optimal ramping, slotting, and plunging
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Dia.	Corner Radius	LOC	Overall Length	Flutes	<i>Aplus</i> Coated	<i>Aplus</i> Coated + Weldon Flat	Tool Description
$D1^{+.000''}_{-.002''}$	$D2$ (h6)	$R^{+.002''}_{-.002''}$	$L2^{+.032''}_{-.000''}$	$L1^{+.062''}_{-.062''}$				
1/8	1/8	.010	1/4	1-1/2	4	33017		HSVR-C-S-40125-R.010
	1/8	.010	3/8	2	4	82499		HSVR-C-SR-40125-R.010
	1/8	.010	1/2	2-1/2	4	33032		HSVR-C-R-40125-R.010
	1/8	.010	5/8	2-1/2	4	82500		HSVR-C-A-40125-R.010
	1/8	.030	1/4	1-1/2	4	83453		HSVR-C-S-40125-R.030
	1/8	.030	1/2	2-1/2	4	83454		HSVR-C-R-40125-R.030
3/16	3/16	.010	5/16	2	4	33077		HSVR-C-S-40187-R.010
	3/16	.010	7/16	2	4	82501		HSVR-C-SR-40187-R.010
	3/16	.010	5/8	2-1/2	4	33092		HSVR-C-R-40187-R.010
	3/16	.010	1	2-1/2	4	82502		HSVR-C-M-40187-R.010
	3/16	.030	5/16	2	4	83455		HSVR-C-S-40187-R.030
	3/16	.030	5/8	2-1/2	4	83456		HSVR-C-R-40187-R.030
1/4	1/4	.010	3/8	2	4	83457		HSVR-C-S-40250-R.010
	1/4	.010	1/2	2-1/2	4	83458		HSVR-C-SR-40250-R.010
	1/4	.010	3/4	2-1/2	4	83459		HSVR-C-R-40250-R.010
	1/4	.020	3/8	2	4	33137	33137W	HSVR-C-S-40250-R.020
	1/4	.020	1/2	2-1/2	4	33142	33142W	HSVR-C-SR-40250-R.020
	1/4	.020	3/4	2-1/2	4	33152	33152W	HSVR-C-R-40250-R.020
	1/4	.020	1	3	4	33167		HSVR-C-M-40250-R.020
	1/4	.020	1-1/4	3	4	82503		HSVR-C-L-40250-R.020
	1/4	.030	3/8	2	4	83460		HSVR-C-S-40250-R.030
	1/4	.030	1/2	2-1/2	4	83461		HSVR-C-SR-40250-R.030
	1/4	.030	3/4	2-1/2	4	83462		HSVR-C-R-40250-R.030
5/16	5/16	.020	1/2	2	4	33227		HSVR-C-S-40312-R.020
	5/16	.020	3/4	2-1/2	4	33242		HSVR-C-R-40312-R.020
	5/16	.020	1	2-1/2	4	82504		HSVR-C-A-40312-R.020
	5/16	.020	1-1/4	3	4	33257		HSVR-C-M-40312-R.020

*.0005 max TIR

continued on next page

4 FLUTE - CORNER RADIUS

HSVR-C-4

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Dia.	Corner Radius	LOC	Overall Length	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
D1 ^{+0.001"} / _{-0.002"}	D2 (h6)	R ^{+0.002"} / _{-0.002"}	L2 ^{+0.032"} / _{-0.000"}	L1 ^{+0.062"} / _{-0.062"}				
3/8	3/8	.010	1/2	2	4	83463		HSVR-C-S-40375-R.010
	3/8	.010	7/8	3	4	83464		HSVR-C-SR-40375-R.010
	3/8	.010	1	3	4	83465		HSVR-C-R-40375-R.010
	3/8	.020	1/2	2	4	33317	33317W	HSVR-C-S-40375-R.020
	3/8	.020	7/8	3	4	33332	33332W	HSVR-C-SR-40375-R.020
	3/8	.020	1	3	4	33337	33337W	HSVR-C-R-40375-R.020
	3/8	.020	1-1/4	3	4	33347	33347W	HSVR-C-M-40375-R.020
	3/8	.020	1-1/2	3	4	82505		HSVR-C-L-40375-R.020
	3/8	.030	1/2	2	4	83466		HSVR-C-S-40375-R.030
	3/8	.030	7/8	3	4	83467		HSVR-C-SR-40375-R.030
	3/8	.030	1	3	4	83468		HSVR-C-R-40375-R.030
	7/16	7/16	.020	5/8	2-3/4	4	33407	
7/16		.020	7/8	2-3/4	4	33422		HSVR-C-R-40437-R.020
1/2	1/2	.010	5/8	2-1/2	4	83469		HSVR-C-S-40500-R.010
	1/2	.010	1	3	4	83470		HSVR-C-SR-40500-R.010
	1/2	.010	1-1/4	3	4	83471		HSVR-C-R-40500-R.010
	1/2	.010	1-5/8	4	4	83472		HSVR-C-M-40500-R.010
	1/2	.030	5/8	2-1/2	4	33497	33497W	HSVR-C-S-40500-R.030
	1/2	.030	1	3	4	33512	33512W	HSVR-C-SR-40500-R.030
	1/2	.030	1-1/4	3	4	33527	33527W	HSVR-C-R-40500-R.030
	1/2	.030	1-5/8	4	4	33542	33542W	HSVR-C-M-40500-R.030
	1/2	.030	2	4	4	82506		HSVR-C-L-40500-R.030
	1/2	.030	2-1/2	4	4	82507		HSVR-C-LX-40500-R.030
	1/2	.060	5/8	2-1/2	4	83473		HSVR-C-S-40500-R.060
	1/2	.060	1	3	4	83474		HSVR-C-SR-40500-R.060
	1/2	.060	1-1/4	3	4	83475		HSVR-C-R-40500-R.060
	1/2	.060	1-5/8	4	4	83476		HSVR-C-M-40500-R.060
5/8	5/8	.030	3/4	3	4	33557	33557W	HSVR-C-S-40625-R.030
	5/8	.030	1-1/4	3-1/2	4	33572	33572W	HSVR-C-SR-40625-R.030
	5/8	.030	1-5/8	3-1/2	4	33587	33587W	HSVR-C-R-40625-R.030
	5/8	.030	2	4	4	33602	33602W	HSVR-C-M-40625-R.030
	5/8	.030	2-1/2	5	4	82508		HSVR-C-ML-40625-R.030
	5/8	.030	3-1/4	6	4	33617		HSVR-C-L-40625-R.030
	5/8	.060	1-1/4	3-1/2	4	83477		HSVR-C-SR-40625-R.060
	5/8	.060	1-5/8	3-1/2	4	83478		HSVR-C-R-40625-R.060
	5/8	.060	2	4	4	83479		HSVR-C-M-40625-R.060
3/4	3/4	.030	7/8	3	4	33632	33632W	HSVR-C-S-40750-R.030
	3/4	.030	1-1/4	4	4	33647	33647W	HSVR-C-SR-40750-R.030
	3/4	.030	1-5/8	4	4	33662	33662W	HSVR-C-R-40750-R.030
	3/4	.030	2-1/4	5	4	33677	33677W	HSVR-C-M-40750-R.030
	3/4	.030	2-3/4	5	4	82509		HSVR-C-ML-40750-R.030
	3/4	.030	3-1/4	6	4	33692	33692W	HSVR-C-L-40750-R.030
	3/4	.060	1-5/8	4	4	83480		HSVR-C-R-40750-R.060
	3/4	.060	2-1/4	5	4	83481		HSVR-C-M-40750-R.060
1	1	.030	1-1/2	4	4	33707		HSVR-C-S-41000-R.030
	1	.030	2	4-1/2	4	33722		HSVR-C-R-41000-R.030
	1	.030	2-5/8	5	4	33737	33737W	HSVR-C-M-41000-R.030
	1	.030	3	6	4	33742	33742W	HSVR-C-ML-41000-R.030
	1	.030	4-1/4	7	4	33752		HSVR-C-L-41000-R.030

*.0005 max TIR

HSVR-C-RN-4

4 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- Eccentric relief for maximum edge strength
- Redesigned end geometry for optimal ramping, slotting, and plunging
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.001"} -0.002"	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} -0.002"	Length of Cut L2 ^{+0.032"} -0.000"	OAL L1 ^{+0.062"} -0.062"	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.020	3/8	4	3/4	.237	4	82876	HSVR-C-RN-S-40250-R.020
	1/4	.020	3/8	4	1-1/8	.237	4	82877	HSVR-C-RN-R-40250-R.020
	1/4	.020	3/8	4	2-1/8	.237	4	82878	HSVR-C-RN-M-40250-R.020
3/8	3/8	.020	1/2	4	1-1/8	.356	4	82879	HSVR-C-RN-S-40375-R.020
	3/8	.020	1/2	4	2-1/8	.356	4	82880	HSVR-C-RN-R-40375-R.020
	3/8	.020	1/2	6	3-1/8	.356	4	82881	HSVR-C-RN-M-40375-R.020
1/2	1/2	.030	5/8	4	1-1/2	.475	4	82882	HSVR-C-RN-S-40500-R.030
	1/2	.030	5/8	4	2-1/4	.475	4	82883	HSVR-C-RN-R-40500-R.030
	1/2	.030	5/8	6	3-3/8	.475	4	82884	HSVR-C-RN-M-40500-R.030
	1/2	.030	5/8	6	4-1/8	.475	4	82885	HSVR-C-RN-L-40500-R.030
3/4	3/4	.030	1	4	2	.712	4	82886	HSVR-C-RN-S-40750-R.030
	3/4	.030	1	6	2-1/2	.712	4	82887	HSVR-C-RN-R-40750-R.030
	3/4	.030	1	6	3-3/8	.712	4	82888	HSVR-C-RN-M-40750-R.030

* .0005 max TIR

SPEEDS & FEEDS

HSVR-C-4

4 Flute - Chipbreaker Rougher - Variable Pitch

Roughers

HSVR-C-4 / HSVR-C-RN-4

Material Guide	Hardness	SFM	Inches per Tooth (IPT)													
			1/8		3/16		1/4		3/8		1/2		3/4		1	
			Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL 10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0008	.0013	.0012	.0019	.0015	.0025	.0023	.0037	.0030	.0048	.0042	.0069	.0054	.0088
	75 - 98 HRB	445	.0006	.0009	.0008	.0014	.0011	.0018	.0017	.0027	.0022	.0035	.0031	.0051	.0040	.0065
	21 - 36 HRC	400	.0004	.0006	.0005	.0009	.0007	.0012	.0011	.0017	.0014	.0023	.0020	.0033	.0026	.0042
LOW ALLOY STEEL 13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0005	.0008	.0007	.0012	.0010	.0016	.0014	.0023	.0019	.0031	.0027	.0044	.0034	.0056
	21 - 36 HRC	340	.0004	.0006	.0005	.0009	.0007	.0012	.0011	.0017	.0014	.0023	.0020	.0033	.0025	.0042
	36 - 50 HRC	260	.0003	.0005	.0005	.0008	.0006	.0010	.0009	.0015	.0012	.0020	.0018	.0029	.0022	.0036
	> 50 HRC	155	.0003	.0004	.0004	.0006	.0005	.0008	.0007	.0012	.0010	.0016	.0014	.0023	.0017	.0029
TOOL STEEL A2, H13, L6, P20, S7	75 - 98 HRB	340	.0005	.0008	.0007	.0012	.0010	.0016	.0014	.0023	.0019	.0031	.0027	.0044	.0034	.0056
	21 - 36 HRC	250	.0004	.0006	.0006	.0009	.0008	.0013	.0011	.0019	.0015	.0024	.0021	.0035	.0027	.0045
	36 - 50 HRC	145	.0003	.0005	.0005	.0007	.0006	.0010	.0009	.0015	.0012	.0019	.0017	.0027	.0021	.0035
	> 50 HRC	85	.0003	.0004	.0004	.0006	.0005	.0008	.0007	.0012	.0010	.0016	.0014	.0022	.0017	.0028
SPECIALTY STEEL 300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0006	.0011	.0010	.0015	.0013	.0021	.0019	.0031	.0025	.0040	.0035	.0058	.0045	.0073
	75 - 98 HRB	255	.0005	.0007	.0007	.0011	.0009	.0014	.0013	.0021	.0017	.0028	.0024	.0040	.0031	.0050
	21 - 36 HRC	175	.0004	.0007	.0006	.0010	.0008	.0013	.0012	.0019	.0015	.0025	.0022	.0035	.0028	.0045
	36 - 50 HRC	150	.0004	.0006	.0005	.0009	.0007	.0011	.0010	.0017	.0014	.0022	.0019	.0032	.0025	.0040
	> 50 HRC	55	.0002	.0004	.0003	.0005	.0004	.0007	.0006	.0010	.0008	.0014	.0012	.0019	.0015	.0025
AUSTENITIC STAINLESS STEEL Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0005	.0008	.0007	.0011	.0009	.0015	.0014	.0023	.0018	.0030	.0026	.0043	.0033	.0054
	21 - 36 HRC	225	.0004	.0007	.0006	.0010	.0008	.0014	.0013	.0021	.0016	.0027	.0024	.0039	.0030	.0049
	36 - 50 HRC	180	.0003	.0006	.0005	.0008	.0007	.0011	.0010	.0016	.0013	.0022	.0019	.0031	.0024	.0039
MARTENSITIC & FERRITIC STAINLESS STEEL 403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0005	.0008	.0007	.0012	.0010	.0016	.0014	.0024	.0019	.0031	.0027	.0044	.0034	.0056
	21 - 36 HRC	280	.0004	.0007	.0006	.0010	.0008	.0014	.0012	.0020	.0016	.0027	.0023	.0038	.0030	.0049
PH STAINLESS STEEL 15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0004	.0006	.0005	.0009	.0007	.0012	.0011	.0017	.0014	.0023	.0020	.0032	.0025	.0041
	36 - 50 HRC	145	.0003	.0005	.0005	.0008	.0006	.0010	.0009	.0015	.0012	.0020	.0017	.0028	.0022	.0036
GRAY CAST IRON SAE J431, ASTM A48	75 - 98 HRB	410	.0008	.0013	.0012	.0019	.0016	.0026	.0023	.0038	.0030	.0050	.0044	.0071	.0055	.0091
	21 - 36 HRC	370	.0004	.0007	.0006	.0010	.0009	.0014	.0013	.0021	.0017	.0027	.0024	.0039	.0030	.0049
MALLEABLE CAST IRON ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0024	.0019	.0032	.0028	.0045	.0035	.0058
	21 - 36 HRC	335	.0004	.0007	.0007	.0010	.0009	.0014	.0013	.0021	.0017	.0027	.0024	.0039	.0030	.0049
NODULAR (DUCTILE) CAST IRON ASTM A536, ASTM 897	75 - 98 HRB	310	.0005	.0009	.0008	.0013	.0010	.0017	.0015	.0025	.0020	.0033	.0029	.0047	.0037	.0060
	21 - 36 HRC	260	.0004	.0006	.0005	.0008	.0007	.0011	.0010	.0017	.0013	.0022	.0019	.0031	.0024	.0040
	36 - 50 HRC	135	.0002	.0004	.0003	.0005	.0004	.0007	.0007	.0011	.0009	.0014	.0012	.0020	.0015	.0025
PURE NICKEL Nickel 200, Nickel 201	< 75 HRB	285	.0007	.0011	.0010	.0016	.0013	.0022	.0020	.0032	.0026	.0042	.0037	.0060	.0047	.0077
	75 - 98 HRB	250	.0006	.0009	.0008	.0014	.0011	.0018	.0017	.0027	.0022	.0035	.0031	.0051	.0039	.0064
NICKEL ALLOY Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0003	.0006	.0005	.0008	.0007	.0011	.0010	.0016	.0013	.0022	.0019	.0031	.0024	.0039
	21 - 36 HRC	75	.0003	.0005	.0005	.0008	.0006	.0011	.0010	.0016	.0013	.0021	.0018	.0030	.0023	.0037
	36 - 50 HRC	70	.0003	.0005	.0004	.0007	.0006	.0009	.0008	.0014	.0011	.0018	.0015	.0025	.0020	.0032
PURE TITANIUM Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0009	.0015	.0014	.0022	.0018	.0030	.0027	.0044	.0036	.0058	.0051	.0083	.0065	.0106
	75 - 98 HRB	275	.0008	.0013	.0012	.0019	.0015	.0025	.0023	.0037	.0030	.0049	.0043	.0070	.0054	.0089
	21 - 36 HRC	250	.0006	.0010	.0009	.0014	.0012	.0019	.0017	.0028	.0022	.0037	.0032	.0052	.0041	.0067
TITANIUM ALLOY Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0005	.0008	.0007	.0011	.0009	.0015	.0014	.0022	.0018	.0029	.0025	.0041	.0032	.0053
	36 - 50 HRC	160	.0004	.0007	.0006	.0010	.0008	.0014	.0012	.0020	.0016	.0026	.0023	.0038	.0029	.0048
COBALT ALLOY ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0004	.0006	.0006	.0009	.0008	.0013	.0011	.0019	.0015	.0024	.0021	.0035	.0027	.0045
	21 - 36 HRC	170	.0004	.0006	.0006	.0009	.0008	.0012	.0011	.0018	.0014	.0024	.0021	.0034	.0026	.0043
	36 - 50 HRC	65	.0003	.0004	.0004	.0006	.0005	.0008	.0007	.0012	.0010	.0016	.0014	.0023	.0018	.0029

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	75%-125% Diameter	100% Diameter
	≥ 35 HRC	60%-75% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	20%-40% Diameter

NOTES:

Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

HEV-C-5



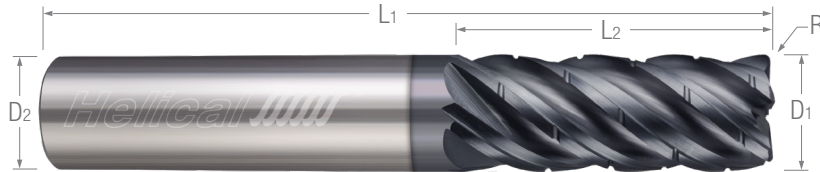
New Items!

5 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 5 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 173 for *Tplus* coating



new
new
new
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new

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1^{+.000^*}_{-.002^*}$	D_2 (h6)	$R^{+.002^*}_{-.002^*}$	$L_2^{+.032^*}_{-.000^*}$	$L_1^{+.062^*}_{-.062^*}$			
1/8	1/8	.010	1/4	1-1/2	5	59391	HEV-C-S-50125-R.010
	1/8	.010	3/8	2	5	82213	HEV-C-SR-50125-R.010
	1/8	.010	1/2	2-1/2	5	59392	HEV-C-R-50125-R.010
	1/8	.010	5/8	2-1/2	5	82214	HEV-C-A-50125-R.010
	1/8	.010	3/4	2-1/2	5	83068	HEV-C-M-50125-R.010
	1/8	.020	1/4	1-1/2	5	87343	HEV-C-S-50125-R.020
	1/8	.020	3/8	2	5	87344	HEV-C-SR-50125-R.020
	1/8	.020	1/2	2-1/2	5	87345	HEV-C-R-50125-R.020
	1/8	.020	5/8	2-1/2	5	87346	HEV-C-A-50125-R.020
	1/8	.020	3/4	2-1/2	5	87347	HEV-C-M-50125-R.020
	1/8	.030	1/4	1-1/2	5	87348	HEV-C-S-50125-R.030
	1/8	.030	3/8	2	5	87349	HEV-C-SR-50125-R.030
	1/8	.030	1/2	2-1/2	5	87350	HEV-C-R-50125-R.030
	1/8	.030	5/8	2-1/2	5	87351	HEV-C-A-50125-R.030
1/8	.030	3/4	2-1/2	5	87352	HEV-C-M-50125-R.030	
3/16	3/16	.010	5/16	2	5	59393	HEV-C-S-50187-R.010
	3/16	.010	7/16	2	5	81956	HEV-C-SR-50187-R.010
	3/16	.010	9/16	2-1/2	5	59394	HEV-C-R-50187-R.010
	3/16	.010	3/4	2-1/2	5	81957	HEV-C-M-50187-R.010
	3/16	.010	1	2-1/2	5	83069	HEV-C-ML-50187-R.010
	3/16	.020	5/16	2	5	87353	HEV-C-S-50187-R.020
	3/16	.020	7/16	2	5	87354	HEV-C-SR-50187-R.020
	3/16	.020	9/16	2-1/2	5	87355	HEV-C-R-50187-R.020
	3/16	.020	3/4	2-1/2	5	87356	HEV-C-M-50187-R.020
	3/16	.020	1	2-1/2	5	87357	HEV-C-ML-50187-R.020
	3/16	.030	5/16	2	5	83070	HEV-C-S-50187-R.030
	3/16	.030	7/16	2	5	83071	HEV-C-SR-50187-R.030
	3/16	.030	9/16	2-1/2	5	83072	HEV-C-R-50187-R.030
	3/16	.030	3/4	2-1/2	5	83073	HEV-C-M-50187-R.030
3/16	.030	1	2-1/2	5	87358	HEV-C-ML-50187-R.030	

*.0005 max TIR

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5 FLUTE - CORNER RADIUS New Items!



HEV-C-5

Chipbreaker Rougher - Variable Pitch (cont.)

Roughers

continued from previous page

Cutter Diameter* D1 ^{+0.000"} / _{-0.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	Length of Cut L2 ^{+0.032"} / _{-0.000"}	Overall Length L1 ^{+0.062"} / _{-0.062"}	Flutes	Aplus Coated	Tool Description
1/4	1/4	.020	3/8	2	5	59395	HEV-C-S-50250-R.020
	1/4	.020	1/2	2-1/2	5	59396	HEV-C-SR-50250-R.020
	1/4	.020	3/4	2-1/2	5	59397	HEV-C-R-50250-R.020
	1/4	.020	1	3	5	59398	HEV-C-M-50250-R.020
	1/4	.020	1-1/4	3	5	82215	HEV-C-L-50250-R.020
	1/4	.020	1-1/2	3	5	83074	HEV-C-LX-50250-R.020
	1/4	.030	3/8	2	5	83075	HEV-C-S-50250-R.030
	1/4	.030	1/2	2-1/2	5	83076	HEV-C-SR-50250-R.030
	1/4	.030	3/4	2-1/2	5	83077	HEV-C-R-50250-R.030
	1/4	.030	1	3	5	83078	HEV-C-M-50250-R.030
	1/4	.060	3/8	2	5	87359	HEV-C-S-50250-R.060 new
	1/4	.060	1/2	2-1/2	5	87360	HEV-C-SR-50250-R.060 new
	1/4	.060	3/4	2-1/2	5	87361	HEV-C-R-50250-R.060 new
1/4	.060	1	3	5	87362	HEV-C-M-50250-R.060 new	
5/16	5/16	.020	7/16	2	5	59399	HEV-C-S-50312-R.020
	5/16	.020	13/16	2-1/2	5	59400	HEV-C-R-50312-R.020
	5/16	.020	1-1/4	3	5	82216	HEV-C-L-50312-R.020
3/8	3/8	.020	1/2	2	5	59401	HEV-C-S-50375-R.020
	3/8	.020	3/4	2-1/2	5	81958	HEV-C-SR-50375-R.020
	3/8	.020	1	3	5	59402	HEV-C-R-50375-R.020
	3/8	.020	1-1/4	3	5	59403	HEV-C-M-50375-R.020
	3/8	.020	1-1/2	3-1/2	5	82217	HEV-C-L-50375-R.020
	3/8	.020	2	4	5	83079	HEV-C-LX-50375-R.020
	3/8	.030	1/2	2	5	83080	HEV-C-S-50375-R.030
	3/8	.030	3/4	2-1/2	5	83081	HEV-C-SR-50375-R.030
	3/8	.030	1	3	5	83082	HEV-C-R-50375-R.030
	3/8	.030	1-1/4	3	5	83083	HEV-C-M-50375-R.030
	3/8	.060	1/2	2	5	87363	HEV-C-S-50375-R.060 new
	3/8	.060	3/4	2-1/2	5	87364	HEV-C-SR-50375-R.060 new
	3/8	.060	1	3	5	87365	HEV-C-R-50375-R.060 new
3/8	.060	1-1/4	3	5	87366	HEV-C-M-50375-R.060 new	
1/2	1/2	.010	5/8	2-1/2	5	83084	HEV-C-S-50500-R.010
	1/2	.010	1	3	5	83085	HEV-C-SR-50500-R.010
	1/2	.010	1-1/4	3	5	83086	HEV-C-R-50500-R.010
	1/2	.010	1-5/8	4	5	83087	HEV-C-M-50500-R.010
	1/2	.010	2	4	5	83088	HEV-C-L-50500-R.010
	1/2	.030	5/8	2-1/2	5	59404	HEV-C-S-50500-R.030
	1/2	.030	1	3	5	59405	HEV-C-SR-50500-R.030
	1/2	.030	1-1/4	3	5	59406	HEV-C-R-50500-R.030
	1/2	.030	1-5/8	4	5	59407	HEV-C-M-50500-R.030
	1/2	.030	2	4	5	59408	HEV-C-L-50500-R.030
	1/2	.030	2-1/2	5	5	81959	HEV-C-LX-50500-R.030
	1/2	.030	3-1/8	6	5	82218	HEV-C-X-50500-R.030
	1/2	.030	3-5/8	6	5	82219	HEV-C-Y-50500-R.030

* .0005 max TIR

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New Items!

5 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D ₁ ^{+0.000"} / _{-0.002"}	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	Length of Cut L ₂ ^{+0.032"} / _{-0.000"}	Overall Length L ₁ ^{+0.062"} / _{-0.062"}	Flutes	Aplus Coated	Tool Description
1/2	1/2	.060	5/8	2-1/2	5	81960	HEV-C-S-50500-R.060
	1/2	.060	1	3	5	81961	HEV-C-SR-50500-R.060
	1/2	.060	1-1/4	3	5	81962	HEV-C-R-50500-R.060
	1/2	.060	1-5/8	4	5	81963	HEV-C-M-50500-R.060
	1/2	.060	2	4	5	81964	HEV-C-L-50500-R.060
	1/2	.060	2-1/2	5	5	81965	HEV-C-LX-50500-R.060
	1/2	.060	3-1/8	6	5	83089	HEV-C-X-50500-R.060
	1/2	.125	5/8	2-1/2	5	87367	HEV-C-S-50500-R.125
	1/2	.125	1	3	5	87368	HEV-C-SR-50500-R.125
	1/2	.125	1-1/4	3	5	87369	HEV-C-R-50500-R.125
1/2	.125	1-5/8	4	5	87370	HEV-C-M-50500-R.125	
5/8	5/8	.030	3/4	3	5	59409	HEV-C-S-50625-R.030
	5/8	.030	1-1/4	3-1/2	5	59410	HEV-C-SR-50625-R.030
	5/8	.030	1-5/8	3-1/2	5	59411	HEV-C-R-50625-R.030
	5/8	.030	2-1/8	4	5	59412	HEV-C-M-50625-R.030
	5/8	.030	2-1/2	5	5	82220	HEV-C-L-50625-R.030
	5/8	.030	3-1/4	6	5	82221	HEV-C-LX-50625-R.030
	5/8	.060	3/4	3	5	81966	HEV-C-S-50625-R.060
	5/8	.060	1-1/4	3-1/2	5	81967	HEV-C-SR-50625-R.060
	5/8	.060	1-5/8	3-1/2	5	81968	HEV-C-R-50625-R.060
5/8	.060	2-1/8	4	5	81969	HEV-C-M-50625-R.060	
3/4	3/4	.030	1	3	5	59413	HEV-C-S-50750-R.030
	3/4	.030	1-5/8	4	5	59414	HEV-C-R-50750-R.030
	3/4	.030	2-1/4	5	5	59415	HEV-C-M-50750-R.030
	3/4	.030	2-3/4	5	5	59416	HEV-C-L-50750-R.030
	3/4	.030	3-1/4	6	5	59417	HEV-C-LX-50750-R.030
	3/4	.030	4	6-1/2	5	82222	HEV-C-X-50750-R.030
	3/4	.060	1	3	5	81970	HEV-C-S-50750-R.060
	3/4	.060	1-5/8	4	5	81971	HEV-C-R-50750-R.060
	3/4	.060	2-1/4	5	5	81972	HEV-C-M-50750-R.060
	3/4	.060	2-3/4	5	5	81973	HEV-C-L-50750-R.060
	3/4	.060	3-1/4	6	5	81974	HEV-C-LX-50750-R.060
	3/4	.125	1-5/8	4	5	87371	HEV-C-R-50750-R.125
	3/4	.125	2-1/4	5	5	87372	HEV-C-M-50750-R.125
3/4	.125	2-3/4	5	5	87373	HEV-C-L-50750-R.125	
3/4	.125	3-1/4	6	5	87374	HEV-C-LX-50750-R.125	
1	1	.030	1-1/4	4	5	59418	HEV-C-S-51000-R.030
	1	.030	2	4-1/2	5	59419	HEV-C-R-51000-R.030

*.0005 max TIR

5 FLUTE - CORNER RADIUS New Items!

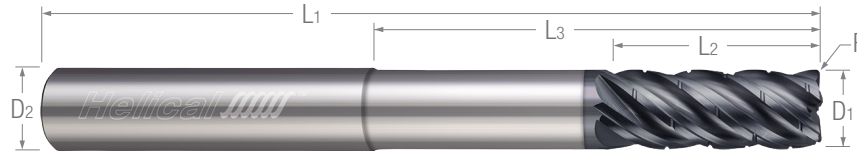


HEV-C-RN-5

Chipbreaker Rougher - Variable Pitch - Reduced Neck

Roughers

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in deep pocket High Efficiency Milling (HEM) applications
- 5 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D ₁ ^{+0.000"} / _{-.002"}	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L ₂ ^{+0.032"} / _{-.000"}	OAL L ₁ ^{+0.062"} / _{-.062"}	Reach (LBS) L ₃	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	5/32	2	3/8	.118	5	87395	HEV-C-RN-S-50125-R.010
	1/8	.010	5/32	2	1/2	.118	5	87396	HEV-C-RN-SR-50125-R.010
	1/8	.010	5/32	2-1/2	3/4	.118	5	87397	HEV-C-RN-R-50125-R.010
	1/8	.010	5/32	2-1/2	1	.118	5	87398	HEV-C-RN-M-50125-R.010
3/16	3/16	.010	7/32	2	1/2	.178	5	87399	HEV-C-RN-S-50187-R.010
	3/16	.010	7/32	2-1/2	3/4	.178	5	87400	HEV-C-RN-SR-50187-R.010
	3/16	.010	7/32	2-1/2	1-1/8	.178	5	87401	HEV-C-RN-R-50187-R.010
	3/16	.010	7/32	2-1/2	1-5/16	.178	5	87402	HEV-C-RN-M-50187-R.010
1/4	1/4	.020	3/8	4	3/4	.237	5	82889	HEV-C-RN-S-50250-R.020
	1/4	.020	3/8	4	1-1/8	.237	5	82890	HEV-C-RN-R-50250-R.020
	1/4	.020	3/4	4	1-1/8	.237	5	82891	HEV-C-RNR-R-50250-R.020
	1/4	.020	3/8	4	2-1/8	.237	5	82892	HEV-C-RN-M-50250-R.020
	1/4	.020	3/4	4	2-1/8	.237	5	82893	HEV-C-RNR-M-50250-R.020
3/8	3/8	.020	1/2	4	1-1/8	.356	5	82894	HEV-C-RN-S-50375-R.020
	3/8	.020	1/2	4	2-1/8	.356	5	82895	HEV-C-RN-R-50375-R.020
	3/8	.020	1	4	2-1/8	.356	5	82896	HEV-C-RNR-R-50375-R.020
	3/8	.020	1/2	6	3-1/8	.356	5	82897	HEV-C-RN-M-50375-R.020
	3/8	.020	1	6	3-1/8	.356	5	82898	HEV-C-RNR-M-50375-R.020
1/2	1/2	.030	5/8	4	1-1/2	.475	5	82899	HEV-C-RN-S-50500-R.030
	1/2	.030	5/8	4	2-1/4	.475	5	82900	HEV-C-RN-R-50500-R.030
	1/2	.030	1-1/4	4	2-1/4	.475	5	82901	HEV-C-RNR-R-50500-R.030
	1/2	.030	5/8	6	3-3/8	.475	5	82902	HEV-C-RN-M-50500-R.030
	1/2	.030	1-1/4	6	3-3/8	.475	5	82903	HEV-C-RNR-M-50500-R.030
	1/2	.030	5/8	6	4-1/8	.475	5	82904	HEV-C-RN-L-50500-R.030
	1/2	.030	1-1/4	6	4-1/8	.475	5	82905	HEV-C-RNR-L-50500-R.030
3/4	3/4	.030	1	4	2	.712	5	82906	HEV-C-RN-S-50750-R.030
	3/4	.030	1	6	2-1/2	.712	5	82907	HEV-C-RN-R-50750-R.030
	3/4	.030	1-5/8	6	2-1/2	.712	5	82908	HEV-C-RNR-R-50750-R.030
	3/4	.030	1	6	3-3/8	.712	5	82909	HEV-C-RN-M-50750-R.030
	3/4	.030	1-5/8	6	3-3/8	.712	5	82910	HEV-C-RNR-M-50750-R.030

* .0005 max TIR

HEV-C-5



SPEEDS & FEEDS

5 Flute - Chipbreaker Rougher - Variable Pitch

HEV-C-5 / HEV-C-RN-5

Material Guide		Hardness	SFM	Inches per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0009	.0015	.0014	.0021	.0018	.0029	.0027	.0043	.0035	.0056	.0051	.0080	.0065	.0102
		75 - 98 HRB	445	.0007	.0011	.0010	.0015	.0013	.0021	.0020	.0031	.0026	.0041	.0037	.0059	.0047	.0075
		21 - 36 HRC	400	.0004	.0007	.0007	.0010	.0009	.0014	.0013	.0020	.0017	.0026	.0024	.0038	.0031	.0048
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0006	.0009	.0009	.0013	.0012	.0018	.0017	.0027	.0022	.0035	.0032	.0051	.0041	.0065
		21 - 36 HRC	340	.0004	.0007	.0007	.0010	.0009	.0013	.0013	.0020	.0017	.0026	.0024	.0038	.0030	.0048
		36 - 50 HRC	260	.0004	.0006	.0006	.0009	.0008	.0012	.0011	.0017	.0015	.0023	.0021	.0033	.0027	.0042
		> 50 HRC	155	.0003	.0005	.0005	.0007	.0006	.0009	.0009	.0014	.0011	.0018	.0017	.0026	.0021	.0033
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0006	.0009	.0009	.0013	.0012	.0018	.0017	.0027	.0022	.0035	.0032	.0051	.0041	.0065
		21 - 36 HRC	250	.0005	.0007	.0007	.0011	.0009	.0015	.0014	.0022	.0018	.0028	.0026	.0040	.0033	.0051
		36 - 50 HRC	145	.0004	.0006	.0005	.0008	.0007	.0011	.0011	.0017	.0014	.0022	.0020	.0031	.0026	.0040
		> 50 HRC	85	.0003	.0005	.0005	.0007	.0006	.0009	.0009	.0014	.0011	.0018	.0016	.0026	.0021	.0033
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0008	.0012	.0011	.0018	.0015	.0024	.0023	.0035	.0029	.0046	.0042	.0066	.0054	.0085
		75 - 98 HRB	255	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0024	.0020	.0032	.0029	.0045	.0037	.0058
		21 - 36 HRC	175	.0005	.0008	.0007	.0011	.0009	.0015	.0014	.0022	.0018	.0029	.0026	.0041	.0033	.0052
		36 - 50 HRC	150	.0004	.0007	.0006	.0010	.0008	.0013	.0012	.0019	.0016	.0026	.0023	.0037	.0030	.0046
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0006	.0009	.0009	.0013	.0011	.0018	.0017	.0026	.0022	.0034	.0031	.0049	.0040	.0063
		21 - 36 HRC	225	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0024	.0020	.0031	.0028	.0044	.0036	.0057
		36 - 50 HRC	180	.0004	.0007	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0036	.0029	.0045
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0006	.0009	.0009	.0013	.0012	.0018	.0017	.0027	.0023	.0035	.0032	.0051	.0041	.0065
		21 - 36 HRC	280	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0024	.0020	.0031	.0028	.0044	.0036	.0056
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0004	.0007	.0006	.0010	.0009	.0013	.0013	.0020	.0017	.0026	.0024	.0037	.0030	.0048
		36 - 50 HRC	145	.0004	.0006	.0006	.0009	.0007	.0012	.0011	.0017	.0014	.0023	.0021	.0032	.0026	.0041
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0010	.0015	.0014	.0022	.0019	.0029	.0028	.0044	.0036	.0057	.0052	.0082	.0066	.0104
		21 - 36 HRC	370	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0024	.0020	.0031	.0028	.0045	.0036	.0057
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0006	.0010	.0009	.0014	.0012	.0019	.0018	.0028	.0023	.0036	.0033	.0052	.0042	.0066
		21 - 36 HRC	335	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0024	.0020	.0031	.0029	.0045	.0036	.0057
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0006	.0010	.0009	.0014	.0012	.0020	.0018	.0029	.0024	.0038	.0034	.0054	.0044	.0069
		21 - 36 HRC	260	.0004	.0007	.0006	.0010	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0036	.0029	.0046
		36 - 50 HRC	135	.0003	.0004	.0004	.0006	.0005	.0008	.0008	.0012	.0010	.0016	.0014	.0023	.0018	.0029
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0008	.0013	.0012	.0018	.0016	.0025	.0024	.0037	.0031	.0049	.0044	.0070	.0056	.0089
		75 - 98 HRB	250	.0007	.0011	.0010	.0015	.0013	.0021	.0020	.0031	.0026	.0041	.0037	.0058	.0047	.0074
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0035	.0029	.0045
		21 - 36 HRC	75	.0004	.0006	.0006	.0009	.0008	.0012	.0012	.0018	.0015	.0024	.0022	.0034	.0028	.0043
		36 - 50 HRC	70	.0003	.0005	.0005	.0008	.0007	.0010	.0010	.0015	.0013	.0020	.0019	.0029	.0023	.0037
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0011	.0017	.0017	.0025	.0022	.0035	.0033	.0051	.0043	.0067	.0061	.0096	.0078	.0122
		75 - 98 HRB	275	.0009	.0015	.0014	.0021	.0018	.0029	.0027	.0043	.0036	.0056	.0051	.0081	.0065	.0103
		21 - 36 HRC	250	.0007	.0011	.0010	.0016	.0014	.0022	.0021	.0032	.0027	.0042	.0038	.0060	.0049	.0077
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0006	.0009	.0008	.0013	.0011	.0017	.0016	.0025	.0021	.0033	.0030	.0048	.0039	.0061
		36 - 50 HRC	160	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0023	.0019	.0030	.0028	.0043	.0035	.0055
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0005	.0007	.0007	.0011	.0009	.0015	.0014	.0021	.0018	.0028	.0026	.0040	.0032	.0051
		21 - 36 HRC	170	.0005	.0007	.0007	.0010	.0009	.0014	.0013	.0021	.0017	.0027	.0025	.0039	.0031	.0050
		36 - 50 HRC	65	.0003	.0005	.0005	.0007	.0006	.0010	.0009	.0014	.0012	.0018	.0017	.0026	.0021	.0034

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	30%-75% Diameter	100% Diameter
	≥ 35 HRC	25%-50% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	10%-30% Diameter
	≥ 35 HRC	Up to Max LOC	10%-30% Diameter

NOTES:

Hardness Scales: HRB = Rockwell B

HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

6 FLUTE - CORNER RADIUS

New Items!



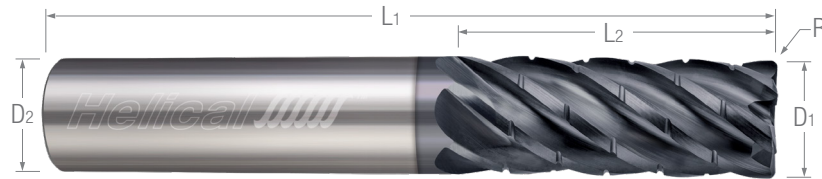
HEV-C-6

Chipbreaker Rougher - Variable Pitch

Roughers

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 6 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 175 for *Tplus* coating



Cutter Diameter* D1 ^{+0.001"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	6	84374	HEV-C-S-60125-R.010
	1/8	.010	3/8	2	6	84375	HEV-C-SR-60125-R.010
	1/8	.010	1/2	2-1/2	6	84376	HEV-C-R-60125-R.010
	1/8	.010	5/8	2-1/2	6	84377	HEV-C-A-60125-R.010
3/16	3/16	.010	5/16	2	6	84378	HEV-C-S-60187-R.010
	3/16	.010	7/16	2	6	84379	HEV-C-SR-60187-R.010
	3/16	.010	9/16	2-1/2	6	84380	HEV-C-R-60187-R.010
	3/16	.010	3/4	2-1/2	6	84381	HEV-C-M-60187-R.010
1/4	1/4	.010	3/8	2	6	83125	HEV-C-S-60250-R.010
	1/4	.010	1/2	2-1/2	6	83126	HEV-C-SR-60250-R.010
	1/4	.010	3/4	2-1/2	6	83127	HEV-C-R-60250-R.010
	1/4	.010	1	3	6	83128	HEV-C-M-60250-R.010
	1/4	.020	3/8	2	6	82223	HEV-C-S-60250-R.020
	1/4	.020	1/2	2-1/2	6	82224	HEV-C-SR-60250-R.020
	1/4	.020	3/4	2-1/2	6	82225	HEV-C-R-60250-R.020
	1/4	.020	1	3	6	82226	HEV-C-M-60250-R.020
	1/4	.030	3/8	2	6	87403	HEV-C-S-60250-R.030 new
	1/4	.030	1/2	2-1/2	6	87404	HEV-C-SR-60250-R.030 new
	1/4	.030	3/4	2-1/2	6	87405	HEV-C-R-60250-R.030 new
	1/4	.030	1	3	6	87406	HEV-C-M-60250-R.030 new
	1/4	.060	3/8	2	6	87407	HEV-C-S-60250-R.060 new
	1/4	.060	1/2	2-1/2	6	87408	HEV-C-SR-60250-R.060 new
	1/4	.060	3/4	2-1/2	6	87409	HEV-C-R-60250-R.060 new
	1/4	.060	1	3	6	87410	HEV-C-M-60250-R.060 new
3/8	3/8	.010	1/2	2	6	83129	HEV-C-S-60375-R.010
	3/8	.010	3/4	2-1/2	6	83130	HEV-C-SR-60375-R.010
	3/8	.010	1	3	6	83131	HEV-C-R-60375-R.010
	3/8	.010	1-1/4	3	6	83132	HEV-C-M-60375-R.010
	3/8	.020	1/2	2	6	87411	HEV-C-S-60375-R.020 new
	3/8	.020	3/4	2-1/2	6	87412	HEV-C-SR-60375-R.020 new
	3/8	.020	1	3	6	87413	HEV-C-R-60375-R.020 new
	3/8	.020	1-1/4	3	6	87414	HEV-C-M-60375-R.020 new

*.0005 max TIR

continued on next page



HEV-C-6



New Items!

6 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
$D_1^{+0.000}$ $-.002$ "	D_2 (h6)	$R^{+0.002}$ $-.002$ "	$L_2^{+0.032}$ $-.000$ "	$L_1^{+0.062}$ $-.062$ "			
new new new new	3/8	.030	1/2	2	6	82227	HEV-C-S-60375-R.030
		.030	3/4	2-1/2	6	82228	HEV-C-SR-60375-R.030
		.030	1	3	6	82229	HEV-C-R-60375-R.030
		.030	1-1/4	3	6	82230	HEV-C-M-60375-R.030
		.060	1/2	2	6	87415	HEV-C-S-60375-R.060
		.060	3/4	2-1/2	6	87416	HEV-C-SR-60375-R.060
		.060	1	3	6	87417	HEV-C-R-60375-R.060
		.060	1-1/4	3	6	87418	HEV-C-M-60375-R.060
new new new new	1/2	.010	5/8	2-1/2	6	83133	HEV-C-S-60500-R.010
		.010	1	3	6	83134	HEV-C-SR-60500-R.010
		.010	1-1/4	3	6	83135	HEV-C-R-60500-R.010
		.010	1-5/8	4	6	83136	HEV-C-M-60500-R.010
		.010	2	4	6	83137	HEV-C-L-60500-R.010
		.010	2-1/2	5	6	83138	HEV-C-LX-60500-R.010
		.030	5/8	2-1/2	6	82231	HEV-C-S-60500-R.030
		.030	1	3	6	82232	HEV-C-SR-60500-R.030
		.030	1-1/4	3	6	82233	HEV-C-R-60500-R.030
		.030	1-5/8	4	6	82234	HEV-C-M-60500-R.030
		.030	2	4	6	82235	HEV-C-L-60500-R.030
		.030	2-1/2	5	6	82236	HEV-C-LX-60500-R.030
		.060	5/8	2-1/2	6	82237	HEV-C-S-60500-R.060
		.060	1	3	6	82238	HEV-C-SR-60500-R.060
		.060	1-1/4	3	6	82239	HEV-C-R-60500-R.060
		.060	1-5/8	4	6	82240	HEV-C-M-60500-R.060
		.060	2	4	6	82241	HEV-C-L-60500-R.060
		.060	2-1/2	5	6	82242	HEV-C-LX-60500-R.060
		.125	5/8	2-1/2	6	87419	HEV-C-S-60500-R.125
.125	1	3	6	87420	HEV-C-SR-60500-R.125		
.125	1-1/4	3	6	87421	HEV-C-R-60500-R.125		
.125	1-5/8	4	6	87422	HEV-C-M-60500-R.125		
new new new new	5/8	.030	1-1/4	3-1/2	6	83139	HEV-C-SR-60625-R.030
		.030	1-5/8	3-1/2	6	83140	HEV-C-R-60625-R.030
		.030	2	4	6	83141	HEV-C-M-60625-R.030
		.060	1-1/4	3-1/2	6	82243	HEV-C-SR-60625-R.060
		.060	1-5/8	3-1/2	6	82244	HEV-C-R-60625-R.060
		.060	2	4	6	82245	HEV-C-M-60625-R.060
new new new new	3/4	.030	1-5/8	4	6	83142	HEV-C-R-60750-R.030
		.030	2-1/4	5	6	83143	HEV-C-M-60750-R.030
		.030	2-3/4	5	6	83144	HEV-C-L-60750-R.030
		.060	1-5/8	4	6	82246	HEV-C-R-60750-R.060
		.060	2-1/4	5	6	82247	HEV-C-M-60750-R.060
		.060	2-3/4	5	6	82248	HEV-C-L-60750-R.060
		.125	1-5/8	4	6	87423	HEV-C-R-60750-R.125
		.125	2-1/4	5	6	87424	HEV-C-M-60750-R.125
.125	2-3/4	5	6	87425	HEV-C-L-60750-R.125		

*.0005 max TIR

SPEEDS & FEEDS



HEV-C-6

6 Flute - Chipbreaker Rougher - Variable Pitch

Roughers

Material Guide		Hardness	SFM	HEV-C-6						
				1/8	3/16	1/4	3/8	1/2	3/4	1
				Rgh	Rgh	Rgh	Rgh	Rgh	Rgh	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0014	.0020	.0028	.0041	.0054	.0077	.0099
		75 - 98 HRB	445	.0010	.0015	.0020	.0030	.0040	.0057	.0073
		21 - 36 HRC	400	.0007	.0010	.0013	.0020	.0026	.0037	.0047
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0009	.0013	.0018	.0026	.0034	.0049	.0063
		21 - 36 HRC	340	.0007	.0010	.0013	.0020	.0026	.0037	.0047
		36 - 50 HRC	260	.0006	.0008	.0011	.0017	.0022	.0032	.0041
		> 50 HRC	155	.0005	.0007	.0009	.0014	.0018	.0025	.0033
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0009	.0013	.0018	.0026	.0034	.0049	.0063
		21 - 36 HRC	250	.0007	.0010	.0014	.0021	.0027	.0039	.0050
		36 - 50 HRC	145	.0006	.0008	.0011	.0016	.0021	.0031	.0040
		> 50 HRC	85	.0005	.0007	.0009	.0013	.0017	.0025	.0032
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0012	.0017	.0023	.0034	.0045	.0064	.0082
		75 - 98 HRB	255	.0008	.0012	.0016	.0023	.0031	.0044	.0056
		21 - 36 HRC	175	.0007	.0010	.0014	.0021	.0027	.0039	.0051
		36 - 50 HRC	150	.0006	.0009	.0013	.0019	.0025	.0035	.0046
		> 50 HRC	55	.0004	.0006	.0008	.0012	.0015	.0022	.0028
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0009	.0013	.0017	.0025	.0033	.0048	.0061
		21 - 36 HRC	225	.0008	.0011	.0015	.0023	.0030	.0043	.0055
		36 - 50 HRC	180	.0006	.0009	.0012	.0018	.0024	.0034	.0044
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0009	.0013	.0018	.0026	.0034	.0049	.0064
		21 - 36 HRC	280	.0008	.0011	.0015	.0023	.0030	.0043	.0055
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0007	.0010	.0013	.0019	.0025	.0036	.0047
		36 - 50 HRC	145	.0006	.0008	.0011	.0017	.0022	.0031	.0040
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0014	.0021	.0029	.0042	.0056	.0080	.0103
		21 - 36 HRC	370	.0008	.0011	.0016	.0023	.0030	.0043	.0056
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0009	.0013	.0018	.0027	.0035	.0051	.0065
		21 - 36 HRC	335	.0008	.0012	.0016	.0023	.0030	.0043	.0056
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0010	.0014	.0019	.0028	.0037	.0052	.0068
		21 - 36 HRC	260	.0006	.0009	.0012	.0019	.0024	.0035	.0045
		36 - 50 HRC	135	.0004	.0006	.0008	.0012	.0015	.0022	.0029
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0012	.0018	.0024	.0036	.0047	.0067	.0087
		75 - 98 HRB	250	.0010	.0015	.0020	.0030	.0039	.0057	.0073
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0006	.0009	.0012	.0018	.0024	.0034	.0044
		21 - 36 HRC	75	.0006	.0009	.0012	.0017	.0023	.0033	.0042
		36 - 50 HRC	70	.0005	.0007	.0010	.0015	.0020	.0028	.0036
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0017	.0025	.0033	.0050	.0065	.0093	.0120
		75 - 98 HRB	275	.0014	.0021	.0028	.0042	.0055	.0078	.0101
		21 - 36 HRC	250	.0011	.0015	.0021	.0031	.0041	.0059	.0076
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0009	.0012	.0017	.0025	.0032	.0046	.0060
		36 - 50 HRC	160	.0008	.0011	.0015	.0022	.0029	.0042	.0054
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0007	.0010	.0014	.0021	.0027	.0039	.0051
		21 - 36 HRC	170	.0007	.0010	.0014	.0020	.0026	.0038	.0049
		36 - 50 HRC	65	.0005	.0007	.0009	.0014	.0018	.0026	.0033

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	15%-25% Diameter
	≥ 35 HRC	Up to Max LOC	10%-20% Diameter

NOTES:

Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

HEV-C-7



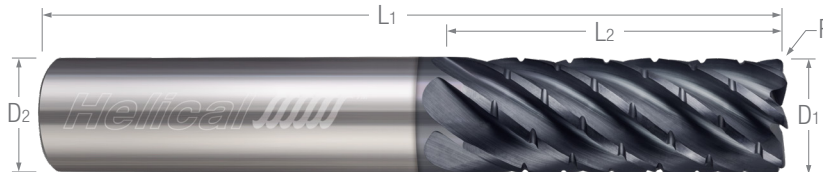
New Items!

7 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 178 for *Tplus* coating

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Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1^{+.000" / -.002"}$	$D_2 (h6)$	$R^{+.002" / -.002"}$	$L_2^{+.032" / -.000"}$	$L_1^{+.062" / -.062"}$			
1/4	1/4	.020	3/8	2	7	59420	HEV-C-S-70250-R.020
	1/4	.020	1/2	2	7	59421	HEV-C-SR-70250-R.020
	1/4	.020	3/4	2-1/2	7	59422	HEV-C-R-70250-R.020
	1/4	.020	1	3	7	82249	HEV-C-M-70250-R.020
	1/4	.020	1-1/4	3	7	83163	HEV-C-L-70250-R.020
	1/4	.030	3/8	2	7	87174	HEV-C-S-70250-R.030
	1/4	.030	1/2	2	7	87175	HEV-C-SR-70250-R.030
	1/4	.030	3/4	2-1/2	7	87176	HEV-C-R-70250-R.030
3/8	3/8	.020	1/2	2	7	59423	HEV-C-S-70375-R.020
	3/8	.020	3/4	2-1/2	7	59424	HEV-C-SR-70375-R.020
	3/8	.020	1	2-1/2	7	59425	HEV-C-R-70375-R.020
	3/8	.020	1-1/2	3-1/2	7	82250	HEV-C-L-70375-R.020
	3/8	.030	1/2	2	7	87177	HEV-C-S-70375-R.030
	3/8	.030	3/4	2-1/2	7	87178	HEV-C-SR-70375-R.030
	3/8	.030	1	2-1/2	7	87179	HEV-C-R-70375-R.030
	3/8	.060	1/2	2	7	83164	HEV-C-S-70375-R.060
1/2	1/2	.010	5/8	2-1/2	7	87180	HEV-C-S-70500-R.010
	1/2	.010	1	3	7	87181	HEV-C-SR-70500-R.010
	1/2	.010	1-1/4	3	7	87182	HEV-C-R-70500-R.010
	1/2	.010	1-5/8	4	7	87183	HEV-C-M-70500-R.010
	1/2	.010	2	4	7	87184	HEV-C-L-70500-R.010
	1/2	.020	5/8	2-1/2	7	83167	HEV-C-S-70500-R.020
	1/2	.020	1	3	7	83168	HEV-C-SR-70500-R.020
	1/2	.020	1-1/4	3	7	83169	HEV-C-R-70500-R.020
	1/2	.020	1-5/8	4	7	83170	HEV-C-M-70500-R.020
	1/2	.020	2	4	7	83171	HEV-C-L-70500-R.020
	1/2	.030	5/8	2-1/2	7	59426	HEV-C-S-70500-R.030
	1/2	.030	1	3	7	59427	HEV-C-SR-70500-R.030
	1/2	.030	1-1/4	3	7	59428	HEV-C-R-70500-R.030
	1/2	.030	1-5/8	4	7	59429	HEV-C-M-70500-R.030
	1/2	.030	2	4	7	81975	HEV-C-L-70500-R.030
1/2	.030	2-1/2	5	7	82251	HEV-C-LX-70500-R.030	
1/2	.030	3-1/8	6	7	82252	HEV-C-X-70500-R.030	

*.0005 max TIR

7 FLUTE - CORNER RADIUS

New Items!



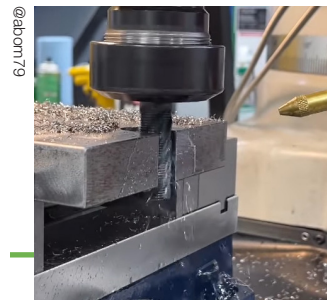
HEV-C-7

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.000"} - _{.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} - _{.002"}	Length of Cut L2 ^{+0.032"} - _{.000"}	Overall Length L1 ^{+0.062"} - _{.062"}	Flutes	Aplus Coated	Tool Description
1/2	1/2	.060	5/8	2-1/2	7	81978	HEV-C-S-70500-R.060
	1/2	.060	1	3	7	81979	HEV-C-SR-70500-R.060
	1/2	.060	1-1/4	3	7	81980	HEV-C-R-70500-R.060
	1/2	.060	1-5/8	4	7	81981	HEV-C-M-70500-R.060
	1/2	.060	2	4	7	81982	HEV-C-L-70500-R.060
	1/2	.060	2-1/2	5	7	83172	HEV-C-LX-70500-R.060
5/8	5/8	.030	3/4	3	7	83173	HEV-C-S-70625-R.030
	5/8	.030	1-1/4	3-1/2	7	59430	HEV-C-SR-70625-R.030
	5/8	.030	1-5/8	4	7	59431	HEV-C-R-70625-R.030
	5/8	.030	2-1/8	4	7	81976	HEV-C-M-70625-R.030
	5/8	.060	1-1/4	3-1/2	7	81983	HEV-C-SR-70625-R.060
	5/8	.060	1-5/8	4	7	81984	HEV-C-R-70625-R.060
	5/8	.060	2-1/8	4	7	81985	HEV-C-M-70625-R.060
3/4	3/4	.030	1-1/4	3-1/2	7	83174	HEV-C-SR-70750-R.030
	3/4	.030	1-5/8	4	7	59432	HEV-C-R-70750-R.030
	3/4	.030	2-1/4	5	7	59433	HEV-C-M-70750-R.030
	3/4	.030	2-3/4	5	7	81977	HEV-C-L-70750-R.030
	3/4	.030	3-1/4	6	7	83175	HEV-C-LX-70750-R.030
	3/4	.030	4	6-1/2	7	87185	HEV-C-X-70750-R.030 new
	3/4	.060	1-1/4	3-1/2	7	83176	HEV-C-SR-70750-R.060
	3/4	.060	1-5/8	4	7	81986	HEV-C-R-70750-R.060
	3/4	.060	2-1/4	5	7	81987	HEV-C-M-70750-R.060
	3/4	.060	2-3/4	5	7	81988	HEV-C-L-70750-R.060
	3/4	.060	3-1/4	6	7	87186	HEV-C-LX-70750-R.060 new
1	1	.030	2-5/8	5	7	87188	HEV-C-M-71000-R.030 new
	1	.030	3-1/4	6	7	87189	HEV-C-L-71000-R.030 new
	1	.030	4-1/8	7	7	87190	HEV-C-X-71000-R.030 new

* .0005 max TIR



Follow Helical Tools on Instagram and See How We Help You Run Faster. Push Harder. Machine Smarter.

SKU: [55257](#)
 Coating: *Aplus*
 Cutter Dia: 5/8"
 Length of Cut: 1-5/8"
 Radius: .060"

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Tag us and share what you are working on @helicaltools

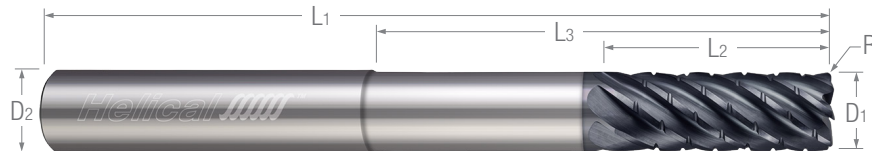
HEV-C-RN-7



7 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch- Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in deep pocket High Efficiency Milling (HEM) applications
- 7 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- End cutting geometry (non-center cutting)
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	OAL L1 ^{+0.062"} / _{-.062"}	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.020	3/4	4	1-1/8	.237	7	82927	HEV-C-RNR-R-70250-R.020
	1/4	.020	3/4	4	2-1/8	.237	7	82928	HEV-C-RNR-M-70250-R.020
3/8	3/8	.020	1	4	2-1/8	.356	7	82929	HEV-C-RNR-R-70375-R.020
	3/8	.020	1	6	3-1/8	.356	7	82930	HEV-C-RNR-M-70375-R.020
1/2	1/2	.030	1-1/4	4	2-1/4	.475	7	82931	HEV-C-RNR-R-70500-R.030
	1/2	.030	1-1/4	6	3-3/8	.475	7	82932	HEV-C-RNR-M-70500-R.030
	1/2	.030	1-1/4	6	4-1/8	.475	7	82933	HEV-C-RNR-L-70500-R.030
	1/2	.060	1-1/4	4	2-1/4	.475	7	82934	HEV-C-RNR-R-70500-R.060
	1/2	.060	1-1/4	6	3-3/8	.475	7	82935	HEV-C-RNR-M-70500-R.060
	1/2	.060	1-1/4	6	4-1/8	.475	7	82936	HEV-C-RNR-L-70500-R.060
3/4	3/4	.030	1-5/8	6	2-1/2	.712	7	82937	HEV-C-RNR-R-70750-R.030
	3/4	.030	1-5/8	6	3-3/8	.712	7	82938	HEV-C-RNR-M-70750-R.030
	3/4	.060	1-5/8	6	2-1/2	.712	7	82939	HEV-C-RNR-R-70750-R.060
	3/4	.060	1-5/8	6	3-3/8	.712	7	82940	HEV-C-RNR-M-70750-R.060

*.0005 max TIR



SPEEDS & FEEDS



HEV-C-7

7 Flute - Chipbreaker Rougher - Variable Pitch

Roughers

Material Guide		Hardness	SFM	HEV-C-7 / HEV-C-RN-7						
				1/8	3/16	1/4	3/8	1/2	3/4	1
				Rgh	Rgh	Rgh	Rgh	Rgh	Rgh	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0015	.0023	.0030	.0045	.0058	.0085	.0108
		75 - 98 HRB	445	.0011	.0017	.0022	.0033	.0042	.0062	.0079
		21 - 36 HRC	400	.0007	.0011	.0014	.0021	.0028	.0040	.0051
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0010	.0014	.0019	.0029	.0037	.0054	.0068
		21 - 36 HRC	340	.0007	.0011	.0014	.0021	.0027	.0040	.0051
		36 - 50 HRC	260	.0006	.0009	.0012	.0019	.0024	.0035	.0044
		> 50 HRC	155	.0005	.0007	.0010	.0015	.0019	.0028	.0035
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0010	.0014	.0019	.0029	.0037	.0054	.0068
		21 - 36 HRC	250	.0008	.0011	.0015	.0023	.0029	.0043	.0054
		36 - 50 HRC	145	.0006	.0009	.0012	.0018	.0023	.0033	.0042
		> 50 HRC	85	.0005	.0007	.0010	.0014	.0019	.0027	.0034
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0013	.0019	.0025	.0037	.0048	.0070	.0089
		75 - 98 HRB	255	.0009	.0013	.0017	.0026	.0033	.0048	.0061
		21 - 36 HRC	175	.0008	.0012	.0015	.0023	.0030	.0043	.0055
		36 - 50 HRC	150	.0007	.0011	.0014	.0021	.0027	.0039	.0049
		> 50 HRC	55	.0004	.0006	.0008	.0013	.0016	.0024	.0030
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0009	.0014	.0019	.0028	.0036	.0052	.0066
		21 - 36 HRC	225	.0008	.0013	.0017	.0025	.0032	.0047	.0060
		36 - 50 HRC	180	.0007	.0010	.0013	.0020	.0026	.0038	.0048
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0010	.0015	.0019	.0029	.0037	.0054	.0068
		21 - 36 HRC	280	.0008	.0013	.0017	.0025	.0032	.0047	.0059
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0007	.0011	.0014	.0021	.0027	.0039	.0050
		36 - 50 HRC	145	.0006	.0009	.0012	.0018	.0024	.0034	.0044
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0016	.0024	.0031	.0046	.0060	.0087	.0111
		21 - 36 HRC	370	.0009	.0013	.0017	.0025	.0032	.0047	.0060
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0010	.0015	.0019	.0029	.0038	.0055	.0070
		21 - 36 HRC	335	.0009	.0013	.0017	.0025	.0033	.0047	.0060
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0010	.0016	.0020	.0031	.0039	.0057	.0073
		21 - 36 HRC	260	.0007	.0010	.0013	.0020	.0026	.0038	.0048
		36 - 50 HRC	135	.0004	.0007	.0009	.0013	.0017	.0024	.0031
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0013	.0020	.0026	.0039	.0051	.0074	.0094
		75 - 98 HRB	250	.0011	.0017	.0022	.0033	.0042	.0062	.0079
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0007	.0010	.0013	.0020	.0026	.0037	.0048
		21 - 36 HRC	75	.0007	.0010	.0013	.0019	.0025	.0036	.0046
		36 - 50 HRC	70	.0006	.0008	.0011	.0016	.0021	.0031	.0039
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0018	.0028	.0036	.0054	.0070	.0102	.0129
		75 - 98 HRB	275	.0015	.0023	.0030	.0045	.0059	.0085	.0108
		21 - 36 HRC	250	.0011	.0017	.0023	.0034	.0044	.0064	.0081
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0009	.0014	.0018	.0027	.0035	.0050	.0064
		36 - 50 HRC	160	.0008	.0012	.0016	.0025	.0032	.0046	.0058
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0008	.0012	.0015	.0023	.0029	.0043	.0054
		21 - 36 HRC	170	.0007	.0011	.0015	.0022	.0028	.0041	.0052
		36 - 50 HRC	65	.0005	.0008	.0010	.0015	.0019	.0028	.0036

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	10%-20% Diameter
	≥ 35 HRC	Up to Max LOC	10%-20% Diameter

NOTES:

Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

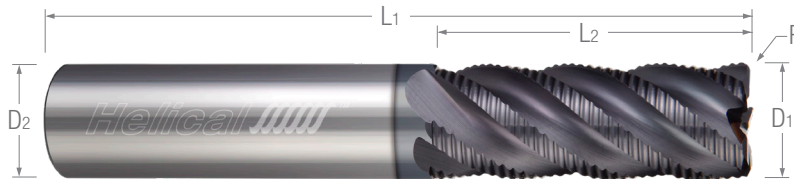
HXVR

MULTI-FLUTE - CORNER RADIUS

Knuckle Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with staggered "low profile" edge geometry for chip control and minimized cutting forces
- Available in 4 flute and 5 flute options
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 180 for *Tplus* coating



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	<i>Aplus</i> Coated + Weldon Flat	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 \text{ (h6)}$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$				
1/4	1/4	.030	3/8	2	4	54017	54017W	HXVR-S-40250-R.030
	1/4	.030	1/2	2-1/2	4	82859		HXVR-SR-40250-R.030
	1/4	.030	3/4	2-1/2	4	54047	54047W	HXVR-R-40250-R.030
	1/4	.030	1	3	4	82860		HXVR-M-40250-R.030
3/8	3/8	.040	1/2	2	4	54092	54092W	HXVR-S-40375-R.040
	3/8	.040	1/2	2	5	55092	55092W	HXVR-S-50375-R.040
	3/8	.040	3/4	2-1/2	4	82861		HXVR-SR-40375-R.040
	3/8	.040	3/4	2-1/2	5	82862		HXVR-SR-50375-R.040
	3/8	.040	1	3	4	54107	54107W	HXVR-R-40375-R.040
	3/8	.040	1	3	5	55107	55107W	HXVR-R-50375-R.040
	3/8	.040	1-1/4	3	4	82863		HXVR-M-40375-R.040
	3/8	.040	1-1/4	3	5	82864		HXVR-M-50375-R.040
1/2	1/2	.040	5/8	2-1/2	4	54152	54152W	HXVR-S-40500-R.040
	1/2	.040	5/8	2-1/2	5	55152	55152W	HXVR-S-50500-R.040
	1/2	.040	1	3	4	82865		HXVR-SR-40500-R.040
	1/2	.040	1	3	5	82866		HXVR-SR-50500-R.040
	1/2	.040	1-1/4	3	4	54182	54182W	HXVR-R-40500-R.040
	1/2	.040	1-1/4	3	5	55182	55182W	HXVR-R-50500-R.040
	1/2	.040	1-5/8	4	4	82867		HXVR-M-40500-R.040
	1/2	.040	1-5/8	4	5	82868		HXVR-M-50500-R.040
5/8	5/8	.060	3/4	3	4	54227		HXVR-S-40625-R.060
	5/8	.060	3/4	3	5	55227		HXVR-S-50625-R.060
	5/8	.060	1-5/8	3-1/2	4	54257		HXVR-R-40625-R.060
	5/8	.060	1-5/8	3-1/2	5	55257		HXVR-R-50625-R.060
	5/8	.060	2	4	5	82869		HXVR-M-50625-R.060
3/4	3/4	.060	1	3	4	54302		HXVR-S-40750-R.060
	3/4	.060	1	3	5	55302		HXVR-S-50750-R.060
	3/4	.060	1-5/8	4	4	54317	54317W	HXVR-R-40750-R.060
	3/4	.060	1-5/8	4	5	55317	55317W	HXVR-R-50750-R.060
	3/4	.060	2-1/4	5	5	82870		HXVR-M-50750-R.060
1	1	.060	1-1/4	4	4	54377		HXVR-S-41000-R.060
	1	.060	1-1/4	4	5	55377		HXVR-S-51000-R.060
	1	.060	2	4-1/2	4	54392		HXVR-R-41000-R.060
	1	.060	2	4-1/2	5	55392		HXVR-R-51000-R.060

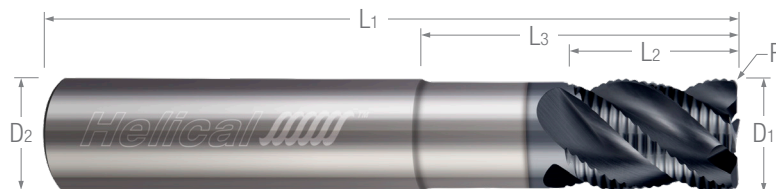
*.0005 max TIR

MULTI-FLUTE - CORNER RADIUS

HXVR-RN

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Cutter Dia.* D1 ^{+0.001"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.030	3/8	2-1/2	1-1/8	.237	4	64032	HXVR-RN-R-40250-R.030
	1/4	.030	3/8	3	1-3/8	.237	4	82871	HXVR-RN-A-40250-R.030
3/8	3/8	.040	1/2	2-1/2	1-1/8	.356	4	64077	HXVR-RN-R-40375-R.040
	3/8	.040	1/2	2-1/2	1-1/8	.356	5	65077	HXVR-RN-R-50375-R.040
	3/8	.040	1/2	4	1-5/8	.356	5	82872	HXVR-RN-A-50375-R.040
1/2	1/2	.040	5/8	3	1-3/8	.475	4	64152	HXVR-RN-R-40500-R.040
	1/2	.040	5/8	3	1-3/8	.475	5	65152	HXVR-RN-R-50500-R.040
	1/2	.040	5/8	4	2-1/4	.475	4	82873	HXVR-RN-M-40500-R.040
	1/2	.040	5/8	4	2-1/4	.475	5	82874	HXVR-RN-M-50500-R.040
5/8	5/8	.060	3/4	3-1/2	1-5/8	.593	5	65227	HXVR-RN-R-50625-R.060
3/4	3/4	.060	1	4	2	.712	5	65302	HXVR-RN-R-50750-R.060
	3/4	.060	1	6	2-1/2	.712	5	82875	HXVR-RN-A-50750-R.060
1	1	.060	1-1/4	5	2-5/8	.950	5	65377	HXVR-RN-R-51000-R.060

* .0005 max TIR

Climb Milling vs. Conventional Milling

In The Loupe
MACHINISTS BLOG

There are two distinct ways to cut materials when milling: Conventional Milling (Up) and Climb Milling (Down). The difference between these two techniques is the relationship of the rotation of the cutter to the direction of feed. Using the right approach may prolong your tool's life. Learn which way of machining is right for you by reading our "In the Loupe" post *Climb Milling vs. Conventional Milling*.

www.harveypformance.com/in-the-loupe/conventional-vs-climb-milling/



SCAN TO READ

HXVR-4

SPEEDS & FEEDS

4 Flute - Knuckle Rougher - Variable Pitch

HXVR / HXVR-RN (4 Flute)

Material Guide		Hardness	SFM	Inches per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0007	.0010	.0010	.0015	.0015	.0023	.0022	.0034	.0028	.0044	.0040	.0063	.0051	.0081
		75 - 98 HRB	445	.0005	.0009	.0008	.0013	.0012	.0019	.0018	.0028	.0024	.0037	.0034	.0053	.0043	.0067
		21 - 36 HRC	400	.0004	.0006	.0005	.0008	.0008	.0012	.0012	.0018	.0015	.0022	.0024	.0034	.0028	.0043
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0005	.0007	.0007	.0011	.0011	.0016	.0016	.0024	.0020	.0032	.0029	.0045	.0037	.0058
		21 - 36 HRC	340	.0004	.0006	.0005	.0008	.0008	.0012	.0012	.0018	.0015	.0024	.0022	.0034	.0028	.0043
		36 - 50 HRC	260	.0003	.0005	.0005	.0007	.0007	.0011	.0010	.0016	.0013	.0021	.0019	.0030	.0024	.0038
		> 50 HRC	155	.0003	.0004	.0004	.0006	.0005	.0008	.0008	.0013	.0010	.0016	.0015	.0023	.0019	.0030
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0005	.0007	.0007	.0011	.0011	.0016	.0016	.0024	.0020	.0032	.0029	.0045	.0037	.0058
		21 - 36 HRC	250	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0036	.0029	.0046
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0007	.0010	.0010	.0015	.0013	.0020	.0018	.0028	.0023	.0036
		> 50 HRC	85	.0002	.0004	.0004	.0006	.0005	.0008	.0008	.0012	.0010	.0016	.0015	.0023	.0019	.0029
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0003	.0005	.0005	.0008	.0008	.0012	.0011	.0018	.0015	.0023	.0021	.0034	.0027	.0043
		75 - 98 HRB	255	.0005	.0008	.0008	.0012	.0011	.0018	.0017	.0026	.0022	.0035	.0032	.0050	.0040	.0063
		21 - 36 HRC	175	.0003	.0004	.0004	.0006	.0006	.0009	.0009	.0014	.0011	.0018	.0016	.0025	.0021	.0032
		36 - 50 HRC	150	.0003	.0005	.0005	.0008	.0008	.0012	.0011	.0018	.0015	.0023	.0021	.0033	.0027	.0042
		> 50 HRC	55	.0002	.0003	.0003	.0005	.0005	.0007	.0007	.0011	.0009	.0014	.0013	.0020	.0016	.0026
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0005	.0008	.0008	.0012	.0012	.0019	.0018	.0027	.0023	.0036	.0033	.0051	.0042	.0065
		21 - 36 HRC	225	.0004	.0006	.0006	.0009	.0009	.0014	.0013	.0020	.0017	.0026	.0024	.0038	.0031	.0048
		36 - 50 HRC	180	.0003	.0005	.0005	.0007	.0007	.0010	.0010	.0016	.0013	.0020	.0019	.0029	.0024	.0037
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0005	.0007	.0007	.0011	.0011	.0016	.0016	.0024	.0020	.0032	.0029	.0046	.0037	.0058
		21 - 36 HRC	280	.0004	.0006	.0006	.0009	.0009	.0014	.0014	.0021	.0018	.0028	.0025	.0040	.0032	.0051
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0003	.0005	.0005	.0008	.0008	.0012	.0011	.0018	.0015	.0023	.0021	.0034	.0027	.0043
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0006	.0010	.0010	.0015	.0012	.0019	.0018	.0028	.0023	.0036
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0008	.0012	.0011	.0018	.0017	.0026	.0025	.0039	.0033	.0052	.0047	.0074	.0060	.0094
		21 - 36 HRC	370	.0004	.0007	.0006	.0010	.0009	.0014	.0014	.0021	.0018	.0028	.0026	.0040	.0033	.0051
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0005	.0008	.0007	.0011	.0011	.0017	.0016	.0025	.0021	.0033	.0030	.0047	.0038	.0060
		21 - 36 HRC	335	.0004	.0007	.0006	.0010	.0009	.0015	.0014	.0022	.0018	.0028	.0026	.0040	.0033	.0051
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0005	.0008	.0008	.0012	.0011	.0017	.0017	.0026	.0022	.0034	.0031	.0049	.0040	.0062
		21 - 36 HRC	260	.0003	.0005	.0005	.0008	.0007	.0012	.0011	.0017	.0014	.0023	.0021	.0032	.0026	.0041
		36 - 50 HRC	135	.0002	.0003	.0003	.0005	.0005	.0007	.0007	.0011	.0009	.0014	.0013	.0020	.0017	.0026
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0007	.0010	.0010	.0015	.0014	.0022	.0021	.0033	.0028	.0044	.0040	.0063	.0051	.0080
		75 - 98 HRB	250	.0005	.0009	.0008	.0013	.0012	.0019	.0018	.0028	.0023	.0037	.0033	.0052	.0043	.0067
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0004	.0006	.0005	.0008	.0008	.0013	.0012	.0019	.0016	.0025	.0022	.0035	.0028	.0045
		21 - 36 HRC	75	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0036	.0029	.0046
		36 - 50 HRC	70	.0003	.0005	.0004	.0007	.0007	.0010	.0010	.0015	.0013	.0020	.0018	.0029	.0023	.0036
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0009	.0014	.0013	.0021	.0020	.0031	.0029	.0046	.0039	.0060	.0055	.0086	.0070	.0110
		75 - 98 HRB	275	.0008	.0012	.0011	.0017	.0017	.0026	.0025	.0039	.0032	.0051	.0046	.0072	.0059	.0092
		21 - 36 HRC	250	.0006	.0009	.0008	.0013	.0012	.0020	.0019	.0029	.0024	.0038	.0035	.0054	.0044	.0069
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0004	.0007	.0007	.0010	.0010	.0015	.0015	.0023	.0019	.0030	.0027	.0043	.0035	.0054
		36 - 50 HRC	160	.0004	.0006	.0006	.0009	.0009	.0014	.0013	.0021	.0017	.0027	.0025	.0039	.0032	.0050
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0036	.0030	.0046
		21 - 36 HRC	170	.0004	.0006	.0005	.0008	.0008	.0013	.0012	.0019	.0016	.0025	.0022	.0035	.0028	.0045
		36 - 50 HRC	65	.0003	.0004	.0004	.0006	.0005	.0009	.0008	.0013	.0011	.0017	.0015	.0024	.0019	.0030

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	75%-125% Diameter	100% Diameter
	≥ 35 HRC	60%-75% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	20%-40% Diameter
	≥ 35 HRC	Up to Max LOC	20%-40% Diameter

NOTES:

Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

SPEEDS & FEEDS

HXVR-5

5 Flute - Knuckle Rougher - Variable Pitch

Roughers

Material Guide		Hardness	SFM	Inches per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	445	.0007	.0010	.0010	.0015	.0015	.0023	.0022	.0034	.0029	.0045	.0041	.0064	.0052	.0082
		75 - 98 HRB	445	.0006	.0009	.0008	.0013	.0012	.0019	.0018	.0028	.0024	.0037	.0034	.0053	.0043	.0068
		21 - 36 HRC	400	.0004	.0006	.0005	.0008	.0008	.0012	.0012	.0018	.0018	.0015	.0024	.0022	.0035	.0028
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0005	.0008	.0007	.0011	.0011	.0017	.0016	.0025	.0021	.0032	.0029	.0046	.0038	.0059
		21 - 36 HRC	340	.0004	.0006	.0005	.0008	.0008	.0012	.0012	.0018	.0015	.0024	.0022	.0034	.0028	.0044
		36 - 50 HRC	260	.0003	.0005	.0005	.0007	.0007	.0011	.0010	.0016	.0013	.0021	.0019	.0030	.0024	.0038
		> 50 HRC	155	.0003	.0004	.0004	.0006	.0005	.0009	.0008	.0013	.0011	.0017	.0015	.0024	.0019	.0030
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0005	.0008	.0007	.0011	.0011	.0017	.0016	.0025	.0021	.0032	.0029	.0046	.0038	.0059
		21 - 36 HRC	250	.0004	.0006	.0006	.0009	.0008	.0013	.0013	.0020	.0016	.0026	.0023	.0037	.0030	.0047
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0007	.0010	.0010	.0015	.0013	.0020	.0018	.0029	.0023	.0036
		> 50 HRC	85	.0002	.0004	.0004	.0006	.0005	.0008	.0008	.0013	.0010	.0016	.0015	.0023	.0019	.0030
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0004	.0006	.0005	.0008	.0008	.0012	.0012	.0018	.0015	.0024	.0022	.0034	.0028	.0043
		75 - 98 HRB	255	.0005	.0008	.0008	.0012	.0011	.0018	.0017	.0027	.0022	.0035	.0032	.0050	.0041	.0064
		21 - 36 HRC	175	.0003	.0004	.0004	.0006	.0006	.0009	.0009	.0014	.0012	.0018	.0017	.0026	.0021	.0033
		36 - 50 HRC	150	.0004	.0005	.0005	.0008	.0008	.0012	.0011	.0018	.0015	.0023	.0021	.0033	.0027	.0042
		> 50 HRC	55	.0002	.0003	.0003	.0005	.0005	.0007	.0007	.0011	.0009	.0014	.0013	.0020	.0017	.0026
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0005	.0008	.0008	.0012	.0012	.0019	.0018	.0028	.0023	.0036	.0033	.0052	.0042	.0066
		21 - 36 HRC	225	.0004	.0006	.0006	.0009	.0009	.0014	.0013	.0021	.0017	.0027	.0025	.0038	.0031	.0049
		36 - 50 HRC	180	.0003	.0005	.0005	.0007	.0007	.0011	.0010	.0016	.0013	.0021	.0019	.0030	.0024	.0038
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0005	.0008	.0007	.0011	.0011	.0017	.0016	.0025	.0021	.0032	.0030	.0046	.0038	.0059
		21 - 36 HRC	280	.0004	.0007	.0006	.0010	.0009	.0014	.0014	.0021	.0018	.0028	.0026	.0040	.0033	.0051
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0004	.0006	.0005	.0008	.0008	.0012	.0012	.0018	.0015	.0024	.0022	.0034	.0028	.0043
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0007	.0010	.0010	.0015	.0013	.0020	.0018	.0028	.0023	.0036
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0008	.0012	.0012	.0018	.0017	.0027	.0025	.0040	.0033	.0052	.0048	.0075	.0061	.0095
		21 - 36 HRC	370	.0004	.0007	.0006	.0010	.0009	.0015	.0014	.0022	.0018	.0028	.0026	.0041	.0033	.0052
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0005	.0008	.0007	.0011	.0011	.0017	.0016	.0025	.0021	.0033	.0030	.0047	.0039	.0061
		21 - 36 HRC	335	.0004	.0007	.0006	.0010	.0009	.0015	.0014	.0022	.0018	.0029	.0026	.0041	.0033	.0052
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0005	.0008	.0008	.0012	.0011	.0018	.0017	.0026	.0022	.0034	.0032	.0049	.0040	.0063
		21 - 36 HRC	260	.0003	.0005	.0005	.0008	.0008	.0012	.0011	.0017	.0015	.0023	.0021	.0033	.0027	.0042
		36 - 50 HRC	135	.0002	.0003	.0003	.0005	.0005	.0007	.0007	.0011	.0009	.0015	.0013	.0021	.0017	.0026
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0007	.0010	.0010	.0015	.0015	.0023	.0022	.0034	.0028	.0044	.0041	.0063	.0052	.0081
		75 - 98 HRB	250	.0005	.0009	.0008	.0013	.0012	.0019	.0018	.0028	.0024	.0037	.0034	.0053	.0043	.0068
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0036	.0029	.0045
		21 - 36 HRC	75	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0036	.0030	.0046
		36 - 50 HRC	70	.0003	.0005	.0005	.0007	.0007	.0010	.0010	.0016	.0013	.0020	.0019	.0029	.0024	.0037
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0009	.0014	.0014	.0021	.0020	.0032	.0030	.0047	.0039	.0061	.0056	.0088	.0071	.0112
		75 - 98 HRB	275	.0008	.0012	.0011	.0018	.0017	.0026	.0025	.0039	.0033	.0051	.0047	.0073	.0060	.0094
		21 - 36 HRC	250	.0006	.0009	.0009	.0013	.0013	.0020	.0019	.0029	.0025	.0038	.0035	.0055	.0045	.0070
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0005	.0007	.0007	.0010	.0010	.0016	.0015	.0023	.0019	.0030	.0028	.0043	.0035	.0055
		36 - 50 HRC	160	.0004	.0007	.0006	.0009	.0009	.0014	.0013	.0021	.0018	.0028	.0025	.0039	.0032	.0050
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0020	.0016	.0026	.0023	.0037	.0030	.0047
		21 - 36 HRC	170	.0004	.0006	.0006	.0009	.0008	.0013	.0012	.0019	.0016	.0025	.0023	.0035	.0029	.0045
		36 - 50 HRC	65	.0003	.0004	.0004	.0006	.0006	.0009	.0008	.0013	.0011	.0017	.0015	.0024	.0020	.0031

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	30%-60% Diameter	100% Diameter
	≥ 35 HRC	30%-60% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	10%-30% Diameter
	≥ 35 HRC	Up to Max LOC	10%-30% Diameter

NOTES:

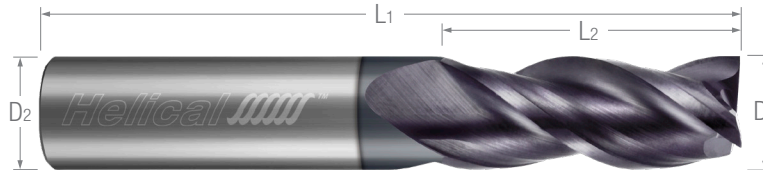
Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

HSV-3

3 FLUTE - SQUARE
Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed with variable pitch and 3 flutes for reduced harmonics, increased chip clearance, and higher quality parts in full slotting and heavy roughing applications
- Eccentric relief for maximum edge strength
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1^{+0.000}_{-0.002}$	D_2 (h6)	$L_2^{+0.032}_{-0.000}$	$L_1^{+0.062}_{-0.062}$			
1/8	1/8	1/4	1-1/2	3	23010	HSV-S-30125
	1/8	1/2	2-1/2	3	23020	HSV-R-30125
3/16	3/16	5/16	2	3	23040	HSV-S-30187
	3/16	9/16	2-1/2	3	23050	HSV-R-30187
1/4	1/4	3/8	2	3	23070	HSV-S-30250
	1/4	1/2	2-1/2	3	23080	HSV-SR-30250
	1/4	3/4	2-1/2	3	23090	HSV-R-30250
	1/4	1	3	3	23100	HSV-M-30250
5/16	5/16	7/16	2	3	23120	HSV-S-30312
	5/16	13/16	2-1/2	3	23130	HSV-R-30312
	5/16	1-1/4	3	3	23140	HSV-M-30312
3/8	3/8	1/2	2	3	23150	HSV-S-30375
	3/8	1	3	3	23160	HSV-R-30375
	3/8	1-1/4	3	3	23170	HSV-M-30375
1/2	1/2	5/8	2-1/2	3	23190	HSV-S-30500
	1/2	1	3	3	23200	HSV-SR-30500
	1/2	1-1/4	3	3	23210	HSV-R-30500
	1/2	1-5/8	4	3	23220	HSV-M-30500
5/8	5/8	3/4	3	3	23240	HSV-S-30625
	5/8	1-1/8	3-1/2	3	23250	HSV-SR-30625
	5/8	1-5/8	4	3	23260	HSV-R-30625
	5/8	2-1/8	4	3	23270	HSV-M-30625
3/4	3/4	1	3	3	23290	HSV-S-30750
	3/4	1-5/8	4	3	23300	HSV-R-30750
	3/4	2-1/4	5	3	23310	HSV-M-30750
1	1	1-1/4	4	3	23330	HSV-S-31000
	1	2	4-1/2	3	23340	HSV-R-31000
	1	2-5/8	6	3	23350	HSV-M-31000

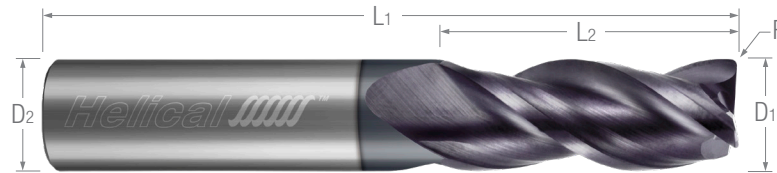
* .0005 max TIR

3 FLUTE - CORNER RADIUS

HSV-3

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed with variable pitch and 3 flutes for reduced harmonics, increased chip clearance, and higher quality parts in full slotting and heavy roughing applications
- Eccentric relief for maximum edge strength
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	3	23011	HSV-S-30125-R.010
	1/8	.010	1/2	2-1/2	3	23021	HSV-R-30125-R.010
3/16	3/16	.010	5/16	2	3	23041	HSV-S-30187-R.010
	3/16	.010	9/16	2-1/2	3	23051	HSV-R-30187-R.010
1/4	1/4	.020	3/8	2	3	23072	HSV-S-30250-R.020
	1/4	.020	1/2	2-1/2	3	23082	HSV-SR-30250-R.020
	1/4	.020	3/4	2-1/2	3	23092	HSV-R-30250-R.020
	1/4	.020	1	3	3	23102	HSV-M-30250-R.020
5/16	5/16	.020	7/16	2	3	23122	HSV-S-30312-R.020
	5/16	.020	13/16	2-1/2	3	23132	HSV-R-30312-R.020
	5/16	.020	1-1/4	3	3	23142	HSV-M-30312-R.020
3/8	3/8	.020	1/2	2	3	23152	HSV-S-30375-R.020
	3/8	.020	1	3	3	23162	HSV-R-30375-R.020
	3/8	.020	1-1/4	3	3	23172	HSV-M-30375-R.020
1/2	1/2	.030	5/8	2-1/2	3	23193	HSV-S-30500-R.030
	1/2	.030	1	3	3	23203	HSV-SR-30500-R.030
	1/2	.030	1-1/4	3	3	23213	HSV-R-30500-R.030
	1/2	.030	1-5/8	4	3	23223	HSV-M-30500-R.030
5/8	5/8	.030	3/4	3	3	23243	HSV-S-30625-R.030
	5/8	.030	1-1/8	3-1/2	3	23253	HSV-SR-30625-R.030
	5/8	.030	1-5/8	4	3	23263	HSV-R-30625-R.030
	5/8	.030	2-1/8	4	3	23273	HSV-M-30625-R.030
3/4	3/4	.030	1	3	3	23293	HSV-S-30750-R.030
	3/4	.030	1-5/8	4	3	23303	HSV-R-30750-R.030
	3/4	.030	2-1/4	5	3	23313	HSV-M-30750-R.030
1	1	.030	1-1/4	4	3	23333	HSV-S-31000-R.030
	1	.030	2	4-1/2	3	23343	HSV-R-31000-R.030
	1	.030	2-5/8	6	3	23353	HSV-M-31000-R.030

* .0005 max TIR

HSV-3

SPEEDS & FEEDS
3 Flute - Variable Pitch

HSV-3

Material Guide		Hardness	SFM	Inches per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0007	.0012	.0010	.0018	.0013	.0023	.0020	.0035	.0026	.0045	.0037	.0066	.0047	.0084
		75 - 98 HRB	445	.0005	.0009	.0007	.0013	.0010	.0017	.0014	.0026	.0019	.0033	.0027	.0048	.0034	.0062
		21 - 36 HRC	400	.0003	.0006	.0005	.0008	.0006	.0011	.0009	.0017	.0012	.0021	.0017	.0031	.0022	.0040
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0004	.0008	.0006	.0011	.0008	.0015	.0012	.0022	.0016	.0029	.0023	.0042	.0030	.0053
		21 - 36 HRC	340	.0003	.0006	.0005	.0009	.0006	.0011	.0009	.0017	.0012	.0021	.0017	.0031	.0022	.0040
		36 - 50 HRC	260	.0003	.0005	.0004	.0007	.0005	.0010	.0008	.0014	.0011	.0019	.0015	.0027	.0019	.0035
		> 50 HRC	155	.0002	.0004	.0003	.0006	.0004	.0008	.0006	.0011	.0008	.0015	.0012	.0021	.0015	.0027
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0004	.0008	.0006	.0011	.0008	.0015	.0012	.0022	.0016	.0029	.0023	.0042	.0030	.0053
		21 - 36 HRC	250	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0018	.0013	.0023	.0019	.0033	.0023	.0042
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0005	.0009	.0008	.0014	.0010	.0018	.0014	.0026	.0018	.0033
		> 50 HRC	85	.0002	.0004	.0003	.0006	.0004	.0008	.0006	.0011	.0008	.0015	.0012	.0021	.0015	.0027
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0006	.0010	.0008	.0015	.0011	.0019	.0016	.0029	.0021	.0038	.0031	.0055	.0039	.0070
		75 - 98 HRB	255	.0004	.0007	.0006	.0010	.0008	.0013	.0011	.0020	.0015	.0026	.0021	.0038	.0027	.0048
		21 - 36 HRC	175	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0018	.0013	.0023	.0019	.0034	.0024	.0043
		36 - 50 HRC	150	.0003	.0005	.0005	.0008	.0006	.0011	.0009	.0016	.0012	.0021	.0017	.0030	.0021	.0039
		> 50 HRC	55	.0002	.0003	.0003	.0005	.0004	.0007	.0005	.0010	.0007	.0013	.0010	.0019	.0013	.0024
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0004	.0007	.0006	.0011	.0008	.0014	.0012	.0022	.0016	.0028	.0023	.0041	.0029	.0052
		21 - 36 HRC	225	.0004	.0007	.0006	.0010	.0007	.0013	.0011	.0020	.0014	.0025	.0020	.0037	.0026	.0047
		36 - 50 HRC	180	.0003	.0005	.0004	.0008	.0006	.0011	.0009	.0016	.0011	.0020	.0016	.0030	.0021	.0038
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0004	.0008	.0006	.0011	.0008	.0015	.0013	.0022	.0016	.0029	.0023	.0042	.0030	.0054
		21 - 36 HRC	280	.0004	.0007	.0006	.0010	.0007	.0013	.0011	.0020	.0014	.0025	.0020	.0036	.0026	.0047
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0003	.0006	.0005	.0008	.0006	.0011	.0009	.0016	.0012	.0021	.0017	.0031	.0022	.0039
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0005	.0010	.0008	.0014	.0010	.0018	.0015	.0027	.0019	.0034
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0007	.0012	.0010	.0018	.0013	.0024	.0020	.0036	.0026	.0047	.0038	.0068	.0048	.0087
		21 - 36 HRC	370	.0004	.0007	.0006	.0010	.0007	.0013	.0011	.0020	.0014	.0025	.0021	.0037	.0026	.0047
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0004	.0008	.0007	.0012	.0009	.0015	.0013	.0023	.0017	.0030	.0024	.0043	.0030	.0055
		21 - 36 HRC	335	.0004	.0007	.0006	.0010	.0007	.0013	.0011	.0020	.0014	.0025	.0021	.0037	.0026	.0047
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0005	.0008	.0007	.0012	.0009	.0016	.0013	.0024	.0017	.0031	.0025	.0045	.0032	.0057
		21 - 36 HRC	260	.0003	.0005	.0005	.0008	.0006	.0011	.0009	.0016	.0012	.0020	.0016	.0030	.0021	.0038
		36 - 50 HRC	135	.0002	.0003	.0003	.0005	.0004	.0007	.0006	.0010	.0007	.0013	.0010	.0019	.0013	.0024
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0006	.0010	.0009	.0016	.0012	.0020	.0017	.0031	.0022	.0039	.0032	.0057	.0041	.0073
		75 - 98 HRB	250	.0005	.0009	.0007	.0013	.0010	.0017	.0014	.0026	.0019	.0033	.0027	.0048	.0034	.0061
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0003	.0005	.0004	.0008	.0006	.0010	.0009	.0016	.0011	.0020	.0016	.0029	.0021	.0037
		21 - 36 HRC	75	.0003	.0005	.0004	.0008	.0006	.0010	.0008	.0015	.0011	.0019	.0016	.0028	.0020	.0036
		36 - 50 HRC	70	.0003	.0004	.0004	.0007	.0005	.0008	.0007	.0013	.0009	.0016	.0013	.0024	.0017	.0031
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0008	.0014	.0012	.0022	.0016	.0028	.0024	.0042	.0031	.0055	.0044	.0079	.0056	.0101
		75 - 98 HRB	275	.0007	.0012	.0010	.0018	.0013	.0024	.0020	.0035	.0026	.0046	.0037	.0066	.0047	.0085
		21 - 36 HRC	250	.0005	.0009	.0008	.0014	.0010	.0018	.0015	.0027	.0019	.0034	.0028	.0050	.0035	.0064
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0004	.0007	.0006	.0011	.0008	.0014	.0012	.0021	.0015	.0027	.0022	.0039	.0028	.0050
		36 - 50 HRC	160	.0004	.0006	.0005	.0010	.0007	.0013	.0011	.0019	.0014	.0025	.0020	.0036	.0025	.0046
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0018	.0013	.0023	.0019	.0033	.0024	.0042
		21 - 36 HRC	170	.0003	.0006	.0005	.0009	.0006	.0011	.0010	.0017	.0012	.0022	.0018	.0032	.0023	.0041
		36 - 50 HRC	65	.0002	.0004	.0003	.0006	.0004	.0008	.0007	.0012	.0008	.0015	.0012	.0022	.0015	.0028

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	100%-150% Diameter	100% Diameter
	≥ 35 HRC	100%-125% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	Up to 50% Diameter
	≥ 35 HRC	Up to Max LOC	Up to 50% Diameter

NOTES:

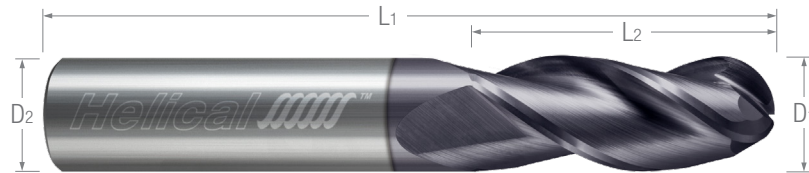
Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

3 FLUTE - BALL

HST-3

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed for excellent chip evacuation in slotting, pocketing, and roughing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



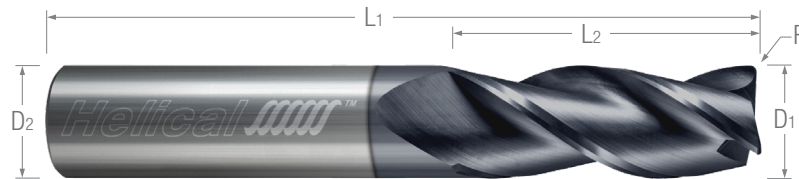
Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	D_2 (h6)	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/8	1/8	1/4	1-1/2	3	12017	HST-S-30125-BN
	1/8	1/2	2-1/2	3	12032	HST-R-30125-BN
3/16	3/16	5/16	2	3	12062	HST-S-30187-BN
	3/16	9/16	2-1/2	3	12077	HST-R-30187-BN
1/4	1/4	3/8	2	3	12107	HST-S-30250-BN
	1/4	1/2	2-1/2	3	12112	HST-SR-30250-BN
	1/4	3/4	2-1/2	3	12122	HST-R-30250-BN
5/16	5/16	7/16	2	3	12167	HST-S-30312-BN
	5/16	13/16	2-1/2	3	12182	HST-R-30312-BN
3/8	3/8	1/2	2	3	12212	HST-S-30375-BN
	3/8	1	3	3	12227	HST-R-30375-BN
1/2	1/2	5/8	2-1/2	3	12317	HST-S-30500-BN
	1/2	1	3	3	12332	HST-SR-30500-BN
	1/2	1-1/4	3	3	12347	HST-R-30500-BN
5/8	5/8	1-1/8	3-1/2	3	12407	HST-SR-30625-BN
3/4	3/4	1	3	3	12467	HST-S-30750-BN
	3/4	1-5/8	4	3	12482	HST-R-30750-BN
1	1	1-1/4	4	3	12527	HST-S-31000-BN
	1	2	4-1/2	3	12542	HST-R-31000-BN

* .0005 max TIR

HST-3

3 FLUTE - CORNER RADIUS

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed for excellent chip evacuation in slotting, pocketing, and roughing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



3 Flute

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1^{+.000''}_{-.002''}$	D_2 (h6)	$R^{+.002''}_{-.002''}$	$L_2^{+.032''}_{-.000''}$	$L_1^{+.062''}_{-.062''}$			
1/8	1/8	.010	1/4	1-1/2	3	08017	HST-S-30125-R.010
	1/8	.010	1/2	2-1/2	3	08032	HST-R-30125-R.010
3/16	3/16	.010	5/16	2	3	08062	HST-S-30187-R.010
	3/16	.010	9/16	2-1/2	3	08077	HST-R-30187-R.010
1/4	1/4	.020	3/8	2	3	08107	HST-S-30250-R.020
	1/4	.020	1/2	2-1/2	3	08112	HST-SR-30250-R.020
	1/4	.020	3/4	2-1/2	3	08122	HST-R-30250-R.020
	1/4	.020	1	3	3	08137	HST-M-30250-R.020
5/16	5/16	.020	7/16	2	3	08167	HST-S-30312-R.020
	5/16	.020	13/16	2-1/2	3	08182	HST-R-30312-R.020
	5/16	.020	1-1/4	3	3	08192	HST-M-30312-R.020
3/8	3/8	.020	1/2	2	3	08212	HST-S-30375-R.020
	3/8	.020	1	3	3	08227	HST-R-30375-R.020
	3/8	.020	1-1/4	3	3	08242	HST-M-30375-R.020
1/2	1/2	.030	5/8	2-1/2	3	08317	HST-S-30500-R.030
	1/2	.030	1	3	3	08332	HST-SR-30500-R.030
	1/2	.030	1-1/4	3	3	08347	HST-R-30500-R.030
	1/2	.030	1-5/8	4	3	08362	HST-M-30500-R.030
5/8	5/8	.030	3/4	3	3	08392	HST-S-30625-R.030
	5/8	.030	1-1/8	3-1/2	3	08407	HST-SR-30625-R.030
	5/8	.030	1-5/8	4	3	08422	HST-R-30625-R.030
	5/8	.030	2-1/8	4	3	08437	HST-M-30625-R.030
3/4	3/4	.030	1	3	3	08467	HST-S-30750-R.030
	3/4	.030	1-5/8	4	3	08482	HST-R-30750-R.030
	3/4	.030	2-1/4	5	3	08497	HST-M-30750-R.030
1	1	.030	1-1/4	4	3	08527	HST-S-31000-R.030
	1	.030	2	4-1/2	3	08542	HST-R-31000-R.030
	1	.030	2-5/8	6	3	08557	HST-M-31000-R.030

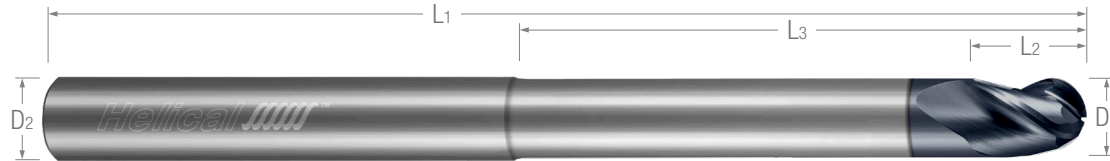
*.0005 max TIR

3 FLUTE - BALL

HST-RN-3

Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed for excellent chip evacuation in slotting, pocketing, and roughing applications
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Reach (LBS)	Neck Diameter	Flutes	<i>Aplus</i> Coated	Tool Description
$D1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D2 (h6)$	$L2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	$L3$				
1/8	1/8	5/32	3	3/8	.118	3	13017	HST-RN-S-30125-BN
	1/8	5/32	3	1/2	.118	3	13032	HST-RN-R-30125-BN
	1/8	5/32	3	5/8	.118	3	13047	HST-RN-M-30125-BN
3/16	3/16	7/32	3	1/2	.178	3	13077	HST-RN-R-30187-BN
	3/16	7/32	3	3/4	.178	3	13092	HST-RN-M-30187-BN
1/4	1/4	3/8	4	3/4	.237	3	13112	HST-RN-S-30250-BN
	1/4	3/8	4	1-1/8	.237	3	13122	HST-RN-R-30250-BN
	1/4	3/8	4	2-1/8	.237	3	13137	HST-RN-M-30250-BN
5/16	5/16	7/16	4	1-1/8	.296	3	13157	HST-RN-R-30312-BN
	5/16	7/16	4	2-1/8	.296	3	13167	HST-RN-M-30312-BN
3/8	3/8	1/2	4	1-1/8	.356	3	13197	HST-RN-R-30375-BN
	3/8	1/2	6	2-3/8	.356	3	13212	HST-RN-M-30375-BN
	3/8	1/2	6	3-3/8	.356	3	13227	HST-RN-L-30375-BN
	3/8	1/2	6	4	.356	3	13232	HST-RN-X-30375-BN
1/2	1/2	5/8	4	1-3/8	.475	3	13302	HST-RN-R-30500-BN
	1/2	5/8	6	2-3/8	.475	3	13317	HST-RN-M-30500-BN
	1/2	5/8	6	3-3/8	.475	3	13332	HST-RN-L-30500-BN
	1/2	5/8	6	4-1/8	.475	3	13347	HST-RN-X-30500-BN

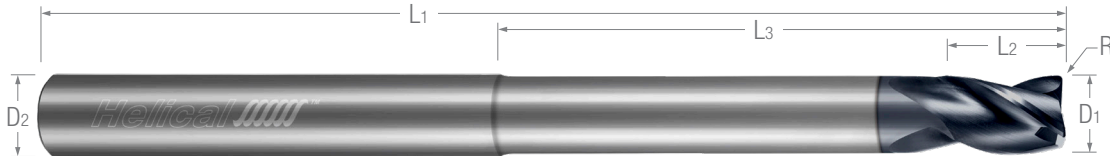
* .0005 max TIR

HST-RN-3

3 FLUTE - CORNER RADIUS

Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed for excellent chip evacuation in slotting, pocketing, and roughing applications
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.001"} -0.002"	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} -0.002"	Length of Cut L2 ^{+0.032"} -0.000"	OAL L1 ^{+0.062"} -0.062"	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	5/32	3	3/8	.118	3	10017	HST-RN-S-30125-R.010
	1/8	.010	5/32	3	5/8	.118	3	10047	HST-RN-M-30125-R.010
3/16	3/16	.010	7/32	3	3/4	.178	3	10092	HST-RN-M-30187-R.010
1/4	1/4	.020	3/8	4	3/4	.237	3	10112	HST-RN-S-30250-R.020
	1/4	.020	3/8	4	1-1/8	.237	3	10122	HST-RN-R-30250-R.020
	1/4	.020	3/8	4	2-1/8	.237	3	10137	HST-RN-M-30250-R.020
5/16	5/16	.020	7/16	4	1-1/8	.296	3	10157	HST-RN-R-30312-R.020
	5/16	.020	7/16	4	2-1/8	.296	3	10167	HST-RN-M-30312-R.020
3/8	3/8	.020	1/2	4	1-1/8	.356	3	10197	HST-RN-R-30375-R.020
	3/8	.020	1/2	6	2-3/8	.356	3	10212	HST-RN-M-30375-R.020
1/2	1/2	.030	5/8	4	1-3/8	.475	3	10302	HST-RN-R-30500-R.030
	1/2	.030	5/8	6	2-3/8	.475	3	10317	HST-RN-M-30500-R.030
	1/2	.030	5/8	6	3-3/8	.475	3	10332	HST-RN-L-30500-R.030
	1/2	.030	5/8	6	4-1/8	.475	3	10347	HST-RN-X-30500-R.030

* .0005 max TIR

SPEEDS & FEEDS

3 Flute

HST-3

3 Flute

Material Guide		Hardness	SFM	Inches per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0007	.0011	.0010	.0017	.0013	.0023	.0019	.0034	.0025	.0044	.0036	.0064	.0045	.0082
		75 - 98 HRC	445	.0005	.0009	.0007	.0013	.0009	.0017	.0014	.0025	.0018	.0032	.0026	.0047	.0033	.0060
		21 - 36 HRC	400	.0003	.0006	.0005	.0008	.0006	.0011	.0009	.0016	.0012	.0021	.0017	.0030	.0021	.0039
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0004	.0007	.0006	.0011	.0008	.0015	.0012	.0022	.0016	.0028	.0023	.0041	.0029	.0052
		21 - 36 HRC	340	.0003	.0005	.0005	.0008	.0006	.0011	.0009	.0016	.0012	.0021	.0017	.0030	.0021	.0039
		36 - 50 HRC	260	.0003	.0005	.0004	.0007	.0005	.0009	.0008	.0014	.0010	.0018	.0015	.0026	.0019	.0034
		> 50 HRC	155	.0002	.0004	.0003	.0006	.0004	.0007	.0006	.0011	.0008	.0014	.0012	.0021	.0015	.0027
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0004	.0007	.0006	.0011	.0008	.0015	.0012	.0022	.0016	.0028	.0023	.0041	.0029	.0052
		21 - 36 HRC	250	.0003	.0006	.0005	.0009	.0007	.0011	.0010	.0017	.0013	.0022	.0018	.0032	.0023	.0041
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0005	.0009	.0008	.0014	.0010	.0017	.0014	.0025	.0018	.0032
		> 50 HRC	85	.0002	.0004	.0003	.0006	.0004	.0007	.0006	.0011	.0008	.0014	.0012	.0021	.0015	.0026
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0006	.0010	.0008	.0015	.0011	.0019	.0016	.0029	.0021	.0037	.0030	.0053	.0038	.0068
		75 - 98 HRB	255	.0004	.0007	.0006	.0010	.0007	.0013	.0011	.0020	.0014	.0025	.0020	.0037	.0026	.0047
		21 - 36 HRC	175	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0017	.0013	.0023	.0018	.0033	.0023	.0042
		36 - 50 HRC	150	.0003	.0005	.0004	.0008	.0006	.0011	.0009	.0016	.0011	.0020	.0016	.0029	.0021	.0038
		> 50 HRC	55	.0002	.0003	.0003	.0005	.0004	.0007	.0005	.0010	.0007	.0012	.0010	.0018	.0013	.0023
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0004	.0007	.0006	.0011	.0008	.0014	.0012	.0021	.0015	.0027	.0022	.0040	.0028	.0051
		21 - 36 HRC	225	.0004	.0006	.0006	.0010	.0007	.0013	.0011	.0019	.0014	.0025	.0020	.0036	.0025	.0046
		36 - 50 HRC	180	.0003	.0005	.0004	.0008	.0006	.0010	.0009	.0015	.0011	.0020	.0016	.0029	.0020	.0037
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0004	.0007	.0006	.0011	.0008	.0015	.0012	.0022	.0016	.0028	.0023	.0041	.0029	.0052
		21 - 36 HRC	280	.0004	.0006	.0005	.0010	.0007	.0013	.0011	.0019	.0014	.0024	.0020	.0035	.0025	.0045
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0003	.0005	.0005	.0008	.0006	.0011	.0009	.0016	.0012	.0021	.0017	.0030	.0021	.0038
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0005	.0009	.0008	.0014	.0010	.0018	.0014	.0026	.0018	.0033
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0007	.0012	.0010	.0018	.0013	.0023	.0020	.0035	.0026	.0045	.0037	.0066	.0047	.0084
		21 - 36 HRC	370	.0004	.0006	.0005	.0010	.0007	.0013	.0011	.0019	.0014	.0025	.0020	.0036	.0025	.0046
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0004	.0008	.0006	.0011	.0008	.0015	.0012	.0022	.0016	.0029	.0023	.0042	.0030	.0054
		21 - 36 HRC	335	.0004	.0007	.0005	.0010	.0007	.0013	.0011	.0019	.0014	.0025	.0020	.0036	.0026	.0046
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0005	.0008	.0007	.0012	.0009	.0015	.0013	.0023	.0017	.0030	.0024	.0043	.0031	.0056
		21 - 36 HRC	260	.0003	.0005	.0004	.0008	.0006	.0010	.0009	.0015	.0011	.0020	.0016	.0029	.0020	.0037
		36 - 50 HRC	135	.0002	.0003	.0003	.0005	.0004	.0007	.0005	.0010	.0007	.0013	.0010	.0018	.0013	.0023
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0006	.0010	.0008	.0015	.0011	.0020	.0017	.0030	.0022	.0038	.0031	.0056	.0040	.0072
		75 - 98 HRB	250	.0005	.0008	.0007	.0013	.0009	.0017	.0014	.0025	.0018	.0032	.0026	.0047	.0033	.0060
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0003	.0005	.0004	.0008	.0006	.0010	.0008	.0015	.0011	.0020	.0016	.0029	.0020	.0036
		21 - 36 HRC	75	.0003	.0005	.0004	.0007	.0006	.0010	.0008	.0015	.0011	.0019	.0015	.0027	.0019	.0035
		36 - 50 HRC	70	.0002	.0004	.0004	.0006	.0005	.0008	.0007	.0013	.0009	.0016	.0013	.0023	.0017	.0030
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0008	.0014	.0012	.0021	.0015	.0027	.0023	.0041	.0030	.0053	.0043	.0077	.0055	.0099
		75 - 98 HRB	275	.0007	.0012	.0010	.0018	.0013	.0023	.0019	.0034	.0025	.0045	.0036	.0065	.0046	.0083
		21 - 36 HRC	250	.0005	.0009	.0007	.0013	.0010	.0017	.0014	.0026	.0019	.0033	.0027	.0049	.0034	.0062
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0004	.0007	.0006	.0010	.0008	.0014	.0011	.0020	.0015	.0026	.0021	.0038	.0027	.0049
		36 - 50 HRC	160	.0004	.0006	.0005	.0009	.0007	.0012	.0010	.0019	.0014	.0024	.0019	.0035	.0025	.0045
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0017	.0013	.0022	.0018	.0032	.0023	.0041
		21 - 36 HRC	170	.0003	.0006	.0005	.0009	.0006	.0011	.0009	.0017	.0012	.0022	.0017	.0031	.0022	.0040
		36 - 50 HRC	65	.0002	.0004	.0003	.0006	.0004	.0008	.0006	.0011	.0008	.0015	.0012	.0021	.0015	.0027

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	100%-150% Diameter	100% Diameter
	≥ 35 HRC	100%-125% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	Up to 50% Diameter
	≥ 35 HRC	Up to Max LOC	Up to 50% Diameter

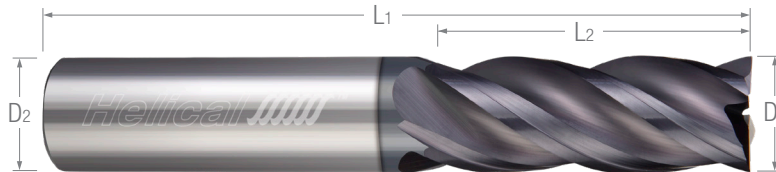
NOTES:
 Hardness Scales: HRB = Rockwell B
 HRC = Rockwell C
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

HSV-4

4 FLUTE - SQUARE
Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 181 for *Tplus* coating



Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter D_2 (h6)	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	<i>Aplus</i> Coated + Weldon Flat	Tool Description
1/8	1/8	1/4	1-1/2	4	30017		HSV-S-40125
	1/8	3/8	2	4	81635		HSV-SR-40125
	1/8	1/2	2-1/2	4	30032		HSV-R-40125
	1/8	5/8	2-1/2	4	81636		HSV-A-40125
	1/8	3/4	2-1/2	4	81637		HSV-M-40125
	1/8	7/8	2-1/2	4	82253		HSV-L-40125
	1/8	1	2-1/2	4	84685		HSV-LX-40125
5/32	3/16	3/16	2	4	30047		HSV-S-40156
	3/16	5/16	2	4	84686		HSV-SR-40156
	3/16	7/16	2-1/2	4	30062		HSV-R-40156
	3/16	9/16	2-1/2	4	81638		HSV-M-40156
	3/16	3/4	2-1/2	4	82254		HSV-ML-40156
3/16	3/16	5/16	2	4	30077		HSV-S-40187
	3/16	7/16	2	4	81639		HSV-SR-40187
	3/16	5/8	2-1/2	4	30092		HSV-R-40187
	3/16	1	2-1/2	4	81640		HSV-M-40187
	3/16	1-3/16	3	4	82255		HSV-L-40187
	3/16	1-3/8	3	4	84687		HSV-LX-40187
7/32	1/4	1/4	2	4	30107		HSV-S-40218
	1/4	7/16	2-1/2	4	30122		HSV-R-40218
	1/4	5/8	2-1/2	4	82256		HSV-A-40218
1/4	1/4	3/8	2	4	30137	30137W	HSV-S-40250
	1/4	1/2	2-1/2	4	30142	30142W	HSV-SR-40250
	1/4	3/4	2-1/2	4	30152	30152W	HSV-R-40250
	1/4	1	3	4	30167	30167W	HSV-M-40250
	1/4	1-1/4	3	4	81641		HSV-L-40250
	1/4	1-1/2	3	4	81642		HSV-LX-40250
	1/4	1-3/4	4	4	83182		HSV-X-40250
9/32	5/16	7/16	2	4	30182		HSV-S-40281
	5/16	5/8	2-1/2	4	30197		HSV-R-40281
	5/16	1	3	4	30212		HSV-M-40281
	5/16	1-1/2	3	4	84688		HSV-L-40281

*.0005 max TIR

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4 FLUTE - SQUARE

HSV-4

Variable Pitch (cont.)

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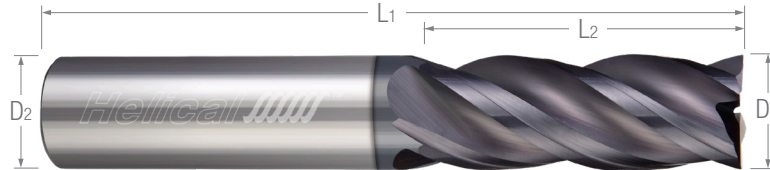
Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
$D_1^{+.000"}$ $-.002"$	$D_2 (h6)$	$L_2^{+.032"}$ $-.000"$	$L_1^{+.062"}$ $-.062"$				
5/16	5/16	1/2	2	4	30227	30227W	HSV-S-40312
	5/16	3/4	2-1/2	4	30242	30242W	HSV-R-40312
	5/16	1	2-1/2	4	81643		HSV-A-40312
	5/16	1-1/4	3	4	30257	30257W	HSV-M-40312
	5/16	1-9/16	4	4	82257		HSV-L-40312
3/8	3/8	1/2	2	4	30317	30317W	HSV-S-40375
	3/8	7/8	3	4	30332	30332W	HSV-SR-40375
	3/8	1	3	4	30337	30337W	HSV-R-40375
	3/8	1-1/4	3	4	30347	30347W	HSV-M-40375
	3/8	1-1/2	3	4	81644		HSV-L-40375
	3/8	2	4	4	82258		HSV-LX-40375
13/32	7/16	1/2	2-3/4	4	30362		HSV-S-40406
	7/16	15/16	2-3/4	4	30377		HSV-R-40406
7/16	7/16	5/8	2-3/4	4	30407		HSV-S-40437
	7/16	7/8	2-3/4	4	30422		HSV-R-40437
	7/16	1-1/8	3-1/2	4	30437		HSV-M-40437
	7/16	1-5/8	3-1/2	4	84690		HSV-ML-40437
1/2	1/2	5/8	2-1/2	4	30497	30497W	HSV-S-40500
	1/2	1	3	4	30512	30512W	HSV-SR-40500
	1/2	1-1/4	3	4	30527	30527W	HSV-R-40500
	1/2	1-5/8	4	4	30542	30542W	HSV-M-40500
	1/2	2	4	4	81645	81645W	HSV-L-40500
	1/2	2-1/2	5	4	81646		HSV-LX-40500
	1/2	3-1/8	6	4	82259		HSV-X-40500
5/8	5/8	3/4	3	4	30557		HSV-S-40625
	5/8	1-1/4	3-1/2	4	30572	30572W	HSV-SR-40625
	5/8	1-5/8	3-1/2	4	30587	30587W	HSV-R-40625
	5/8	2	4	4	30602	30602W	HSV-M-40625
	5/8	2-1/2	5	4	82260		HSV-ML-40625
	5/8	3-1/4	6	4	30617		HSV-L-40625
3/4	3/4	3-3/4	6	4	84691		HSV-LX-40625
	3/4	7/8	3	4	30632		HSV-S-40750
	3/4	1-1/4	4	4	30647	30647W	HSV-SR-40750
	3/4	1-5/8	4	4	30662	30662W	HSV-R-40750
	3/4	2-1/4	5	4	30677	30677W	HSV-M-40750
	3/4	2-3/4	5	4	81647		HSV-ML-40750
	3/4	3-1/4	6	4	30692	30692W	HSV-L-40750
	3/4	4	6-1/2	4	82261		HSV-LX-40750
1	3/4	4-3/4	7	4	84692		HSV-X-40750
	1	1-1/2	4	4	30707		HSV-S-41000
	1	2	4-1/2	4	30722	30722W	HSV-R-41000
	1	2-5/8	5	4	30737	30737W	HSV-M-41000
	1	3	6	4	30742		HSV-ML-41000
	1	4-1/4	7	4	30752		HSV-L-41000

*.0005 max TIR

MHSV-4**METRIC****4 FLUTE - SQUARE - METRIC**

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* $D_1 \begin{smallmatrix} +.00 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	Shank Diameter $D_2 \text{ (h6)}$	Length of Cut $L_2 \begin{smallmatrix} +.80 \text{ mm} \\ -.00 \text{ mm} \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +1.60 \text{ mm} \\ -1.60 \text{ mm} \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
6 mm	6.00 mm	9.00 mm	63 mm	4	59458	MHSV-015-40600
	6.00 mm	12.00 mm	63 mm	4	59476	MHSV-020-40600
	6.00 mm	18.00 mm	63 mm	4	59510	MHSV-030-40600
8 mm	8.00 mm	12.00 mm	63 mm	4	59461	MHSV-015-40800
	8.00 mm	16.00 mm	63 mm	4	59479	MHSV-020-40800
	8.00 mm	24.00 mm	75 mm	4	59513	MHSV-030-40800
10 mm	10.00 mm	15.00 mm	63 mm	4	59464	MHSV-015-41000
	10.00 mm	20.00 mm	63 mm	4	59482	MHSV-020-41000
	10.00 mm	25.00 mm	75 mm	4	59496	MHSV-025-41000
12 mm	12.00 mm	18.00 mm	75 mm	4	59467	MHSV-015-41200
	12.00 mm	24.00 mm	75 mm	4	59485	MHSV-020-41200
	12.00 mm	30.00 mm	75 mm	4	59499	MHSV-025-41200
16 mm	16.00 mm	24.00 mm	89 mm	4	59470	MHSV-015-41600
	16.00 mm	32.00 mm	89 mm	4	59488	MHSV-020-41600
	16.00 mm	40.00 mm	89 mm	4	59502	MHSV-025-41600
20 mm	20.00 mm	30.00 mm	89 mm	4	59473	MHSV-015-42000
	20.00 mm	40.00 mm	100 mm	4	59491	MHSV-020-42000
	20.00 mm	50.00 mm	125 mm	4	59505	MHSV-025-42000
25 mm	25.00 mm	50.00 mm	125 mm	4	59494	MHSV-020-42500
	25.00 mm	64.00 mm	125 mm	4	59508	MHSV-025-42500

*.013 mm max TIR



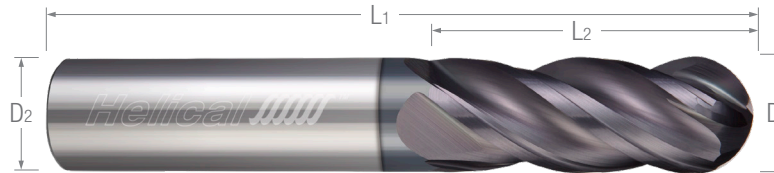
4 FLUTE - BALL

Variable Pitch

HSV-4

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 183 for *Tplus* coating



4 Flute

Cutter Diameter* D1 $\begin{smallmatrix} +.000 \\ -.002 \end{smallmatrix}$ "	Shank Diameter D2 (h6)	Length of Cut L2 $\begin{smallmatrix} +.032 \\ -.000 \end{smallmatrix}$ "	Overall Length L1 $\begin{smallmatrix} +.062 \\ -.062 \end{smallmatrix}$ "	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	1/4	1-1/2	4	56017	HSV-S-40125-BN
	1/8	3/8	2	4	81674	HSV-SR-40125-BN
	1/8	1/2	2-1/2	4	56032	HSV-R-40125-BN
	1/8	5/8	2-1/2	4	81675	HSV-A-40125-BN
	1/8	3/4	2-1/2	4	82510	HSV-M-40125-BN
	1/8	7/8	2-1/2	4	84742	HSV-L-40125-BN
5/32	3/16	3/16	2	4	83941	HSV-S-40156-BN
	3/16	7/16	2-1/2	4	83942	HSV-R-40156-BN
	3/16	9/16	2-1/2	4	83943	HSV-M-40156-BN
	3/16	3/4	2-1/2	4	84743	HSV-ML-40156-BN
3/16	3/16	5/16	2	4	56077	HSV-S-40187-BN
	3/16	7/16	2	4	82511	HSV-SR-40187-BN
	3/16	5/8	2-1/2	4	56092	HSV-R-40187-BN
	3/16	1	2-1/2	4	81676	HSV-M-40187-BN
	3/16	1-3/16	3	4	83273	HSV-L-40187-BN
7/32	1/4	1/4	2	4	83944	HSV-S-40218-BN
	1/4	7/16	2-1/2	4	83945	HSV-R-40218-BN
1/4	1/4	3/8	2	4	56137	HSV-S-40250-BN
	1/4	1/2	2-1/2	4	56142	HSV-SR-40250-BN
	1/4	3/4	2-1/2	4	56152	HSV-R-40250-BN
	1/4	1	3	4	56167	HSV-M-40250-BN
	1/4	1-1/4	3	4	81677	HSV-L-40250-BN
	1/4	1-1/2	3	4	82512	HSV-LX-40250-BN
	1/4	1-3/4	4	4	84744	HSV-X-40250-BN
9/32	5/16	7/16	2	4	83946	HSV-S-40281-BN
	5/16	5/8	2-1/2	4	83947	HSV-R-40281-BN
	5/16	1	3	4	84745	HSV-M-40281-BN
5/16	5/16	1/2	2	4	56227	HSV-S-40312-BN
	5/16	3/4	2-1/2	4	56242	HSV-R-40312-BN
	5/16	1	2-1/2	4	81678	HSV-A-40312-BN
	5/16	1-1/4	3	4	56257	HSV-M-40312-BN
	5/16	1-9/16	4	4	82513	HSV-L-40312-BN

* .0005 max TIR

continued on next page

HSV-4

4 FLUTE - BALL

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* $D_1 \begin{smallmatrix} +.0001 \\ -.002 \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Length of Cut $L_2 \begin{smallmatrix} +.0321 \\ -.000 \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.0621 \\ -.062 \end{smallmatrix}$	Flutes	Aplus Coated	Tool Description
3/8	3/8	1/2	2	4	56317	HSV-S-40375-BN
	3/8	7/8	3	4	56332	HSV-SR-40375-BN
	3/8	1	3	4	56337	HSV-R-40375-BN
	3/8	1-1/4	3	4	56347	HSV-M-40375-BN
	3/8	1-1/2	3	4	82514	HSV-L-40375-BN
	3/8	2	4	4	84746	HSV-LX-40375-BN
7/16	7/16	5/8	2-3/4	4	56407	HSV-S-40437-BN
	7/16	7/8	2-3/4	4	56422	HSV-R-40437-BN
	7/16	1-1/8	3-1/2	4	56437	HSV-M-40437-BN
1/2	1/2	5/8	2-1/2	4	56497	HSV-S-40500-BN
	1/2	1	3	4	56512	HSV-SR-40500-BN
	1/2	1-1/4	3	4	56527	HSV-R-40500-BN
	1/2	1-5/8	4	4	56542	HSV-M-40500-BN
	1/2	2	4	4	81679	HSV-L-40500-BN
	1/2	2-1/2	5	4	83274	HSV-LX-40500-BN
5/8	5/8	3/4	3	4	56557	HSV-S-40625-BN
	5/8	1-1/4	3-1/2	4	56572	HSV-SR-40625-BN
	5/8	1-5/8	3-1/2	4	56587	HSV-R-40625-BN
	5/8	2	4	4	56602	HSV-M-40625-BN
	5/8	2-1/2	5	4	84747	HSV-ML-40625-BN
	5/8	3-1/4	6	4	56617	HSV-L-40625-BN
3/4	3/4	7/8	3	4	56632	HSV-S-40750-BN
	3/4	1-1/4	4	4	56647	HSV-SR-40750-BN
	3/4	1-5/8	4	4	56662	HSV-R-40750-BN
	3/4	2-1/4	5	4	56677	HSV-M-40750-BN
	3/4	2-3/4	5	4	84748	HSV-ML-40750-BN
	3/4	3-1/4	6	4	56692	HSV-L-40750-BN
	3/4	4	6-1/2	4	84749	HSV-LX-40750-BN
1	1	1-1/2	4	4	56707	HSV-S-41000-BN
	1	2	4-1/2	4	56722	HSV-R-41000-BN
	1	2-5/8	5	4	56737	HSV-M-41000-BN
	1	3	6	4	56742	HSV-ML-41000-BN
	1	4-1/4	7	4	56752	HSV-L-41000-BN

*.0005 max TIR

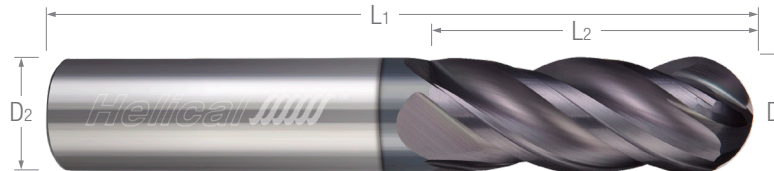
4 FLUTE - BALL - METRIC

MHSV-4

METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 ^{+0.00 mm} / _{-0.05 mm}	Shank Diameter D2 (h6)	Length of Cut L2 ^{+0.80 mm} / _{-0.00 mm}	Overall Length L1 ^{+1.60 mm} / _{-1.60 mm}	Flutes	<i>Aplus</i> Coated	Tool Description
6 mm	6.00 mm	9.00 mm	63 mm	4	84960	MHSV-015-40600-BN
	6.00 mm	12.00 mm	63 mm	4	84961	MHSV-020-40600-BN
	6.00 mm	18.00 mm	63 mm	4	84962	MHSV-030-40600-BN
8 mm	8.00 mm	12.00 mm	63 mm	4	84963	MHSV-015-40800-BN
	8.00 mm	16.00 mm	63 mm	4	84964	MHSV-020-40800-BN
	8.00 mm	24.00 mm	75 mm	4	84965	MHSV-030-40800-BN
10 mm	10.00 mm	15.00 mm	63 mm	4	84966	MHSV-015-41000-BN
	10.00 mm	20.00 mm	63 mm	4	84967	MHSV-020-41000-BN
	10.00 mm	25.00 mm	75 mm	4	84968	MHSV-025-41000-BN
12 mm	12.00 mm	18.00 mm	75 mm	4	84969	MHSV-015-41200-BN
	12.00 mm	24.00 mm	75 mm	4	84970	MHSV-020-41200-BN
	12.00 mm	30.00 mm	75 mm	4	84971	MHSV-025-41200-BN
16 mm	16.00 mm	24.00 mm	89 mm	4	84972	MHSV-015-41600-BN
	16.00 mm	32.00 mm	89 mm	4	84973	MHSV-020-41600-BN
	16.00 mm	40.00 mm	89 mm	4	84974	MHSV-025-41600-BN
20 mm	20.00 mm	30.00 mm	89 mm	4	84975	MHSV-015-42000-BN
	20.00 mm	40.00 mm	100 mm	4	84976	MHSV-020-42000-BN
	20.00 mm	50.00 mm	125 mm	4	84977	MHSV-025-42000-BN
25 mm	25.00 mm	50.00 mm	125 mm	4	84978	MHSV-020-42500-BN
	25.00 mm	64.00 mm	125 mm	4	84979	MHSV-026-42500-BN

* .013 mm max TIR

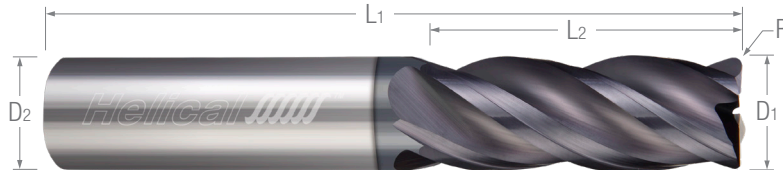
HSV-4

4 FLUTE - CORNER RADIUS

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 185 for *Tplus* coating



Cutter Diameter* D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter D2 (h6)	Corner Radius R $\begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut L2 $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	<i>Aplus</i> Coated + Weldon Flat	Tool Description
1/8	1/8	.010	1/4	1-1/2	4	31017		HSV-S-40125-R.010
	1/8	.010	3/8	2	4	81648		HSV-SR-40125-R.010
	1/8	.010	1/2	2-1/2	4	31032		HSV-R-40125-R.010
	1/8	.010	5/8	2-1/2	4	81649		HSV-A-40125-R.010
	1/8	.010	3/4	2-1/2	4	81650		HSV-M-40125-R.010
	1/8	.010	7/8	2-1/2	4	83212		HSV-L-40125-R.010
	1/8	.015	1/4	1-1/2	4	81651		HSV-S-40125-R.015
	1/8	.015	3/8	2	4	82276		HSV-SR-40125-R.015
	1/8	.015	1/2	2-1/2	4	81652		HSV-R-40125-R.015
	1/8	.015	5/8	2-1/2	4	83213		HSV-A-40125-R.015
	1/8	.020	1/4	1-1/2	4	83214		HSV-S-40125-R.020
	1/8	.020	3/8	2	4	83215		HSV-SR-40125-R.020
	1/8	.020	1/2	2-1/2	4	83216		HSV-R-40125-R.020
	1/8	.030	1/4	1-1/2	4	43017		HSV-S-40125-R.030
	1/8	.030	3/8	2	4	82277		HSV-SR-40125-R.030
	1/8	.030	1/2	2-1/2	4	43032		HSV-R-40125-R.030
	1/8	.030	5/8	2-1/2	4	82278		HSV-A-40125-R.030
	1/8	.030	3/4	2-1/2	4	84697		HSV-M-40125-R.030
5/32	3/16	.010	3/16	2	4	31047		HSV-S-40156-R.010
	3/16	.010	5/16	2	4	84698		HSV-SR-40156-R.010
	3/16	.010	7/16	2-1/2	4	31062		HSV-R-40156-R.010
	3/16	.010	9/16	2-1/2	4	81653		HSV-M-40156-R.010
	3/16	.030	3/16	2	4	82279		HSV-S-40156-R.030
	3/16	.030	5/16	2	4	84699		HSV-SR-40156-R.030
	3/16	.030	7/16	2-1/2	4	82280		HSV-R-40156-R.030
3/16	.030	9/16	2-1/2	4	84700		HSV-M-40156-R.030	
3/16	3/16	.010	5/16	2	4	31077		HSV-S-40187-R.010
	3/16	.010	7/16	2	4	81654		HSV-SR-40187-R.010
	3/16	.010	5/8	2-1/2	4	31092		HSV-R-40187-R.010
	3/16	.010	1	2-1/2	4	81655		HSV-M-40187-R.010
	3/16	.010	1-3/16	3	4	83217		HSV-L-40187-R.010
	3/16	.015	5/16	2	4	83218		HSV-S-40187-R.015
	3/16	.015	7/16	2	4	83219		HSV-SR-40187-R.015
	3/16	.015	5/8	2-1/2	4	83220		HSV-R-40187-R.015
	3/16	.020	5/16	2	4	83221		HSV-S-40187-R.020
	3/16	.020	7/16	2	4	83222		HSV-SR-40187-R.020
	3/16	.020	5/8	2-1/2	4	83223		HSV-R-40187-R.020

*.0005 max TIR

continued on next page

4 FLUTE - CORNER RADIUS

HSV-4

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	Shank Diameter D2 (h6)	Corner Radius R $\begin{smallmatrix} +.002" \\ -.002" \end{smallmatrix}$	Length of Cut L2 $\begin{smallmatrix} +.032" \\ -.000" \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +.062" \\ -.062" \end{smallmatrix}$	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
3/16	3/16	.030	5/16	2	4	43077		HSV-S-40187-R.030
	3/16	.030	7/16	2	4	82281		HSV-SR-40187-R.030
	3/16	.030	5/8	2-1/2	4	43092		HSV-R-40187-R.030
	3/16	.030	1	2-1/2	4	82282		HSV-M-40187-R.030
7/32	1/4	.010	1/4	2	4	31107		HSV-S-40218-R.010
	1/4	.010	7/16	2-1/2	4	31122		HSV-R-40218-R.010
	1/4	.010	5/8	2-1/2	4	82283		HSV-A-40218-R.010
1/4	1/4	.010	3/8	2	4	81656		HSV-S-40250-R.010
	1/4	.010	1/2	2-1/2	4	81657		HSV-SR-40250-R.010
	1/4	.010	3/4	2-1/2	4	81658		HSV-R-40250-R.010
	1/4	.010	1	3	4	82284		HSV-M-40250-R.010
	1/4	.010	1-1/4	3	4	82285		HSV-L-40250-R.010
	1/4	.015	3/8	2	4	82286		HSV-S-40250-R.015
	1/4	.015	1/2	2-1/2	4	82287		HSV-SR-40250-R.015
	1/4	.015	3/4	2-1/2	4	82288		HSV-R-40250-R.015
	1/4	.015	1	3	4	82289		HSV-M-40250-R.015
	1/4	.015	1-1/4	3	4	82290		HSV-L-40250-R.015
	1/4	.020	3/8	2	4	31137	31137W	HSV-S-40250-R.020
	1/4	.020	1/2	2-1/2	4	31142	31142W	HSV-SR-40250-R.020
	1/4	.020	3/4	2-1/2	4	31152	31152W	HSV-R-40250-R.020
	1/4	.020	1	3	4	31167	31167W	HSV-M-40250-R.020
	1/4	.020	1-1/4	3	4	81659		HSV-L-40250-R.020
	1/4	.020	1-1/2	3	4	83224		HSV-LX-40250-R.020
	1/4	.030	3/8	2	4	43137		HSV-S-40250-R.030
	1/4	.030	1/2	2-1/2	4	43142	43142W	HSV-SR-40250-R.030
	1/4	.030	3/4	2-1/2	4	43152	43152W	HSV-R-40250-R.030
	1/4	.030	1	3	4	43167		HSV-M-40250-R.030
	1/4	.030	1-1/4	3	4	82291		HSV-L-40250-R.030
	1/4	.060	3/8	2	4	43138		HSV-S-40250-R.060
	1/4	.060	1/2	2-1/2	4	43143		HSV-SR-40250-R.060
	1/4	.060	3/4	2-1/2	4	43153		HSV-R-40250-R.060
	1/4	.060	1	3	4	43168		HSV-M-40250-R.060
	1/4	.060	1-1/4	3	4	82292		HSV-L-40250-R.060
	9/32	5/16	.020	7/16	2	4	31182	
5/16		.020	5/8	2-1/2	4	31197		HSV-R-40281-R.020
5/16		.020	1	3	4	31212		HSV-M-40281-R.020
5/16	5/16	.010	1/2	2	4	82293		HSV-S-40312-R.010
	5/16	.010	3/4	2-1/2	4	82294		HSV-R-40312-R.010
	5/16	.010	1	2-1/2	4	84701		HSV-A-40312-R.010
	5/16	.010	1-1/4	3	4	82295		HSV-M-40312-R.010
	5/16	.020	1/2	2	4	31227	31227W	HSV-S-40312-R.020
	5/16	.020	3/4	2-1/2	4	31242	31242W	HSV-R-40312-R.020
	5/16	.020	1	2-1/2	4	81660		HSV-A-40312-R.020
	5/16	.020	1-1/4	3	4	31257	31257W	HSV-M-40312-R.020
	5/16	.020	1-9/16	4	4	82296		HSV-ML-40312-R.020
	5/16	.030	1/2	2	4	43227	43227W	HSV-S-40312-R.030
	5/16	.030	3/4	2-1/2	4	43242		HSV-R-40312-R.030
	5/16	.030	1	2-1/2	4	84702		HSV-A-40312-R.030
	5/16	.030	1-1/4	3	4	43257		HSV-M-40312-R.030
5/16	.030	1-9/16	4	4	84703		HSV-ML-40312-R.030	

*.0005 max TIR

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HSV-4

4 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 $^{+.000''}$ $_{-.002''}$	Shank Diameter D2 (h6)	Corner Radius R $^{+.002''}$ $_{-.002''}$	Length of Cut L2 $^{+.032''}$ $_{-.000''}$	Overall Length L1 $^{+.062''}$ $_{-.062''}$	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
5/16	5/16	.060	1/2	2	4	43228		HSV-S-40312-R.060
	5/16	.060	3/4	2-1/2	4	43243		HSV-R-40312-R.060
	5/16	.060	1	2-1/2	4	84704		HSV-A-40312-R.060
	5/16	.060	1-1/4	3	4	43258		HSV-M-40312-R.060
	5/16	.060	1-9/16	4	4	84705		HSV-ML-40312-R.060
3/8	3/8	.010	1/2	2	4	81661		HSV-S-40375-R.010
	3/8	.010	7/8	3	4	81662		HSV-SR-40375-R.010
	3/8	.010	1-1/4	3	4	81663		HSV-M-40375-R.010
	3/8	.010	1-1/2	3	4	83225		HSV-L-40375-R.010
	3/8	.015	1/2	2	4	83226		HSV-S-40375-R.015
	3/8	.015	7/8	3	4	83227		HSV-SR-40375-R.015
	3/8	.015	1-1/4	3	4	83228		HSV-M-40375-R.015
	3/8	.020	1/2	2	4	31317	31317W	HSV-S-40375-R.020
	3/8	.020	7/8	3	4	31332	31332W	HSV-SR-40375-R.020
	3/8	.020	1	3	4	31337	31337W	HSV-R-40375-R.020
	3/8	.020	1-1/4	3	4	31347	31347W	HSV-M-40375-R.020
	3/8	.020	1-1/2	3	4	81664		HSV-L-40375-R.020
	3/8	.030	1/2	2	4	43317	43317W	HSV-S-40375-R.030
	3/8	.030	7/8	3	4	43332	43332W	HSV-SR-40375-R.030
	3/8	.030	1	3	4	43337	43337W	HSV-R-40375-R.030
	3/8	.030	1-1/4	3	4	43347	43347W	HSV-M-40375-R.030
	3/8	.030	1-1/2	3	4	83229		HSV-L-40375-R.030
	3/8	.060	1/2	2	4	43318	43318W	HSV-S-40375-R.060
	3/8	.060	7/8	3	4	43333	43333W	HSV-SR-40375-R.060
	3/8	.060	1	3	4	43338	43338W	HSV-R-40375-R.060
	3/8	.060	1-1/4	3	4	43348	43348W	HSV-M-40375-R.060
	3/8	.060	1-1/2	3	4	83230		HSV-L-40375-R.060
	3/8	.090	1/2	2	4	43319		HSV-S-40375-R.090
	3/8	.090	7/8	3	4	43334		HSV-SR-40375-R.090
3/8	.090	1	3	4	43339		HSV-R-40375-R.090	
3/8	.090	1-1/4	3	4	43349		HSV-M-40375-R.090	
13/32	7/16	.020	1/2	2-3/4	4	31362		HSV-S-40406-R.020
	7/16	.020	15/16	2-3/4	4	31377		HSV-R-40406-R.020
7/16	7/16	.020	5/8	2-3/4	4	31407		HSV-S-40437-R.020
	7/16	.020	7/8	2-3/4	4	31422		HSV-R-40437-R.020
	7/16	.020	1-1/8	3-1/2	4	31437		HSV-M-40437-R.020
	7/16	.030	5/8	2-3/4	4	43407		HSV-S-40437-R.030
	7/16	.030	7/8	2-3/4	4	43422		HSV-R-40437-R.030
	7/16	.030	1-1/8	3-1/2	4	43437		HSV-M-40437-R.030
	7/16	.060	5/8	2-3/4	4	43408		HSV-S-40437-R.060
	7/16	.060	7/8	2-3/4	4	43423		HSV-R-40437-R.060
	7/16	.060	1-1/8	3-1/2	4	43438		HSV-M-40437-R.060
	7/16	.090	5/8	2-3/4	4	43409		HSV-S-40437-R.090
	7/16	.090	7/8	2-3/4	4	43424		HSV-R-40437-R.090
7/16	.090	1-1/8	3-1/2	4	43439		HSV-M-40437-R.090	
15/32	1/2	.030	5/8	2-1/2	4	31452		HSV-S-40468-R.030
	1/2	.030	1	3	4	31467		HSV-R-40468-R.030
	1/2	.030	1-1/4	3	4	31482		HSV-M-40468-R.030

*.0005 max TIR

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4 FLUTE - CORNER RADIUS

HSV-4

Variable Pitch (cont.)

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Cutter Diameter* D ₁ ^{+0.000"} / _{-.002"}	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L ₂ ^{+0.032"} / _{-.000"}	Overall Length L ₁ ^{+0.062"} / _{-.062"}	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
1/2	1/2	.010	5/8	2-1/2	4	82297		HSV-S-40500-R.010
	1/2	.010	1	3	4	82298		HSV-SR-40500-R.010
	1/2	.010	1-1/4	3	4	82299		HSV-R-40500-R.010
	1/2	.010	1-5/8	4	4	83231		HSV-M-40500-R.010
	1/2	.010	2	4	4	84706		HSV-L-40500-R.010
	1/2	.015	5/8	2-1/2	4	81665		HSV-S-40500-R.015
	1/2	.015	1	3	4	81666		HSV-SR-40500-R.015
	1/2	.015	1-1/4	3	4	81667		HSV-R-40500-R.015
	1/2	.015	1-5/8	4	4	83232		HSV-M-40500-R.015
	1/2	.015	2	4	4	83233		HSV-L-40500-R.015
	1/2	.020	5/8	2-1/2	4	43496	43496W	HSV-S-40500-R.020
	1/2	.020	1	3	4	43511	43511W	HSV-SR-40500-R.020
	1/2	.020	1-1/4	3	4	43526	43526W	HSV-R-40500-R.020
	1/2	.020	1-5/8	4	4	43541		HSV-M-40500-R.020
	1/2	.020	2	4	4	83234		HSV-L-40500-R.020
	1/2	.030	5/8	2-1/2	4	31497	31497W	HSV-S-40500-R.030
	1/2	.030	1	3	4	31512	31512W	HSV-SR-40500-R.030
	1/2	.030	1-1/4	3	4	31527	31527W	HSV-R-40500-R.030
	1/2	.030	1-5/8	4	4	31542	31542W	HSV-M-40500-R.030
	1/2	.030	2	4	4	81668	81668W	HSV-L-40500-R.030
	1/2	.030	2-1/2	5	4	83235		HSV-LX-40500-R.030
	1/2	.060	5/8	2-1/2	4	43497	43497W	HSV-S-40500-R.060
	1/2	.060	1	3	4	43512	43512W	HSV-SR-40500-R.060
	1/2	.060	1-1/4	3	4	43527	43527W	HSV-R-40500-R.060
	1/2	.060	1-5/8	4	4	43542	43542W	HSV-M-40500-R.060
	1/2	.060	2	4	4	81669		HSV-L-40500-R.060
	1/2	.060	2-1/2	5	4	83236		HSV-LX-40500-R.060
	1/2	.090	5/8	2-1/2	4	43498		HSV-S-40500-R.090
	1/2	.090	1	3	4	43513		HSV-SR-40500-R.090
	1/2	.090	1-1/4	3	4	43528		HSV-R-40500-R.090
	1/2	.090	1-5/8	4	4	43543		HSV-M-40500-R.090
	1/2	.125	5/8	2-1/2	4	43499		HSV-S-40500-R.125
1/2	.125	1	3	4	43514	43514W	HSV-SR-40500-R.125	
1/2	.125	1-1/4	3	4	43529	43529W	HSV-R-40500-R.125	
1/2	.125	1-5/8	4	4	43544	43544W	HSV-M-40500-R.125	
1/2	.125	2	4	4	83237		HSV-L-40500-R.125	
5/8	5/8	.015	1-1/4	3-1/2	4	84707		HSV-SR-40625-R.015
	5/8	.015	1-5/8	3-1/2	4	84708		HSV-R-40625-R.015
	5/8	.015	2	4	4	84709		HSV-M-40625-R.015
	5/8	.020	1-1/4	3-1/2	4	84710		HSV-SR-40625-R.020
	5/8	.020	1-5/8	3-1/2	4	84711		HSV-R-40625-R.020
	5/8	.020	2	4	4	84712		HSV-M-40625-R.020
	5/8	.030	3/4	3	4	31557		HSV-S-40625-R.030
	5/8	.030	1-1/4	3-1/2	4	31572	31572W	HSV-SR-40625-R.030
	5/8	.030	1-5/8	3-1/2	4	31587	31587W	HSV-R-40625-R.030
	5/8	.030	2	4	4	31602	31602W	HSV-M-40625-R.030
	5/8	.030	2-1/2	5	4	81670		HSV-ML-40625-R.030
	5/8	.030	3-1/4	6	4	31617		HSV-L-40625-R.030
5/8	.030	3-3/4	6	4	82300		HSV-LX-40625-R.030	

* .0005 max TIR

continued on next page

4 Flute

HSV-4

4 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
5/8	5/8	.060	3/4	3	4	43557		HSV-S-40625-R.060
	5/8	.060	1-1/4	3-1/2	4	43572		HSV-SR-40625-R.060
	5/8	.060	1-5/8	3-1/2	4	43587		HSV-R-40625-R.060
	5/8	.060	2	4	4	43602		HSV-M-40625-R.060
	5/8	.060	3-1/4	6	4	43617		HSV-L-40625-R.060
	5/8	.090	3/4	3	4	43558		HSV-S-40625-R.090
	5/8	.090	1-1/4	3-1/2	4	43573		HSV-SR-40625-R.090
	5/8	.090	1-5/8	3-1/2	4	43588		HSV-R-40625-R.090
	5/8	.090	2	4	4	43603		HSV-M-40625-R.090
	5/8	.090	3-1/4	6	4	43618		HSV-L-40625-R.090
	5/8	.125	3/4	3	4	43559		HSV-S-40625-R.125
	5/8	.125	1-1/4	3-1/2	4	43574		HSV-SR-40625-R.125
	5/8	.125	1-5/8	3-1/2	4	43589		HSV-R-40625-R.125
	5/8	.125	2	4	4	43604		HSV-M-40625-R.125
	5/8	.125	3-1/4	6	4	43619		HSV-L-40625-R.125
3/4	3/4	.015	1-1/4	4	4	81671		HSV-SR-40750-R.015
	3/4	.015	1-5/8	4	4	81672		HSV-R-40750-R.015
	3/4	.015	2-1/4	5	4	84713		HSV-M-40750-R.015
	3/4	.020	1-1/4	4	4	84714		HSV-SR-40750-R.020
	3/4	.020	1-5/8	4	4	84715		HSV-R-40750-R.020
	3/4	.020	2-1/4	5	4	84716		HSV-M-40750-R.020
	3/4	.030	7/8	3	4	31632	31632W	HSV-S-40750-R.030
	3/4	.030	1-1/4	4	4	31647	31647W	HSV-SR-40750-R.030
	3/4	.030	1-5/8	4	4	31662	31662W	HSV-R-40750-R.030
	3/4	.030	2-1/4	5	4	31677	31677W	HSV-M-40750-R.030
	3/4	.030	2-3/4	5	4	81673		HSV-ML-40750-R.030
	3/4	.030	3-1/4	6	4	31692	31692W	HSV-L-40750-R.030
	3/4	.030	4	6-1/2	4	82301		HSV-LX-40750-R.030
	3/4	.030	4-3/4	7	4	84717		HSV-X-40750-R.030
	3/4	.060	7/8	3	4	43632		HSV-S-40750-R.060
	3/4	.060	1-1/4	4	4	43647		HSV-SR-40750-R.060
	3/4	.060	1-5/8	4	4	43662		HSV-R-40750-R.060
	3/4	.060	2-1/4	5	4	43677		HSV-M-40750-R.060
	3/4	.060	3-1/4	6	4	43692		HSV-L-40750-R.060
	3/4	.090	7/8	3	4	43633		HSV-S-40750-R.090
	3/4	.090	1-1/4	4	4	43648		HSV-SR-40750-R.090
	3/4	.090	1-5/8	4	4	43663		HSV-R-40750-R.090
	3/4	.090	2-1/4	5	4	43678		HSV-M-40750-R.090
	3/4	.090	3-1/4	6	4	43693		HSV-L-40750-R.090
	3/4	.125	7/8	3	4	43634		HSV-S-40750-R.125
	3/4	.125	1-1/4	4	4	43649		HSV-SR-40750-R.125
	3/4	.125	1-5/8	4	4	43664		HSV-R-40750-R.125
	3/4	.125	2-1/4	5	4	43679		HSV-M-40750-R.125
	3/4	.125	3-1/4	6	4	43694		HSV-L-40750-R.125
	3/4	.190	7/8	3	4	43635		HSV-S-40750-R.190
	3/4	.190	1-1/4	4	4	43650		HSV-SR-40750-R.190
	3/4	.190	1-5/8	4	4	43665		HSV-R-40750-R.190
	3/4	.190	2-1/4	5	4	43680		HSV-M-40750-R.190
3/4	.190	3-1/4	6	4	43695		HSV-L-40750-R.190	

*.0005 max TIR

continued on next page

4 FLUTE - CORNER RADIUS

HSV-4

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.001"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
3/4	3/4	.250	7/8	3	4	43636		HSV-S-40750-R.250
	3/4	.250	1-1/4	4	4	43651		HSV-SR-40750-R.250
	3/4	.250	1-5/8	4	4	43666		HSV-R-40750-R.250
	3/4	.250	2-1/4	5	4	43681		HSV-M-40750-R.250
	3/4	.250	3-1/4	6	4	43696		HSV-L-40750-R.250
1	1	.030	1-1/2	4	4	31707		HSV-S-41000-R.030
	1	.030	2	4-1/2	4	31722	31722W	HSV-R-41000-R.030
	1	.030	2-5/8	5	4	31737		HSV-M-41000-R.030
	1	.030	3	6	4	31742		HSV-ML-41000-R.030
	1	.030	4-1/4	7	4	31752		HSV-L-41000-R.030
	1	.030	5-1/4	9	4	82302		HSV-LX-41000-R.030
	1	.060	1-1/2	4	4	43707		HSV-S-41000-R.060
	1	.060	2	4-1/2	4	43722	43722W	HSV-R-41000-R.060
	1	.060	2-5/8	5	4	43737		HSV-M-41000-R.060
	1	.060	3	6	4	43742		HSV-ML-41000-R.060
	1	.060	4-1/4	7	4	43752		HSV-L-41000-R.060
	1	.090	1-1/2	4	4	43708		HSV-S-41000-R.090
	1	.090	2	4-1/2	4	43723		HSV-R-41000-R.090
	1	.090	2-5/8	5	4	43738		HSV-M-41000-R.090
	1	.090	3	6	4	43743		HSV-ML-41000-R.090
	1	.090	4-1/4	7	4	43753		HSV-L-41000-R.090
	1	.125	1-1/2	4	4	43709		HSV-S-41000-R.125
	1	.125	2	4-1/2	4	43724		HSV-R-41000-R.125
	1	.125	2-5/8	5	4	43739		HSV-M-41000-R.125
	1	.125	3	6	4	43744		HSV-ML-41000-R.125
	1	.125	4-1/4	7	4	43754		HSV-L-41000-R.125
	1	.190	1-1/2	4	4	43710		HSV-S-41000-R.190
	1	.190	2	4-1/2	4	43725		HSV-R-41000-R.190
	1	.190	2-5/8	5	4	43740		HSV-M-41000-R.190
	1	.190	3	6	4	43745		HSV-ML-41000-R.190
	1	.190	4-1/4	7	4	43755		HSV-L-41000-R.190
	1	.250	1-1/2	4	4	43711		HSV-S-41000-R.250
	1	.250	2	4-1/2	4	43726		HSV-R-41000-R.250
	1	.250	2-5/8	5	4	43741		HSV-M-41000-R.250
	1	.250	3	6	4	43746		HSV-ML-41000-R.250
1	.250	4-1/4	7	4	43756		HSV-L-41000-R.250	

*.0005 max TIR

4 Flute

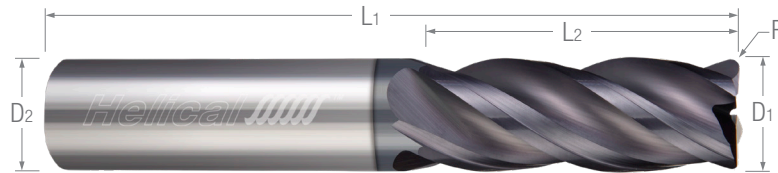
MHSV-4

METRIC

4 FLUTE - CORNER RADIUS - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 $\begin{smallmatrix} +.00 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	Shank Diameter D2 (h6)	Corner Radius R $\begin{smallmatrix} +.05 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	Length of Cut L2 $\begin{smallmatrix} +.80 \text{ mm} \\ -.00 \text{ mm} \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +1.60 \text{ mm} \\ -1.60 \text{ mm} \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	4	59459	MHSV-015-40600-R0.50
	6.00 mm	.50 mm	12.00 mm	63 mm	4	59477	MHSV-020-40600-R0.50
	6.00 mm	.50 mm	18.00 mm	63 mm	4	59511	MHSV-030-40600-R0.50
	6.00 mm	1.00 mm	9.00 mm	63 mm	4	59460	MHSV-015-40600-R1.00
	6.00 mm	1.00 mm	12.00 mm	63 mm	4	59478	MHSV-020-40600-R1.00
	6.00 mm	1.00 mm	18.00 mm	63 mm	4	59512	MHSV-030-40600-R1.00
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	4	59462	MHSV-015-40800-R0.50
	8.00 mm	.50 mm	16.00 mm	63 mm	4	59480	MHSV-020-40800-R0.50
	8.00 mm	.50 mm	24.00 mm	75 mm	4	59514	MHSV-030-40800-R0.50
	8.00 mm	1.00 mm	12.00 mm	63 mm	4	59463	MHSV-015-40800-R1.00
	8.00 mm	1.00 mm	16.00 mm	63 mm	4	59481	MHSV-020-40800-R1.00
	8.00 mm	1.00 mm	24.00 mm	75 mm	4	59515	MHSV-030-40800-R1.00
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	4	59465	MHSV-015-41000-R0.50
	10.00 mm	.50 mm	20.00 mm	63 mm	4	59483	MHSV-020-41000-R0.50
	10.00 mm	.50 mm	25.00 mm	75 mm	4	59497	MHSV-025-41000-R0.50
	10.00 mm	1.00 mm	15.00 mm	63 mm	4	59466	MHSV-015-41000-R1.00
	10.00 mm	1.00 mm	20.00 mm	63 mm	4	59484	MHSV-020-41000-R1.00
	10.00 mm	1.00 mm	25.00 mm	75 mm	4	59498	MHSV-025-41000-R1.00
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	4	59468	MHSV-015-41200-R0.50
	12.00 mm	.50 mm	24.00 mm	75 mm	4	59486	MHSV-020-41200-R0.50
	12.00 mm	.50 mm	30.00 mm	75 mm	4	59500	MHSV-025-41200-R0.50
	12.00 mm	1.00 mm	18.00 mm	75 mm	4	59469	MHSV-015-41200-R1.00
	12.00 mm	1.00 mm	24.00 mm	75 mm	4	59487	MHSV-020-41200-R1.00
	12.00 mm	1.00 mm	30.00 mm	75 mm	4	59501	MHSV-025-41200-R1.00
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	4	59471	MHSV-015-41600-R0.50
	16.00 mm	.50 mm	32.00 mm	89 mm	4	59489	MHSV-020-41600-R0.50
	16.00 mm	.50 mm	40.00 mm	89 mm	4	59503	MHSV-025-41600-R0.50
	16.00 mm	1.00 mm	24.00 mm	89 mm	4	59472	MHSV-015-41600-R1.00
	16.00 mm	1.00 mm	32.00 mm	89 mm	4	59490	MHSV-020-41600-R1.00
	16.00 mm	1.00 mm	40.00 mm	89 mm	4	59504	MHSV-025-41600-R1.00
20 mm	20.00 mm	.50 mm	30.00 mm	89 mm	4	59474	MHSV-015-42000-R0.50
	20.00 mm	.50 mm	40.00 mm	100 mm	4	59492	MHSV-020-42000-R0.50
	20.00 mm	.50 mm	50.00 mm	125 mm	4	59506	MHSV-025-42000-R0.50
	20.00 mm	1.00 mm	30.00 mm	89 mm	4	59475	MHSV-015-42000-R1.00
	20.00 mm	1.00 mm	40.00 mm	100 mm	4	59493	MHSV-020-42000-R1.00
	20.00 mm	1.00 mm	50.00 mm	125 mm	4	59507	MHSV-025-42000-R1.00
25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	4	59495	MHSV-020-42500-R1.00
	25.00 mm	1.00 mm	64.00 mm	125 mm	4	59509	MHSV-025-42500-R1.00

*.013 mm max TIR



4 FLUTE - SQUARE

HSV-RN-4

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 189 for *Tplus* coating



Cutter Dia.* D1 ^{+0.000} / _{-.002} "	Shank Diameter D2 (h6)	Length of Cut L2 ^{+0.032} / _{-.000} "	Overall Length L1 ^{+0.062} / _{-.062} "	Reach (LBS) L3	Neck Diameter	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	5/32	3	3/8	.118	4	52017	HSV-RN-S-40125
	1/8	5/32	3	1/2	.118	4	52032	HSV-RN-R-40125
	1/8	5/32	3	5/8	.118	4	52047	HSV-RN-M-40125
	1/8	5/32	3	3/4	.118	4	83496	HSV-RN-ML-40125
	1/8	5/32	3	1	.118	4	83497	HSV-RN-LX-40125
3/16	3/16	7/32	3	1/2	.178	4	52062	HSV-RN-R-40187
	3/16	7/32	3	3/4	.178	4	52077	HSV-RN-M-40187
	3/16	7/32	3	1	.178	4	52092	HSV-RN-L-40187
	3/16	7/32	3	1-5/16	.178	4	83498	HSV-RN-X-40187
1/4	1/4	3/8	3	3/4	.237	4	52107	HSV-RN-S-40250
	1/4	3/8	4	1-1/8	.237	4	52122	HSV-RN-R-40250
	1/4	3/8	4	1-5/8	.237	4	81680	HSV-RN-A-40250
	1/4	3/8	4	2-1/8	.237	4	52137	HSV-RN-M-40250
	1/4	3/8	4	2-1/2	.237	4	83499	HSV-RN-ML-40250
3/8	3/8	1/2	4	1-1/8	.356	4	52152	HSV-RN-S-40375
	3/8	1/2	4	1-5/8	.356	4	81681	HSV-RN-SR-40375
	3/8	1/2	4	2-1/8	.356	4	52167	HSV-RN-R-40375
	3/8	1/2	6	2-1/2	.356	4	81682	HSV-RN-A-40375
	3/8	1/2	6	3-1/8	.356	4	52182	HSV-RN-M-40375
	3/8	1/2	6	4-1/8	.356	4	52197	HSV-RN-L-40375
1/2	1/2	5/8	4	1-1/2	.475	4	52212	HSV-RN-S-40500
	1/2	5/8	4	1-3/4	.475	4	81683	HSV-RN-SR-40500
	1/2	5/8	4	2-1/4	.475	4	52227	HSV-RN-R-40500
	1/2	5/8	5	2-3/4	.475	4	81684	HSV-RN-A-40500
	1/2	5/8	6	3-3/8	.475	4	52242	HSV-RN-M-40500
	1/2	5/8	6	3-3/4	.475	4	83500	HSV-RN-ML-40500
	1/2	5/8	6	4-1/8	.475	4	52257	HSV-RN-L-40500
5/8	5/8	3/4	4	1-5/8	.593	4	52272	HSV-RN-S-40625
	5/8	3/4	6	2-3/8	.593	4	52287	HSV-RN-R-40625
	5/8	3/4	6	3-3/8	.593	4	52302	HSV-RN-M-40625
	5/8	3/4	6	4-1/8	.593	4	52317	HSV-RN-L-40625
3/4	3/4	1	4	2	.712	4	52332	HSV-RN-S-40750
	3/4	1	6	2-1/2	.712	4	52347	HSV-RN-R-40750
	3/4	1	6	3-3/8	.712	4	52362	HSV-RN-M-40750
	3/4	1	6	4-1/8	.712	4	52377	HSV-RN-L-40750
1	1	1-1/4	4	2-1/4	.950	4	52392	HSV-RN-S-41000
	1	1-1/4	6	2-5/8	.950	4	52407	HSV-RN-R-41000
	1	1-1/4	6	3-3/8	.950	4	52422	HSV-RN-M-41000
	1	1-1/4	6	4-1/8	.950	4	52437	HSV-RN-L-41000

* .0005 max TIR

HSV-RN-4

4 FLUTE - BALL

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 190 for *Tplus* coating



Cutter Dia.* D ₁ ^{+0.000} / _{-0.002} "	Shank Diameter D ₂ (H6)	Length of Cut L ₂ ^{+0.032} / _{-0.000} "	Overall Length L ₁ ^{+0.062} / _{-0.062} "	Reach (LBS) L ₃	Neck Diameter	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	5/32	3	3/8	.118	4	57017	HSV-RN-S-40125-BN
	1/8	5/32	3	1/2	.118	4	57032	HSV-RN-R-40125-BN
	1/8	5/32	3	5/8	.118	4	57047	HSV-RN-M-40125-BN
	1/8	5/32	3	3/4	.118	4	82515	HSV-RN-ML-40125-BN
	1/8	5/32	3	1	.118	4	83512	HSV-RN-LX-40125-BN
3/16	3/16	7/32	3	1/2	.178	4	57062	HSV-RN-S-40187-BN
	3/16	7/32	3	3/4	.178	4	57077	HSV-RN-R-40187-BN
	3/16	7/32	3	1	.178	4	57092	HSV-RN-M-40187-BN
	3/16	7/32	3	1-5/16	.178	4	82516	HSV-RN-L-40187-BN
	3/16	7/32	3	1-1/2	.178	4	83513	HSV-RN-LX-40187-BN
1/4	1/4	3/8	3	3/4	.237	4	57107	HSV-RN-S-40250-BN
	1/4	3/8	4	1-1/8	.237	4	57122	HSV-RN-R-40250-BN
	1/4	3/8	4	1-5/8	.237	4	81694	HSV-RN-A-40250-BN
	1/4	3/8	4	2-1/8	.237	4	57137	HSV-RN-M-40250-BN
	1/4	3/8	4	2-1/2	.237	4	81695	HSV-RN-ML-40250-BN
	1/4	3/8	4-1/2	3	.237	4	82517	HSV-RN-L-40250-BN
3/8	3/8	1/2	4	1-1/8	.356	4	57152	HSV-RN-S-40375-BN
	3/8	1/2	4	1-5/8	.356	4	81696	HSV-RN-SR-40375-BN
	3/8	1/2	4	2-1/8	.356	4	57167	HSV-RN-R-40375-BN
	3/8	1/2	6	2-1/2	.356	4	81697	HSV-RN-A-40375-BN
	3/8	1/2	6	3-1/8	.356	4	57182	HSV-RN-M-40375-BN
	3/8	1/2	6	3-5/8	.356	4	83514	HSV-RN-ML-40375-BN
	3/8	1/2	6	4-1/8	.356	4	57197	HSV-RN-L-40375-BN
1/2	1/2	5/8	4	1-1/2	.475	4	57212	HSV-RN-S-40500-BN
	1/2	5/8	4	1-3/4	.475	4	81698	HSV-RN-SR-40500-BN
	1/2	5/8	4	2-1/4	.475	4	57227	HSV-RN-R-40500-BN
	1/2	5/8	5	2-3/4	.475	4	81699	HSV-RN-A-40500-BN
	1/2	5/8	6	3-3/8	.475	4	57242	HSV-RN-M-40500-BN
	1/2	5/8	6	3-3/4	.475	4	81700	HSV-RN-ML-40500-BN
	1/2	5/8	6	4-1/8	.475	4	57257	HSV-RN-L-40500-BN
	1/2	5/8	7	5	.475	4	83515	HSV-RN-X-40500-BN

*.0005 max TIR

continued on next page

4 FLUTE - BALL

HSV-RN-4

Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.* D ₁ ^{+0.000"} / _{-.002"}	Shank Diameter D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} / _{-.000"}	Overall Length L ₁ ^{+0.062"} / _{-.062"}	Reach (LBS) L ₃	Neck Diameter	Flutes	Aplus Coated	Tool Description
5/8	5/8	3/4	4	1-5/8	.593	4	57272	HSV-RN-S-40625-BN
	5/8	3/4	6	2-3/8	.593	4	57287	HSV-RN-R-40625-BN
	5/8	3/4	6	3-3/8	.593	4	57302	HSV-RN-M-40625-BN
	5/8	3/4	6	4-1/8	.593	4	57317	HSV-RN-L-40625-BN
3/4	3/4	1	4	2	.712	4	57332	HSV-RN-S-40750-BN
	3/4	1	6	2-1/2	.712	4	57347	HSV-RN-R-40750-BN
	3/4	1	6	3-3/8	.712	4	57362	HSV-RN-M-40750-BN
	3/4	1	6	3-3/4	.712	4	83516	HSV-RN-ML-40750-BN
	3/4	1	6	4-1/8	.712	4	57377	HSV-RN-L-40750-BN
1	1	1-1/4	4	2-1/4	.950	4	57392	HSV-RN-S-41000-BN
	1	1-1/4	6	2-5/8	.950	4	57407	HSV-RN-R-41000-BN
	1	1-1/4	6	3-3/8	.950	4	57422	HSV-RN-M-41000-BN
	1	1-1/4	6	4-1/8	.950	4	57437	HSV-RN-L-41000-BN

* .0005 max TIR

HSV-RN-4

4 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 191 for *Tplus* coating



Cutter Dia.* D1 ^{+0.000} / _{-.002} "	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002} / _{-.002} "	LOC L2 ^{+0.032} / _{-.000} "	OAL L1 ^{+0.062} / _{-.062} "	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	5/32	3	3/8	.118	4	32017	HSV-RN-S-40125-R.010
	1/8	.010	5/32	3	1/2	.118	4	32032	HSV-RN-R-40125-R.010
	1/8	.010	5/32	3	5/8	.118	4	32047	HSV-RN-M-40125-R.010
	1/8	.010	5/32	3	3/4	.118	4	81685	HSV-RN-ML-40125-R.010
	1/8	.010	5/32	3	1	.118	4	83501	HSV-RN-LX-40125-R.010
	1/8	.030	5/32	3	3/8	.118	4	53017	HSV-RN-S-40125-R.030
	1/8	.030	5/32	3	1/2	.118	4	53032	HSV-RN-R-40125-R.030
	1/8	.030	5/32	3	5/8	.118	4	53047	HSV-RN-M-40125-R.030
	1/8	.030	5/32	3	3/4	.118	4	83502	HSV-RN-ML-40125-R.030
3/16	3/16	.010	7/32	3	1/2	.178	4	32062	HSV-RN-S-40187-R.010
	3/16	.010	7/32	3	3/4	.178	4	32077	HSV-RN-R-40187-R.010
	3/16	.010	7/32	3	1	.178	4	32092	HSV-RN-M-40187-R.010
	3/16	.010	7/32	3	1-5/16	.178	4	81686	HSV-RN-L-40187-R.010
	3/16	.010	7/32	3	1-1/2	.178	4	83503	HSV-RN-LX-40187-R.010
	3/16	.030	7/32	3	1/2	.178	4	53062	HSV-RN-S-40187-R.030
	3/16	.030	7/32	3	3/4	.178	4	53077	HSV-RN-R-40187-R.030
	3/16	.030	7/32	3	1	.178	4	53092	HSV-RN-M-40187-R.030
	3/16	.030	7/32	3	1-5/16	.178	4	83504	HSV-RN-L-40187-R.030
1/4	1/4	.020	3/8	3	3/4	.237	4	32107	HSV-RN-S-40250-R.020
	1/4	.020	3/8	4	1-1/8	.237	4	32122	HSV-RN-R-40250-R.020
	1/4	.020	3/8	4	1-5/8	.237	4	81687	HSV-RN-A-40250-R.020
	1/4	.020	3/8	4	2-1/8	.237	4	32137	HSV-RN-M-40250-R.020
	1/4	.020	3/8	4	2-1/2	.237	4	83505	HSV-RN-ML-40250-R.020
	1/4	.030	3/8	3	3/4	.237	4	53107	HSV-RN-S-40250-R.030
	1/4	.030	3/8	4	1-1/8	.237	4	53122	HSV-RN-R-40250-R.030
	1/4	.030	3/8	4	1-5/8	.237	4	83506	HSV-RN-A-40250-R.030
	1/4	.030	3/8	4	2-1/8	.237	4	53137	HSV-RN-M-40250-R.030
	1/4	.030	3/8	4	2-1/2	.237	4	83507	HSV-RN-ML-40250-R.030
	1/4	.060	3/8	3	3/4	.237	4	53108	HSV-RN-S-40250-R.060
	1/4	.060	3/8	4	1-1/8	.237	4	53123	HSV-RN-R-40250-R.060
1/4	.060	3/8	4	2-1/8	.237	4	53138	HSV-RN-M-40250-R.060	
3/8	3/8	.020	1/2	4	1-1/8	.356	4	32152	HSV-RN-S-40375-R.020
	3/8	.020	1/2	4	1-5/8	.356	4	81688	HSV-RN-SR-40375-R.020
	3/8	.020	1/2	4	2-1/8	.356	4	32167	HSV-RN-R-40375-R.020
	3/8	.020	1/2	6	2-1/2	.356	4	81689	HSV-RN-A-40375-R.020
	3/8	.020	1/2	6	3-1/8	.356	4	32182	HSV-RN-M-40375-R.020
	3/8	.020	1/2	6	4-1/8	.356	4	32197	HSV-RN-L-40375-R.020
	3/8	.030	1/2	4	1-1/8	.356	4	53152	HSV-RN-S-40375-R.030

* .0005 max TIR

continued on next page

4 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck (cont.)

HSV-RN-4

continued from previous page

Cutter Dia.* D1 ^{+0.001*} -0.002*	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002*} -0.002*	LOC L2 ^{+0.032*} -0.000*	OAL L1 ^{+0.062*} -0.062*	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
3/8	3/8	.030	1/2	4	2-1/8	.356	4	53167	HSV-RN-R-40375-R.030
	3/8	.030	1/2	6	3-1/8	.356	4	53182	HSV-RN-M-40375-R.030
	3/8	.030	1/2	6	4-1/8	.356	4	53197	HSV-RN-L-40375-R.030
	3/8	.060	1/2	4	1-1/8	.356	4	53153	HSV-RN-S-40375-R.060
	3/8	.060	1/2	4	2-1/8	.356	4	53168	HSV-RN-R-40375-R.060
	3/8	.060	1/2	6	3-1/8	.356	4	53183	HSV-RN-M-40375-R.060
	3/8	.060	1/2	6	4-1/8	.356	4	53198	HSV-RN-L-40375-R.060
	3/8	.090	1/2	4	1-1/8	.356	4	53154	HSV-RN-S-40375-R.090
	3/8	.090	1/2	4	2-1/8	.356	4	53169	HSV-RN-R-40375-R.090
	3/8	.090	1/2	6	3-1/8	.356	4	53184	HSV-RN-M-40375-R.090
3/8	.090	1/2	6	4-1/8	.356	4	53199	HSV-RN-L-40375-R.090	
1/2	1/2	.010	5/8	4	1-1/2	.475	4	83508	HSV-RN-S-40500-R.010
	1/2	.010	5/8	4	2-1/4	.475	4	83509	HSV-RN-R-40500-R.010
	1/2	.010	5/8	6	3-3/8	.475	4	83510	HSV-RN-M-40500-R.010
	1/2	.010	5/8	6	4-1/8	.475	4	83511	HSV-RN-L-40500-R.010
	1/2	.020	5/8	4	1-1/2	.475	4	53211	HSV-RN-S-40500-R.020
	1/2	.020	5/8	4	2-1/4	.475	4	53226	HSV-RN-R-40500-R.020
	1/2	.020	5/8	6	3-3/8	.475	4	53241	HSV-RN-M-40500-R.020
	1/2	.020	5/8	6	4-1/8	.475	4	53256	HSV-RN-L-40500-R.020
	1/2	.030	5/8	4	1-1/2	.475	4	32212	HSV-RN-S-40500-R.030
	1/2	.030	5/8	4	1-3/4	.475	4	81690	HSV-RN-SR-40500-R.030
	1/2	.030	5/8	4	2-1/4	.475	4	32227	HSV-RN-R-40500-R.030
	1/2	.030	5/8	5	2-3/4	.475	4	81691	HSV-RN-A-40500-R.030
	1/2	.030	5/8	6	3-3/8	.475	4	32242	HSV-RN-M-40500-R.030
	1/2	.030	5/8	6	3-3/4	.475	4	81692	HSV-RN-ML-40500-R.030
	1/2	.030	5/8	6	4-1/8	.475	4	32257	HSV-RN-L-40500-R.030
	1/2	.060	5/8	4	1-1/2	.475	4	53212	HSV-RN-S-40500-R.060
	1/2	.060	5/8	4	2-1/4	.475	4	53227	HSV-RN-R-40500-R.060
	1/2	.060	5/8	6	3-3/8	.475	4	53242	HSV-RN-M-40500-R.060
	1/2	.060	5/8	6	4-1/8	.475	4	53257	HSV-RN-L-40500-R.060
	1/2	.090	5/8	4	1-1/2	.475	4	53213	HSV-RN-S-40500-R.090
1/2	.090	5/8	4	2-1/4	.475	4	53228	HSV-RN-R-40500-R.090	
1/2	.090	5/8	6	3-3/8	.475	4	53243	HSV-RN-M-40500-R.090	
1/2	.090	5/8	6	4-1/8	.475	4	53258	HSV-RN-L-40500-R.090	
1/2	.125	5/8	4	1-1/2	.475	4	53214	HSV-RN-S-40500-R.125	
1/2	.125	5/8	4	2-1/4	.475	4	53229	HSV-RN-R-40500-R.125	
1/2	.125	5/8	6	3-3/8	.475	4	53244	HSV-RN-M-40500-R.125	
1/2	.125	5/8	6	4-1/8	.475	4	53259	HSV-RN-L-40500-R.125	
5/8	5/8	.030	3/4	4	1-5/8	.593	4	32272	HSV-RN-S-40625-R.030
	5/8	.030	3/4	6	2-3/8	.593	4	32287	HSV-RN-R-40625-R.030
	5/8	.030	3/4	6	3-3/8	.593	4	32302	HSV-RN-M-40625-R.030
	5/8	.030	3/4	6	4-1/8	.593	4	32317	HSV-RN-L-40625-R.030
	5/8	.060	3/4	4	1-5/8	.593	4	53272	HSV-RN-S-40625-R.060
	5/8	.060	3/4	6	2-3/8	.593	4	53287	HSV-RN-R-40625-R.060
	5/8	.060	3/4	6	3-3/8	.593	4	53302	HSV-RN-M-40625-R.060
	5/8	.060	3/4	6	4-1/8	.593	4	53317	HSV-RN-L-40625-R.060
	5/8	.090	3/4	4	1-5/8	.593	4	53273	HSV-RN-S-40625-R.090
	5/8	.090	3/4	6	2-3/8	.593	4	53288	HSV-RN-R-40625-R.090
	5/8	.090	3/4	6	3-3/8	.593	4	53303	HSV-RN-M-40625-R.090
	5/8	.090	3/4	6	4-1/8	.593	4	53318	HSV-RN-L-40625-R.090
	5/8	.125	3/4	4	1-5/8	.593	4	53274	HSV-RN-S-40625-R.125
	5/8	.125	3/4	6	2-3/8	.593	4	53289	HSV-RN-R-40625-R.125
5/8	.125	3/4	6	3-3/8	.593	4	53304	HSV-RN-M-40625-R.125	
5/8	.125	3/4	6	4-1/8	.593	4	53319	HSV-RN-L-40625-R.125	

* .0005 max TIR

continued on next page

4 Flute

HSV-RN-4

4 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.* D1 $^{+.000}$ $_{-.002}$	Shank Dia. D2 (h6)	Corner Radius R $^{+.002}$ $_{-.002}$	LOC L2 $^{+.032}$ $_{-.000}$	OAL L1 $^{+.062}$ $_{-.062}$	Reach (LBS) L3	Neck Dia.	Flutes	Aplus Coated	Tool Description
3/4	3/4	.030	1	4	2	.712	4	32332	HSV-RN-S-40750-R.030
	3/4	.030	1	6	2-1/2	.712	4	32347	HSV-RN-R-40750-R.030
	3/4	.030	1	6	2-7/8	.712	4	81693	HSV-RN-A-40750-R.030
	3/4	.030	1	6	3-3/8	.712	4	32362	HSV-RN-M-40750-R.030
	3/4	.030	1	6	4-1/8	.712	4	32377	HSV-RN-L-40750-R.030
	3/4	.060	1	4	2	.712	4	53332	HSV-RN-S-40750-R.060
	3/4	.060	1	6	2-1/2	.712	4	53347	HSV-RN-R-40750-R.060
	3/4	.060	1	6	3-3/8	.712	4	53362	HSV-RN-M-40750-R.060
	3/4	.060	1	6	4-1/8	.712	4	53377	HSV-RN-L-40750-R.060
	3/4	.090	1	4	2	.712	4	53333	HSV-RN-S-40750-R.090
	3/4	.090	1	6	2-1/2	.712	4	53348	HSV-RN-R-40750-R.090
	3/4	.090	1	6	3-3/8	.712	4	53363	HSV-RN-M-40750-R.090
	3/4	.090	1	6	4-1/8	.712	4	53378	HSV-RN-L-40750-R.090
	3/4	.125	1	4	2	.712	4	53334	HSV-RN-S-40750-R.125
	3/4	.125	1	6	2-1/2	.712	4	53349	HSV-RN-R-40750-R.125
	3/4	.125	1	6	3-3/8	.712	4	53364	HSV-RN-M-40750-R.125
	3/4	.125	1	6	4-1/8	.712	4	53379	HSV-RN-L-40750-R.125
	3/4	.190	1	4	2	.712	4	53335	HSV-RN-S-40750-R.190
	3/4	.190	1	6	2-1/2	.712	4	53350	HSV-RN-R-40750-R.190
	3/4	.190	1	6	3-3/8	.712	4	53365	HSV-RN-M-40750-R.190
3/4	.190	1	6	4-1/8	.712	4	53380	HSV-RN-L-40750-R.190	
3/4	.250	1	4	2	.712	4	53336	HSV-RN-S-40750-R.250	
3/4	.250	1	6	2-1/2	.712	4	53351	HSV-RN-R-40750-R.250	
3/4	.250	1	6	3-3/8	.712	4	53366	HSV-RN-M-40750-R.250	
3/4	.250	1	6	4-1/8	.712	4	53381	HSV-RN-L-40750-R.250	
1	1	.030	1-1/4	4	2-1/4	.950	4	32392	HSV-RN-S-41000-R.030
	1	.030	1-1/4	6	2-5/8	.950	4	32407	HSV-RN-R-41000-R.030
	1	.030	1-1/4	6	3-3/8	.950	4	32422	HSV-RN-M-41000-R.030
	1	.030	1-1/4	6	4-1/8	.950	4	32437	HSV-RN-L-41000-R.030
	1	.060	1-1/4	4	2-1/4	.950	4	53392	HSV-RN-S-41000-R.060
	1	.060	1-1/4	6	2-5/8	.950	4	53407	HSV-RN-R-41000-R.060
	1	.060	1-1/4	6	3-3/8	.950	4	53422	HSV-RN-M-41000-R.060
	1	.060	1-1/4	6	4-1/8	.950	4	53437	HSV-RN-L-41000-R.060
	1	.090	1-1/4	4	2-1/4	.950	4	53393	HSV-RN-S-41000-R.090
	1	.090	1-1/4	6	2-5/8	.950	4	53408	HSV-RN-R-41000-R.090
	1	.090	1-1/4	6	3-3/8	.950	4	53423	HSV-RN-M-41000-R.090
	1	.090	1-1/4	6	4-1/8	.950	4	53438	HSV-RN-L-41000-R.090
	1	.125	1-1/4	4	2-1/4	.950	4	53394	HSV-RN-S-41000-R.125
	1	.125	1-1/4	6	2-5/8	.950	4	53409	HSV-RN-R-41000-R.125
	1	.125	1-1/4	6	3-3/8	.950	4	53424	HSV-RN-M-41000-R.125
	1	.125	1-1/4	6	4-1/8	.950	4	53439	HSV-RN-L-41000-R.125
	1	.190	1-1/4	4	2-1/4	.950	4	53395	HSV-RN-S-41000-R.190
	1	.190	1-1/4	6	2-5/8	.950	4	53410	HSV-RN-R-41000-R.190
	1	.190	1-1/4	6	3-3/8	.950	4	53425	HSV-RN-M-41000-R.190
	1	.190	1-1/4	6	4-1/8	.950	4	53440	HSV-RN-L-41000-R.190
1	.250	1-1/4	4	2-1/4	.950	4	53396	HSV-RN-S-41000-R.250	
1	.250	1-1/4	6	2-5/8	.950	4	53411	HSV-RN-R-41000-R.250	
1	.250	1-1/4	6	3-3/8	.950	4	53426	HSV-RN-M-41000-R.250	
1	.250	1-1/4	6	4-1/8	.950	4	53441	HSV-RN-L-41000-R.250	

*.0005 max TIR

SPEEDS & FEEDS

4 Flute - Variable Pitch

HSV-4

4 Flute

HSV-4 / HSV-RN-4

Material Guide	Hardness	SFM	Inches per Tooth (IPT)																										
			1/16			1/8			3/16			1/4			3/8			1/2			3/4			1					
			Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin			
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB 75 - 98 HRB 21 - 36 HRC	455 445 400	.0004 .0003 .0002	.0006 .0005 .0003	.0008 .0007 .0006	.0007 .0005 .0003	.0012 .0009 .0006	.0016 .0014 .0011	.0010 .0008 .0005	.0018 .0013 .0009	.0019 .0016 .0010	.0014 .0018 .0010	.0024 .0018 .0010	.0021 .0018 .0010	.0020 .0015 .0010	.0036 .0026 .0021	.0024 .0022 .0020	.0027 .0024 .0020	.0047 .0034 .0022	.0028 .0024 .0019	.0038 .0028 .0018	.0067 .0049 .0032	.0034 .0029 .0023	.0049 .0036 .0023	.0086 .0063 .0041	.0041 .0035 .0028		
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	390 340 260	.0003 .0002 .0002	.0004 .0003 .0006	.0007 .0003 .0006	.0005 .0003 .0004	.0008 .0006 .0005	.0013 .0011 .0004	.0007 .0005 .0004	.0011 .0009 .0007	.0015 .0013 .0007	.0009 .0007 .0012	.0015 .0012 .0006	.0017 .0014 .0010	.0013 .0010 .0013	.0023 .0017 .0015	.0019 .0017 .0016	.0017 .0013 .0011	.0030 .0022 .0019	.0023 .0019 .0018	.0024 .0022 .0016	.0043 .0032 .0028	.0027 .0023 .0022	.0031 .0023 .0020	.0054 .0040 .0035	.0033 .0028 .0026		
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	340 250 145	.0003 .0002 .0002	.0004 .0003 .0003	.0007 .0006 .0005	.0005 .0004 .0003	.0008 .0006 .0005	.0013 .0012 .0010	.0007 .0005 .0004	.0011 .0009 .0004	.0015 .0013 .0007	.0009 .0007 .0012	.0015 .0012 .0005	.0017 .0015 .0010	.0013 .0010 .0013	.0023 .0018 .0008	.0019 .0017 .0015	.0017 .0013 .0010	.0030 .0024 .0020	.0023 .0020 .0019	.0024 .0022 .0015	.0043 .0034 .0027	.0027 .0024 .0021	.0031 .0025 .0019	.0054 .0043 .0034	.0033 .0029 .0026		
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB 75 - 98 HRB 21 - 36 HRC	290 255 175	.0003 .0002 .0002	.0005 .0004 .0003	.0008 .0006 .0006	.0006 .0004 .0004	.0010 .0007 .0012	.0015 .0012 .0005	.0009 .0006 .0005	.0015 .0010 .0009	.0017 .0014 .0008	.0011 .0008 .0013	.0020 .0014 .0007	.0019 .0016 .0012	.0017 .0012 .0008	.0030 .0021 .0018	.0022 .0021 .0017	.0022 .0021 .0024	.0039 .0027 .0024	.0026 .0022 .0020	.0032 .0022 .0020	.0056 .0038 .0034	.0031 .0025 .0024	.0040 .0028 .0025	.0071 .0049 .0044	.0037 .0031 .0028		
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-TMO, 316, 316L, 321, 347	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	265 225 180	.0002 .0002 .0002	.0004 .0004 .0006	.0007 .0006 .0006	.0004 .0004 .0006	.0008 .0007 .0011	.0013 .0012 .0005	.0006 .0006 .0008	.0011 .0010 .0008	.0015 .0014 .0012	.0009 .0008 .0006	.0015 .0014 .0011	.0017 .0016 .0009	.0013 .0011 .0009	.0022 .0020 .0016	.0019 .0018 .0016	.0017 .0015 .0012	.0029 .0026 .0021	.0022 .0021 .0019	.0024 .0022 .0017	.0042 .0038 .0030	.0026 .0025 .0023	.0030 .0027 .0022	.0053 .0048 .0038	.0032 .0030 .0027		
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB 21 - 36 HRC	300 280	.0003 .0002	.0004 .0004	.0007 .0006	.0005 .0004	.0008 .0007	.0013 .0012	.0007 .0006	.0011 .0010	.0015 .0014	.0009 .0008	.0016 .0013	.0017 .0016	.0013 .0011	.0023 .0020	.0019 .0018	.0017 .0015	.0030 .0026	.0023 .0021	.0024 .0021	.0043 .0037	.0027 .0025	.0031 .0027	.0055 .0047	.0033 .0030		
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC 36 - 50 HRC	200 145	.0002 .0002	.0003 .0003	.0006 .0006	.0003 .0005	.0006 .0011	.0011 .0004	.0005 .0007	.0008 .0007	.0012 .0012	.0006 .0006	.0011 .0010	.0014 .0014	.0010 .0008	.0017 .0014	.0016 .0015	.0012 .0011	.0022 .0019	.0019 .0018	.0016 .0016	.0031 .0027	.0023 .0021	.0023 .0020	.0040 .0035	.0028 .0026		
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB 21 - 36 HRC	410 370	.0004 .0002	.0007 .0004	.0009 .0006	.0007 .0004	.0013 .0007	.0017 .0012	.0011 .0006	.0019 .0010	.0019 .0014	.0014 .0008	.0025 .0013	.0021 .0016	.0021 .0011	.0037 .0020	.0025 .0018	.0027 .0015	.0048 .0026	.0029 .0021	.0039 .0021	.0069 .0038	.0034 .0025	.0050 .0027	.0088 .0048	.0042 .0031		
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB 21 - 36 HRC	345 335	.0003 .0002	.0004 .0004	.0007 .0006	.0005 .0004	.0008 .0007	.0013 .0012	.0007 .0006	.0012 .0010	.0015 .0014	.0009 .0008	.0016 .0014	.0017 .0016	.0013 .0011	.0023 .0020	.0019 .0018	.0017 .0015	.0031 .0026	.0023 .0021	.0025 .0021	.0044 .0038	.0027 .0025	.0032 .0027	.0056 .0048	.0033 .0031		
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	310 260 135	.0003 .0002 .0001	.0004 .0003 .0002	.0007 .0006 .0005	.0005 .0004 .0003	.0008 .0006 .0004	.0014 .0011 .0009	.0007 .0005 .0003	.0012 .0010 .0006	.0015 .0012 .0007	.0009 .0008 .0005	.0016 .0010 .0004	.0017 .0012 .0007	.0021 .0020 .0011	.0018 .0018 .0010	.0031 .0023 .0013	.0023 .0023 .0013	.0041 .0031 .0015	.0026 .0026 .0011	.0033 .0023 .0011	.0059 .0039 .0018	.0031 .0023 .0018	.0042 .0029 .0022	.0075 .0051 .0034	.0038 .0033 .0027		
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB 75 - 98 HRB	285 250	.0003 .0003	.0003 .0005	.0006 .0007	.0006 .0005	.0011 .0009	.0015 .0014	.0009 .0008	.0016 .0013	.0017 .0016	.0012 .0010	.0021 .0018	.0020 .0018	.0018 .0015	.0031 .0026	.0023 .0022	.0023 .0021	.0041 .0034	.0026 .0024	.0033 .0028	.0059 .0049	.0031 .0029	.0042 .0035	.0075 .0063	.0038 .0035		
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	80 75 70	.0002 .0002 .0002	.0003 .0003 .0005	.0006 .0006 .0003	.0003 .0005 .0003	.0005 .0011 .0010	.0011 .0004 .0004	.0005 .0004 .0007	.0008 .0008 .0011	.0012 .0012 .0005	.0006 .0006 .0009	.0011 .0010 .0013	.0014 .0014 .0007	.0009 .0009 .0007	.0016 .0015 .0013	.0016 .0011 .0010	.0012 .0010 .0017	.0021 .0020 .0017	.0019 .0018 .0014	.0017 .0016 .0014	.0030 .0029 .0025	.0023 .0022 .0020	.0022 .0021 .0018	.0038 .0036 .0031	.0027 .0025		
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB 75 - 98 HRB 21 - 36 HRC	300 275 250	.0004 .0004 .0003	.0008 .0006 .0005	.0009 .0009 .0007	.0008 .0007 .0005	.0015 .0012 .0009	.0018 .0017 .0014	.0013 .0010 .0008	.0022 .0018 .0014	.0020 .0019 .0016	.0017 .0014 .0010	.0029 .0024 .0018	.0023 .0021 .0018	.0025 .0021 .0015	.0043 .0036 .0027	.0027 .0024 .0021	.0032 .0027 .0020	.0057 .0047 .0036	.0031 .0028 .0025	.0046 .0039 .0031	.0081 .0068 .0051	.0037 .0034 .0029	.0059 .0049 .0037	.0103 .0087 .0065	.0045 .0041 .0036		
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC 36 - 50 HRC	180 160	.0002 .0002	.0004 .0004	.0007 .0006	.0004 .0004	.0007 .0007	.0013 .0012	.0006 .0006	.0011 .0010	.0014 .0014	.0008 .0007	.0014 .0013	.0016 .0016	.0012 .0011	.0021 .0020	.0019 .0018	.0016 .0015	.0028 .0026	.0022 .0021	.0023 .0021	.0040 .0037	.0026 .0025	.0029 .0026	.0051 .0047	.0031 .0030		
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	210 170 65	.0002 .0002 .0001	.0003 .0003 .0005	.0006 .0006 .0002	.0004 .0006 .0002	.0006 .0011 .0009	.0012 .0011 .0003	.0005 .0005 .0006	.0009 .0009 .0006	.0013 .0013 .0011	.0007 .0007 .0005	.0012 .0012 .0008	.0015 .0015 .0012	.0010 .0010 .0007	.0018 .0017 .0012	.0013 .0013 .0009	.0024 .0023 .0016	.0020 .0020 .0016	.0019 .0019 .0013	.0034 .0033 .0022	.0024 .0023 .0019	.0025 .0023 .0016	.0043 .0042 .0028	.0029 .0028 .0023			

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	75%-125% Diameter	100% Diameter
	≥ 35 HRC	60%-100% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	25%-35% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

For all diameters, please go to HelicalTool.com
 NOTES:
 Hardness Scales: HRB = Rockwell B
 HRC = Rockwell C
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

HEV-5

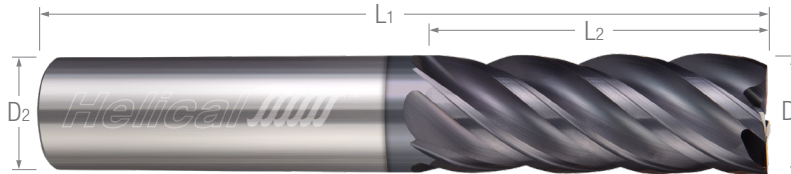


5 FLUTE - SQUARE

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 194 for *Tplus* coating



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	<i>Aplus</i> Coated + Weldon Flat	Tool Description
$D_1^{+0.000}$ $_{-0.002}$	D_2 (h6)	$L_2^{+0.032}$ $_{-0.000}$	$L_1^{+0.062}$ $_{-0.062}$				
1/8	1/8	1/4	1-1/2	5	44017		HEV-S-50125
	1/8	3/8	2	5	81701		HEV-SR-50125
	1/8	1/2	2-1/2	5	44032		HEV-R-50125
	1/8	5/8	2-1/2	5	81702		HEV-A-50125
	1/8	3/4	2-1/2	5	44047		HEV-M-50125
	1/8	7/8	2-1/2	5	82518		HEV-L-50125
	1/8	1	2-1/2	5	84626		HEV-LX-50125
5/32	3/16	3/16	2	5	81703		HEV-S-50156
	3/16	5/16	2	5	84627		HEV-SR-50156
	3/16	7/16	2-1/2	5	81704		HEV-R-50156
	3/16	9/16	2-1/2	5	81705		HEV-M-50156
	3/16	3/4	2-1/2	5	84628		HEV-ML-50156
3/16	3/16	5/16	2	5	44062		HEV-S-50187
	3/16	7/16	2	5	81706		HEV-SR-50187
	3/16	9/16	2-1/2	5	44077		HEV-R-50187
	3/16	3/4	2-1/2	5	44092		HEV-M-50187
	3/16	1	2-1/2	5	81707		HEV-ML-50187
	3/16	1-3/16	3	5	82519		HEV-L-50187
	3/16	1-3/8	3	5	84629		HEV-LX-50187
7/32	1/4	5/16	2	5	81708		HEV-S-50218
	1/4	7/16	2-1/2	5	81709		HEV-R-50218
	1/4	5/8	2-1/2	5	84630		HEV-M-50218
1/4	1/4	3/8	2	5	44107	44107W	HEV-S-50250
	1/4	3/8	4	5	82941		HEV-S-50250
	1/4	1/2	2-1/2	5	44122	44122W	HEV-SR-50250
	1/4	3/4	2-1/2	5	44137	44137W	HEV-R-50250
	1/4	3/4	4	5	82942		HEV-R-50250
	1/4	1	3	5	44152	44152W	HEV-M-50250
	1/4	1-1/4	3	5	44157	44157W	HEV-L-50250
	1/4	1-1/2	3	5	81710		HEV-LX-50250
9/32	5/16	3/4	2-1/2	5	81711		HEV-R-50281
	5/16	1	3	5	81712		HEV-M-50281

*.0005 max TIR

continued on next page



5 FLUTE - SQUARE

Variable Pitch (cont.)



HEV-5

continued from previous page

Cutter Diameter* D ₁ ^{+0.000"} / _{-0.002"}	Shank Diameter D ₂ (h6)	Length of Cut L ₂ ^{+0.032"} / _{-0.000"}	Overall Length L ₁ ^{+0.062"} / _{-0.062"}	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
5/16	5/16	7/16	2	5	44167	44167W	HEV-S-50312
	5/16	5/8	2-1/2	5	84631		HEV-SR-50312
	5/16	13/16	2-1/2	5	44182	44182W	HEV-R-50312
	5/16	1	3	5	44197	44197W	HEV-M-50312
	5/16	1-1/4	3	5	81713		HEV-L-50312
	5/16	1-9/16	4	5	82520		HEV-LX-50312
3/8	3/8	1/2	2	5	44212	44212W	HEV-S-50375
	3/8	1/2	4	5	82943		HEV-S-50375
	3/8	3/4	2-1/2	5	81714	81714W	HEV-SR-50375
	3/8	1	3	5	44227	44227W	HEV-R-50375
	3/8	1	6	5	82944		HEV-R-50375
	3/8	1-1/4	3	5	44242	44242W	HEV-M-50375
	3/8	1-1/2	3-1/2	5	44247	44247W	HEV-L-50375
	3/8	2	4	5	82521		HEV-LX-50375
1/2	1/2	5/8	2-1/2	5	44257	44257W	HEV-S-50500
	1/2	5/8	4	5	82945		HEV-S-50500
	1/2	1	3	5	44272	44272W	HEV-SR-50500
	1/2	1-1/4	3	5	44287	44287W	HEV-R-50500
	1/2	1-1/4	6	5	82946		HEV-R-50500
	1/2	1-5/8	4	5	44302	44302W	HEV-M-50500
	1/2	2	4	5	44307	44307W	HEV-L-50500
	1/2	2-1/2	5	5	81715	81715W	HEV-LX-50500
	1/2	3-1/8	6	5	82522		HEV-X-50500
5/8	5/8	3/4	3	5	44317	44317W	HEV-S-50625
	5/8	1-1/4	3-1/2	5	44322	44322W	HEV-SR-50625
	5/8	1-5/8	3-1/2	5	44332	44332W	HEV-R-50625
	5/8	2-1/8	4	5	44347	44347W	HEV-M-50625
	5/8	2-1/2	5	5	44352	44352W	HEV-L-50625
	5/8	3-1/4	6	5	82524		HEV-LX-50625
3/4	3/4	1	3	5	44362	44362W	HEV-S-50750
	3/4	1	6	5	82947		HEV-S-50750
	3/4	1-1/4	4	5	81716		HEV-SR-50750
	3/4	1-5/8	4	5	44377	44377W	HEV-R-50750
	3/4	1-5/8	6	5	82948		HEV-R-50750
	3/4	2-1/4	5	5	44392	44392W	HEV-M-50750
	3/4	2-3/4	5	5	44397	44397W	HEV-L-50750
	3/4	3-1/4	6	5	44402	44402W	HEV-LX-50750
1	1	1-1/4	4	5	44407		HEV-S-51000
	1	2	4-1/2	5	44422	44422W	HEV-R-51000
	1	2-5/8	5	5	44437	44437W	HEV-M-51000
	1	3-1/4	6	5	44442	44442W	HEV-L-51000
	1	4-1/4	7	5	44447	44447W	HEV-X-51000
1-1/4	1-1/4	2	4-1/2	5	44467		HEV-R-51250
	1-1/4	2-5/8	5-1/2	5	44482		HEV-M-51250
	1-1/4	3-1/4	6	5	44497		HEV-L-51250
	1-1/4	4-1/2	7	5	44512		HEV-LX-51250

*.0005 max TIR

MHEV-5

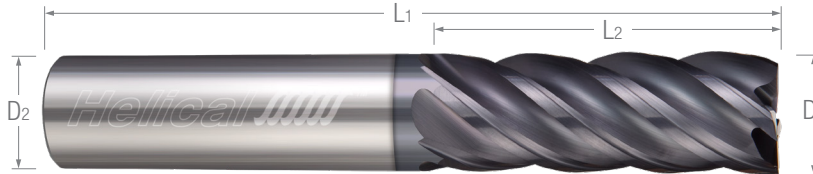
METRIC



5 FLUTE - SQUARE - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
$D1^{+0.00}_{-0.05}$ mm	$D2$ (h6)	$L2^{+0.80}_{-0.00}$ mm	$L1^{+1.6}_{-1.6}$ mm			
6 mm	6.00 mm	9.00 mm	63 mm	5	59516	MHEV-015-50600
	6.00 mm	12.00 mm	63 mm	5	59534	MHEV-020-50600
	6.00 mm	18.00 mm	63 mm	5	59568	MHEV-030-50600
8 mm	8.00 mm	12.00 mm	63 mm	5	59519	MHEV-015-50800
	8.00 mm	16.00 mm	63 mm	5	59537	MHEV-020-50800
	8.00 mm	24.00 mm	75 mm	5	59571	MHEV-030-50800
10 mm	10.00 mm	15.00 mm	63 mm	5	59522	MHEV-015-51000
	10.00 mm	20.00 mm	63 mm	5	59540	MHEV-020-51000
	10.00 mm	25.00 mm	75 mm	5	59554	MHEV-025-51000
12 mm	12.00 mm	18.00 mm	75 mm	5	59525	MHEV-015-51200
	12.00 mm	24.00 mm	75 mm	5	59543	MHEV-020-51200
	12.00 mm	30.00 mm	75 mm	5	59557	MHEV-025-51200
16 mm	16.00 mm	24.00 mm	89 mm	5	59528	MHEV-015-51600
	16.00 mm	32.00 mm	89 mm	5	59546	MHEV-020-51600
	16.00 mm	40.00 mm	89 mm	5	59560	MHEV-025-51600
20 mm	20.00 mm	30.00 mm	89 mm	5	59531	MHEV-015-52000
	20.00 mm	40.00 mm	100 mm	5	59549	MHEV-020-52000
	20.00 mm	50.00 mm	125 mm	5	59563	MHEV-025-52000
25 mm	25.00 mm	50.00 mm	125 mm	5	59552	MHEV-020-52500
	25.00 mm	64.00 mm	125 mm	5	59566	MHEV-025-52500

* .013 mm max TIR



5 FLUTE - CORNER RADIUS

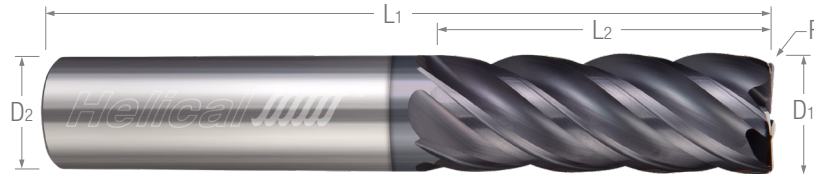
Variable Pitch



HEV-5

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 196 for *Tplus* coating



Cutter Dia.* D1 ^{+0.001"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	LOC L2 ^{+0.032"} / _{-.000"}	OAL L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Aplus</i> Coated	<i>Aplus</i> Coated + Weldon Flat	Tool Description
1/8	1/8	.010	1/4	1-1/2	5	34017		HEV-S-50125-R.010
	1/8	.010	3/8	2	5	81718		HEV-SR-50125-R.010
	1/8	.010	1/2	2-1/2	5	34032		HEV-R-50125-R.010
	1/8	.010	5/8	2-1/2	5	81719		HEV-A-50125-R.010
	1/8	.010	3/4	2-1/2	5	34047		HEV-M-50125-R.010
	1/8	.010	7/8	2-1/2	5	84636		HEV-L-50125-R.010
	1/8	.015	1/4	1-1/2	5	81720		HEV-S-50125-R.015
	1/8	.015	3/8	2	5	82530		HEV-SR-50125-R.015
	1/8	.015	1/2	2-1/2	5	81721		HEV-R-50125-R.015
	1/8	.015	5/8	2-1/2	5	84637		HEV-A-50125-R.015
	1/8	.020	1/4	1-1/2	5	84638		HEV-S-50125-R.020
	1/8	.020	3/8	2	5	84639		HEV-SR-50125-R.020
	1/8	.020	1/2	2-1/2	5	84640		HEV-R-50125-R.020
	1/8	.030	1/4	1-1/2	5	45017		HEV-S-50125-R.030
	1/8	.030	3/8	2	5	82531		HEV-SR-50125-R.030
	1/8	.030	1/2	2-1/2	5	45032		HEV-R-50125-R.030
5/32	3/16	.010	3/16	2	5	81722		HEV-S-50156-R.010
	3/16	.010	5/16	2	5	84642		HEV-SR-50156-R.010
	3/16	.010	7/16	2-1/2	5	81723		HEV-R-50156-R.010
	3/16	.010	9/16	2-1/2	5	81724		HEV-M-50156-R.010
	3/16	.010	3/4	2-1/2	5	84643		HEV-ML-50156-R.010
3/16	3/16	.010	5/16	2	5	34062		HEV-S-50187-R.010
	3/16	.010	7/16	2	5	81725		HEV-SR-50187-R.010
	3/16	.010	9/16	2-1/2	5	34077		HEV-R-50187-R.010
	3/16	.010	3/4	2-1/2	5	34092		HEV-M-50187-R.010
	3/16	.010	1	2-1/2	5	81726		HEV-ML-50187-R.010
	3/16	.010	1-3/16	3	5	84644		HEV-L-50187-R.010
	3/16	.015	5/16	2	5	81727		HEV-S-50187-R.015
	3/16	.015	7/16	2	5	82533		HEV-SR-50187-R.015
	3/16	.015	9/16	2-1/2	5	81728		HEV-R-50187-R.015
	3/16	.015	3/4	2-1/2	5	82534		HEV-M-50187-R.015
	3/16	.015	1	2-1/2	5	82535		HEV-ML-50187-R.015
	3/16	.020	5/16	2	5	84645		HEV-S-50187-R.020

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5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

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Cutter Dia.* D1 $^{+0.000}$ $_{-0.002}$ "	Shank Dia. D2 (h6)	Corner Radius R $^{+0.002}$ $_{-0.002}$ "	LOC L2 $^{+0.032}$ $_{-0.000}$ "	OAL L1 $^{+0.062}$ $_{-0.062}$ "	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description	
3/16	3/16	.020	7/16	2	5	84646		HEV-SR-50187-R.020	
	3/16	.020	9/16	2-1/2	5	84647		HEV-R-50187-R.020	
	3/16	.030	5/16	2	5	45062		HEV-S-50187-R.030	
	3/16	.030	7/16	2	5	81729		HEV-SR-50187-R.030	
	3/16	.030	9/16	2-1/2	5	45077		HEV-R-50187-R.030	
	3/16	.030	3/4	2-1/2	5	45092		HEV-M-50187-R.030	
	3/16	.030	1	2-1/2	5	82536		HEV-ML-50187-R.030	
	3/16	.030	1-3/16	3	5	84648		HEV-L-50187-R.030	
7/32	1/4	.010	5/16	2	5	81730		HEV-S-50218-R.010	
	1/4	.010	7/16	2-1/2	5	81731		HEV-R-50218-R.010	
1/4	1/4	.010	3/8	2	5	81732		HEV-S-50250-R.010	
	1/4	.010	1/2	2-1/2	5	81733		HEV-SR-50250-R.010	
	1/4	.010	3/4	2-1/2	5	81734		HEV-R-50250-R.010	
	1/4	.010	1	3	5	82537		HEV-M-50250-R.010	
	1/4	.010	1-1/4	3	5	82538		HEV-L-50250-R.010	
	1/4	.015	3/8	2	5	81735		HEV-S-50250-R.015	
	1/4	.015	1/2	2-1/2	5	81736		HEV-SR-50250-R.015	
	1/4	.015	3/4	2-1/2	5	81737		HEV-R-50250-R.015	
	1/4	.015	1	3	5	82539		HEV-M-50250-R.015	
	1/4	.015	1-1/4	3	5	82540		HEV-L-50250-R.015	
	1/4	.020	3/8	2	5	34107	34107W	HEV-S-50250-R.020	
	1/4	.020	3/8	4	5	82958		HEV-S-50250-R.020	
	1/4	.020	1/2	2-1/2	5	34122	34122W	HEV-SR-50250-R.020	
	1/4	.020	3/4	2-1/2	5	34137	34137W	HEV-R-50250-R.020	
	1/4	.020	3/4	4	5	82959		HEV-R-50250-R.020	
	1/4	.020	1	3	5	34152	34152W	HEV-M-50250-R.020	
	1/4	.020	1-1/4	3	5	34157		HEV-L-50250-R.020	
	1/4	.020	1-1/2	3	5	82541		HEV-LX-50250-R.020	
	1/4	.030	3/8	2	5	45107	45107W	HEV-S-50250-R.030	
	1/4	.030	1/2	2-1/2	5	45122	45122W	HEV-SR-50250-R.030	
	1/4	.030	3/4	2-1/2	5	45137	45137W	HEV-R-50250-R.030	
	1/4	.030	1	3	5	45152	45152W	HEV-M-50250-R.030	
	1/4	.030	1-1/4	3	5	45157		HEV-L-50250-R.030	
	1/4	.030	1-1/2	3	5	82542		HEV-LX-50250-R.030	
	1/4	.060	3/8	2	5	45108	45108W	HEV-S-50250-R.060	
	1/4	.060	1/2	2-1/2	5	45123	45123W	HEV-SR-50250-R.060	
	1/4	.060	3/4	2-1/2	5	45138	45138W	HEV-R-50250-R.060	
	1/4	.060	1	3	5	45153	45153W	HEV-M-50250-R.060	
	1/4	.060	1-1/4	3	5	45158		HEV-L-50250-R.060	
	1/4	.060	1-1/2	3	5	82543		HEV-LX-50250-R.060	
	9/32	5/16	.020	7/16	2	5	81738		HEV-S-50281-R.020
		5/16	.020	3/4	2-1/2	5	81739		HEV-R-50281-R.020
5/16		.020	1	3	5	81740		HEV-M-50281-R.020	
5/16	5/16	.010	7/16	2	5	81741		HEV-S-50312-R.010	
	5/16	.010	13/16	2-1/2	5	81742		HEV-R-50312-R.010	
	5/16	.010	1	3	5	84649		HEV-M-50312-R.010	
	5/16	.015	7/16	2	5	84650		HEV-S-50312-R.015	
	5/16	.015	13/16	2-1/2	5	84651		HEV-R-50312-R.015	
	5/16	.015	1	3	5	84652		HEV-M-50312-R.015	
	5/16	.020	7/16	2	5	34167	34167W	HEV-S-50312-R.020	
	5/16	.020	5/8	2-1/2	5	84653		HEV-SR-50312-R.020	

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5 FLUTE - CORNER RADIUS



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Variable Pitch (cont.)

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Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	LOC L2 ^{+0.032"} / _{-.000"}	OAL L1 ^{+0.062"} / _{-.062"}	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
5/16	5/16	.020	13/16	2-1/2	5	34182	34182W	HEV-R-50312-R.020
	5/16	.020	1	3	5	34197	34197W	HEV-M-50312-R.020
	5/16	.020	1-1/4	3	5	81743		HEV-L-50312-R.020
	5/16	.020	1-9/16	4	5	82544		HEV-LX-50312-R.020
	5/16	.030	7/16	2	5	45167	45167W	HEV-S-50312-R.030
	5/16	.030	5/8	2-1/2	5	84654		HEV-SR-50312-R.030
	5/16	.030	13/16	2-1/2	5	45182	45182W	HEV-R-50312-R.030
	5/16	.030	1	3	5	45197	45197W	HEV-M-50312-R.030
	5/16	.030	1-1/4	3	5	82545		HEV-L-50312-R.030
	5/16	.060	7/16	2	5	45168		HEV-S-50312-R.060
	5/16	.060	13/16	2-1/2	5	45183		HEV-R-50312-R.060
5/16	.060	1	3	5	45198		HEV-M-50312-R.060	
3/8	3/8	.010	1/2	2	5	81744		HEV-S-50375-R.010
	3/8	.010	3/4	2-1/2	5	82546		HEV-SR-50375-R.010
	3/8	.010	1	3	5	81745		HEV-R-50375-R.010
	3/8	.010	1-1/4	3	5	81746		HEV-M-50375-R.010
	3/8	.010	1-1/2	3-1/2	5	81747		HEV-L-50375-R.010
	3/8	.015	1/2	2	5	81748		HEV-S-50375-R.015
	3/8	.015	3/4	2-1/2	5	82547		HEV-SR-50375-R.015
	3/8	.015	1	3	5	81749		HEV-R-50375-R.015
	3/8	.015	1-1/4	3	5	82548		HEV-M-50375-R.015
	3/8	.020	1/2	2	5	34212	34212W	HEV-S-50375-R.020
	3/8	.020	1/2	4	5	82960		HEV-S-50375-R.020
	3/8	.020	3/4	2-1/2	5	81750		HEV-SR-50375-R.020
	3/8	.020	1	3	5	34227	34227W	HEV-R-50375-R.020
	3/8	.020	1	6	5	82961		HEV-R-50375-R.020
	3/8	.020	1-1/4	3	5	34242	34242W	HEV-M-50375-R.020
	3/8	.020	1-1/2	3-1/2	5	34247		HEV-L-50375-R.020
	3/8	.020	2	4	5	84655		HEV-LX-50375-R.020
	3/8	.030	1/2	2	5	45212	45212W	HEV-S-50375-R.030
	3/8	.030	3/4	2-1/2	5	81751		HEV-SR-50375-R.030
	3/8	.030	1	3	5	45227	45227W	HEV-R-50375-R.030
	3/8	.030	1-1/4	3	5	45242	45242W	HEV-M-50375-R.030
	3/8	.030	1-1/2	3-1/2	5	45247	45247W	HEV-L-50375-R.030
	3/8	.030	2	4	5	84656		HEV-LX-50375-R.030
	3/8	.060	1/2	2	5	45213	45213W	HEV-S-50375-R.060
	3/8	.060	3/4	2-1/2	5	81752		HEV-SR-50375-R.060
	3/8	.060	1	3	5	45228	45228W	HEV-R-50375-R.060
	3/8	.060	1-1/4	3	5	45243	45243W	HEV-M-50375-R.060
	3/8	.060	1-1/2	3-1/2	5	45248		HEV-L-50375-R.060
	3/8	.060	2	4	5	84657		HEV-LX-50375-R.060
	3/8	.090	1/2	2	5	45214		HEV-S-50375-R.090
	3/8	.090	3/4	2-1/2	5	84658		HEV-SR-50375-R.090
	3/8	.090	1	3	5	45229		HEV-R-50375-R.090
	3/8	.090	1-1/4	3	5	45244		HEV-M-50375-R.090
	3/8	.090	1-1/2	3-1/2	5	45249		HEV-L-50375-R.090
	3/8	.125	1/2	2	5	82549		HEV-S-50375-R.125
	3/8	.125	3/4	2-1/2	5	84659		HEV-SR-50375-R.125
3/8	.125	1	3	5	82550		HEV-R-50375-R.125	
3/8	.125	1-1/4	3	5	82551		HEV-M-50375-R.125	
3/8	.125	1-1/2	3-1/2	5	84660		HEV-L-50375-R.125	

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5 Flute

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5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

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Cutter Dia.* D1 $^{+.000}$ $_{-.002}$ "	Shank Dia. D2 (h6)	Corner Radius R $^{+.002}$ $_{-.002}$ "	LOC L2 $^{+.032}$ $_{-.000}$ "	OAL L1 $^{+.062}$ $_{-.062}$ "	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
1/2	1/2	.010	5/8	2-1/2	5	81753	81753W	HEV-S-50500-R.010
	1/2	.010	1	3	5	81754	81754W	HEV-SR-50500-R.010
	1/2	.010	1-1/4	3	5	81755	81755W	HEV-R-50500-R.010
	1/2	.010	1-5/8	4	5	81756		HEV-M-50500-R.010
	1/2	.010	2	4	5	81757		HEV-L-50500-R.010
	1/2	.010	2-1/2	5	5	84661		HEV-LX-50500-R.010
	1/2	.015	5/8	2-1/2	5	81758	81758W	HEV-S-50500-R.015
	1/2	.015	1	3	5	81759	81759W	HEV-SR-50500-R.015
	1/2	.015	1-1/4	3	5	81760	81760W	HEV-R-50500-R.015
	1/2	.015	1-5/8	4	5	82552		HEV-M-50500-R.015
	1/2	.015	2	4	5	82553		HEV-L-50500-R.015
	1/2	.020	5/8	2-1/2	5	81761	81761W	HEV-S-50500-R.020
	1/2	.020	1	3	5	81762	81762W	HEV-SR-50500-R.020
	1/2	.020	1-1/4	3	5	81763	81763W	HEV-R-50500-R.020
	1/2	.020	1-5/8	4	5	82554		HEV-M-50500-R.020
	1/2	.020	2	4	5	82555		HEV-L-50500-R.020
	1/2	.030	5/8	2-1/2	5	34257	34257W	HEV-S-50500-R.030
	1/2	.030	5/8	4	5	82962		HEV-S-50500-R.030
	1/2	.030	1	3	5	34272	34272W	HEV-SR-50500-R.030
	1/2	.030	1-1/4	3	5	34287	34287W	HEV-R-50500-R.030
	1/2	.030	1-1/4	6	5	82963		HEV-R-50500-R.030
	1/2	.030	1-5/8	4	5	34302	34302W	HEV-M-50500-R.030
	1/2	.030	2	4	5	34307	34307W	HEV-L-50500-R.030
	1/2	.030	2-1/2	5	5	81764		HEV-LX-50500-R.030
	1/2	.030	3-1/8	6	5	82556		HEV-X-50500-R.030
	1/2	.030	3-5/8	6	5	82557		HEV-Y-50500-R.030
	1/2	.060	5/8	2-1/2	5	45257	45257W	HEV-S-50500-R.060
	1/2	.060	5/8	4	5	82964		HEV-S-50500-R.060
	1/2	.060	1	3	5	45272	45272W	HEV-SR-50500-R.060
	1/2	.060	1-1/4	3	5	45287	45287W	HEV-R-50500-R.060
	1/2	.060	1-1/4	6	5	82965		HEV-R-50500-R.060
	1/2	.060	1-5/8	4	5	45302	45302W	HEV-M-50500-R.060
	1/2	.060	2	4	5	45307	45307W	HEV-L-50500-R.060
	1/2	.060	2-1/2	5	5	81765		HEV-LX-50500-R.060
	1/2	.090	5/8	2-1/2	5	45258	45258W	HEV-S-50500-R.090
	1/2	.090	1	3	5	45273	45273W	HEV-SR-50500-R.090
	1/2	.090	1-1/4	3	5	45288	45288W	HEV-R-50500-R.090
	1/2	.090	1-5/8	4	5	45303		HEV-M-50500-R.090
	1/2	.090	2	4	5	45308		HEV-L-50500-R.090
	1/2	.090	2-1/2	5	5	82558		HEV-LX-50500-R.090
1/2	.120	5/8	2-1/2	5	45259	45259W	HEV-S-50500-R.120	
1/2	.120	1	3	5	45274	45274W	HEV-SR-50500-R.120	
1/2	.120	1-1/4	3	5	45289	45289W	HEV-R-50500-R.120	
1/2	.120	1-5/8	4	5	45304	45304W	HEV-M-50500-R.120	
1/2	.120	2	4	5	45309	45309W	HEV-L-50500-R.120	
1/2	.120	2-1/2	5	5	82559		HEV-LX-50500-R.120	
1/2	.125	5/8	2-1/2	5	81766		HEV-S-50500-R.125	
1/2	.125	1	3	5	81767		HEV-SR-50500-R.125	
1/2	.125	1-1/4	3	5	81768		HEV-R-50500-R.125	
1/2	.125	1-5/8	4	5	82560		HEV-M-50500-R.125	

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5 FLUTE - CORNER RADIUS



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Variable Pitch (cont.)

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Cutter Dia.* D ₁ ^{+0.001"} / _{-0.002"}	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	LOC L ₂ ^{+0.032"} / _{-0.000"}	OAL L ₁ ^{+0.062"} / _{-0.062"}	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
5/8	5/8	.015	1-1/4	3-1/2	5	84662		HEV-SR-50625-R.015
	5/8	.015	1-5/8	3-1/2	5	84663		HEV-R-50625-R.015
	5/8	.015	2-1/8	4	5	84664		HEV-M-50625-R.015
	5/8	.030	3/4	3	5	34317		HEV-S-50625-R.030
	5/8	.030	1-1/4	3-1/2	5	34322	34322W	HEV-SR-50625-R.030
	5/8	.030	1-5/8	3-1/2	5	34332	34332W	HEV-R-50625-R.030
	5/8	.030	2-1/8	4	5	34347	34347W	HEV-M-50625-R.030
	5/8	.030	2-1/2	5	5	34352		HEV-L-50625-R.030
	5/8	.030	3-1/4	6	5	82561		HEV-LX-50625-R.030
	5/8	.060	3/4	3	5	45317		HEV-S-50625-R.060
	5/8	.060	1-1/4	3-1/2	5	45322		HEV-SR-50625-R.060
	5/8	.060	1-5/8	3-1/2	5	45332		HEV-R-50625-R.060
	5/8	.060	2-1/8	4	5	45347		HEV-M-50625-R.060
	5/8	.060	2-1/2	5	5	45352		HEV-L-50625-R.060
	5/8	.090	3/4	3	5	45318		HEV-S-50625-R.090
	5/8	.090	1-1/4	3-1/2	5	45323		HEV-SR-50625-R.090
	5/8	.090	1-5/8	3-1/2	5	45333		HEV-R-50625-R.090
	5/8	.090	2-1/8	4	5	45348		HEV-M-50625-R.090
	5/8	.090	2-1/2	5	5	45353		HEV-L-50625-R.090
	5/8	.120	3/4	3	5	45319		HEV-S-50625-R.120
5/8	.120	1-1/4	3-1/2	5	45324		HEV-SR-50625-R.120	
5/8	.120	1-5/8	3-1/2	5	45334		HEV-R-50625-R.120	
5/8	.120	2-1/8	4	5	45349		HEV-M-50625-R.120	
5/8	.120	2-1/2	5	5	45354		HEV-L-50625-R.120	
5/8	.120	3-1/4	6	5	82562		HEV-LX-50625-R.120	
3/4	3/4	.010	1	3	5	81769		HEV-S-50750-R.010
	3/4	.010	1-5/8	4	5	81770		HEV-R-50750-R.010
	3/4	.010	2-1/4	5	5	81771		HEV-M-50750-R.010
	3/4	.015	1	3	5	81772		HEV-S-50750-R.015
	3/4	.015	1-5/8	4	5	81773		HEV-R-50750-R.015
	3/4	.015	2-1/4	5	5	81774		HEV-M-50750-R.015
	3/4	.020	1	3	5	81775		HEV-S-50750-R.020
	3/4	.020	1-5/8	4	5	81776		HEV-R-50750-R.020
	3/4	.020	2-1/4	5	5	81777		HEV-M-50750-R.020
	3/4	.030	1	3	5	34362	34362W	HEV-S-50750-R.030
	3/4	.030	1	6	5	82966		HEV-S-50750-R.030
	3/4	.030	1-1/4	4	5	81778	81778W	HEV-SR-50750-R.030
	3/4	.030	1-5/8	4	5	34377	34377W	HEV-R-50750-R.030
	3/4	.030	1-5/8	6	5	82967		HEV-R-50750-R.030
	3/4	.030	2-1/4	5	5	34392	34392W	HEV-M-50750-R.030
	3/4	.030	2-3/4	5	5	34397	34397W	HEV-L-50750-R.030
	3/4	.030	3-1/4	6	5	34402	34402W	HEV-LX-50750-R.030
	3/4	.030	4	6-1/2	5	82563		HEV-X-50750-R.030
	3/4	.060	1	3	5	45362	45362W	HEV-S-50750-R.060
	3/4	.060	1	6	5	82968		HEV-S-50750-R.060
3/4	.060	1-1/4	4	5	81779		HEV-SR-50750-R.060	
3/4	.060	1-5/8	4	5	45377	45377W	HEV-R-50750-R.060	
3/4	.060	1-5/8	6	5	82969		HEV-R-50750-R.060	
3/4	.060	2-1/4	5	5	45392	45392W	HEV-M-50750-R.060	
3/4	.060	2-3/4	5	5	45397		HEV-L-50750-R.060	
3/4	.060	3-1/4	6	5	45402		HEV-LX-50750-R.060	
3/4	.060	4	6-1/2	5	82564		HEV-X-50750-R.060	

*.0005 max TIR

continued on next page

5 Flute

HEV-5



5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Dia.* D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Dia. D2 (h6)	Corner Radius R $\begin{smallmatrix} +.032'' \\ -.002'' \end{smallmatrix}$	LOC L2 $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	OAL L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
3/4	3/4	.090	1	3	5	45363		HEV-S-50750-R.090
	3/4	.090	1-1/4	4	5	84665		HEV-SR-50750-R.090
	3/4	.090	1-5/8	4	5	45378	45378W	HEV-R-50750-R.090
	3/4	.090	2-1/4	5	5	45393		HEV-M-50750-R.090
	3/4	.090	2-3/4	5	5	45398		HEV-L-50750-R.090
	3/4	.090	3-1/4	6	5	45403		HEV-LX-50750-R.090
	3/4	.120	1	3	5	45364		HEV-S-50750-R.120
	3/4	.120	1-1/4	4	5	81780		HEV-SR-50750-R.120
	3/4	.120	1-5/8	4	5	45379	45379W	HEV-R-50750-R.120
	3/4	.120	2-1/4	5	5	45394	45394W	HEV-M-50750-R.120
	3/4	.120	2-3/4	5	5	45399		HEV-L-50750-R.120
	3/4	.120	3-1/4	6	5	45404		HEV-LX-50750-R.120
	3/4	.190	1	3	5	45365		HEV-S-50750-R.190
	3/4	.190	1-1/4	4	5	84666		HEV-SR-50750-R.190
	3/4	.190	1-5/8	4	5	45380	45380W	HEV-R-50750-R.190
	3/4	.190	2-1/4	5	5	45395		HEV-M-50750-R.190
	3/4	.190	2-3/4	5	5	45400		HEV-L-50750-R.190
	3/4	.190	3-1/4	6	5	45405		HEV-LX-50750-R.190
	3/4	.250	1	3	5	45366		HEV-S-50750-R.250
	3/4	.250	1-1/4	4	5	84667		HEV-SR-50750-R.250
3/4	.250	1-5/8	4	5	45381	45381W	HEV-R-50750-R.250	
3/4	.250	2-1/4	5	5	45396		HEV-M-50750-R.250	
3/4	.250	2-3/4	5	5	45401	45401W	HEV-L-50750-R.250	
3/4	.250	3-1/4	6	5	45406		HEV-LX-50750-R.250	
1	1	.030	1-1/4	4	5	34407	34407W	HEV-S-51000-R.030
	1	.030	2	4-1/2	5	34422	34422W	HEV-R-51000-R.030
	1	.030	2-5/8	5	5	34437	34437W	HEV-M-51000-R.030
	1	.030	3-1/4	6	5	34442	34442W	HEV-L-51000-R.030
	1	.030	4-1/4	7	5	34447	34447W	HEV-X-51000-R.030
	1	.030	5-1/4	9	5	84668		HEV-Y-51000-R.030
	1	.060	1-1/4	4	5	45407		HEV-S-51000-R.060
	1	.060	2	4-1/2	5	45422		HEV-R-51000-R.060
	1	.060	2-5/8	5	5	45437		HEV-M-51000-R.060
	1	.060	3-1/4	6	5	45442		HEV-L-51000-R.060
	1	.060	4-1/4	7	5	45447		HEV-X-51000-R.060
	1	.090	1-1/4	4	5	45408		HEV-S-51000-R.090
	1	.090	2	4-1/2	5	45423		HEV-R-51000-R.090
	1	.090	2-5/8	5	5	45438		HEV-M-51000-R.090
	1	.120	1-1/4	4	5	45409		HEV-S-51000-R.120
	1	.120	2	4-1/2	5	45424		HEV-R-51000-R.120
	1	.120	2-5/8	5	5	45439		HEV-M-51000-R.120
	1	.120	3-1/4	6	5	45444		HEV-L-51000-R.120
	1	.120	4-1/4	7	5	45449		HEV-X-51000-R.120
	1	.190	2	4-1/2	5	45425		HEV-R-51000-R.190
1	.190	3-1/4	6	5	45445		HEV-L-51000-R.190	
1	.190	4-1/4	7	5	45450		HEV-X-51000-R.190	
1	.250	1-1/4	4	5	45411		HEV-S-51000-R.250	
1	.250	2	4-1/2	5	45426		HEV-R-51000-R.250	
1	.250	2-5/8	5	5	45441		HEV-M-51000-R.250	
1	.250	3-1/4	6	5	45446		HEV-L-51000-R.250	
1	.250	4-1/4	7	5	45451		HEV-X-51000-R.250	
1-1/4	1-1/4	.060	2	4-1/2	5	34467		HEV-R-51250-R.060
	1-1/4	.060	2-5/8	5-1/2	5	34482		HEV-M-51250-R.060
	1-1/4	.060	3-1/4	6	5	34497		HEV-L-51250-R.060
	1-1/4	.060	4-1/2	7	5	34512		HEV-LX-51250-R.060

*.0005 max TIR

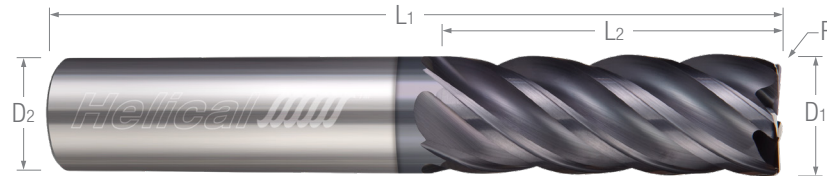
5 FLUTE - CORNER RADIUS - METRIC



MHEV-5 METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.00 mm} / _{-.05 mm}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.05 mm} / _{-.05 mm}	Length of Cut L2 ^{+0.80 mm} / _{-.00 mm}	Overall Length L1 ^{+1.60 mm} / _{-1.60 mm}	Flutes	<i>Aplus</i> Coated	Tool Description	
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	5	59517	MHEV-015-50600-R0.50	
	6.00 mm	.50 mm	12.00 mm	63 mm	5	59535	MHEV-020-50600-R0.50	
	6.00 mm	.50 mm	18.00 mm	63 mm	5	59569	MHEV-030-50600-R0.50	
	6.00 mm	1.00 mm	9.00 mm	63 mm	5	59518	MHEV-015-50600-R1.00	
	6.00 mm	1.00 mm	12.00 mm	63 mm	5	59536	MHEV-020-50600-R1.00	
	6.00 mm	1.00 mm	18.00 mm	63 mm	5	59570	MHEV-030-50600-R1.00	
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	5	59520	MHEV-015-50800-R0.50	
	8.00 mm	.50 mm	16.00 mm	63 mm	5	59538	MHEV-020-50800-R0.50	
	8.00 mm	.50 mm	24.00 mm	75 mm	5	59572	MHEV-030-50800-R0.50	
	8.00 mm	1.00 mm	12.00 mm	63 mm	5	59521	MHEV-015-50800-R1.00	
	8.00 mm	1.00 mm	16.00 mm	63 mm	5	59539	MHEV-020-50800-R1.00	
	8.00 mm	1.00 mm	24.00 mm	75 mm	5	59573	MHEV-030-50800-R1.00	
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	5	59523	MHEV-015-51000-R0.50	
	10.00 mm	.50 mm	20.00 mm	63 mm	5	59541	MHEV-020-51000-R0.50	
	10.00 mm	.50 mm	25.00 mm	75 mm	5	59555	MHEV-025-51000-R0.50	
	10.00 mm	1.00 mm	15.00 mm	63 mm	5	59524	MHEV-015-51000-R1.00	
	10.00 mm	1.00 mm	20.00 mm	63 mm	5	59542	MHEV-020-51000-R1.00	
	10.00 mm	1.00 mm	25.00 mm	75 mm	5	59556	MHEV-025-51000-R1.00	
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	5	59526	MHEV-015-51200-R0.50	
	12.00 mm	.50 mm	24.00 mm	75 mm	5	59544	MHEV-020-51200-R0.50	
	12.00 mm	.50 mm	30.00 mm	75 mm	5	59558	MHEV-025-51200-R0.50	
	12.00 mm	1.00 mm	18.00 mm	75 mm	5	59527	MHEV-015-51200-R1.00	
	12.00 mm	1.00 mm	24.00 mm	75 mm	5	59545	MHEV-020-51200-R1.00	
	12.00 mm	1.00 mm	30.00 mm	75 mm	5	59559	MHEV-025-51200-R1.00	
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	5	59529	MHEV-015-51600-R0.50	
	16.00 mm	.50 mm	32.00 mm	89 mm	5	59547	MHEV-020-51600-R0.50	
	16.00 mm	.50 mm	40.00 mm	89 mm	5	59561	MHEV-025-51600-R0.50	
	16.00 mm	1.00 mm	24.00 mm	89 mm	5	59530	MHEV-015-51600-R1.00	
	16.00 mm	1.00 mm	32.00 mm	89 mm	5	59548	MHEV-020-51600-R1.00	
	16.00 mm	1.00 mm	40.00 mm	89 mm	5	59562	MHEV-025-51600-R1.00	
	20.00 mm	.50 mm	30.00 mm	89 mm	5	59532	MHEV-015-52000-R0.50	
	20.00 mm	.50 mm	40.00 mm	100 mm	5	59550	MHEV-020-52000-R0.50	
	20.00 mm	.50 mm	50.00 mm	125 mm	5	59564	MHEV-025-52000-R0.50	
	20.00 mm	1.00 mm	30.00 mm	89 mm	5	59533	MHEV-015-52000-R1.00	
20 mm	20.00 mm	1.00 mm	40.00 mm	100 mm	5	59551	MHEV-020-52000-R1.00	
	20.00 mm	1.00 mm	50.00 mm	125 mm	5	59565	MHEV-025-52000-R1.00	
	25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	5	59553	MHEV-020-52500-R1.00
		25.00 mm	1.00 mm	64.00 mm	125 mm	5	59567	MHEV-025-52500-R1.00

*.013 mm max TIR

HEV-RN-5



New Items!

5 FLUTE - SQUARE

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Longer lengths of cut available for excellent performance in deep pocket High Efficiency Milling (HEM) applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 201 for *Tplus* coating



Cutter Dia.* D1 $^{+.0001}$ $_{-.002}$	Shank Dia. D2 (h6)	Length of Cut L2 $^{+.032}$ $_{-.000}$	Overall Length L1 $^{+.062}$ $_{-.062}$	Reach (LBS) L3	Neck Diameter	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	5/32	2	3/8	.118	5	50017	HEV-RN-S-50125
	1/8	5/32	2	1/2	.118	5	50032	HEV-RN-R-50125
	1/8	5/32	2-1/2	3/4	.118	5	50047	HEV-RN-M-50125
	1/8	5/32	2-1/2	1	.118	5	81781	HEV-RN-L-50125
	1/8	5/32	2-1/2	1-1/4	.118	5	83014	HEV-RN-LX-50125
	1/8	5/32	3	1-1/2	.118	5	86372	HEV-RN-X-50125
3/16	3/16	7/32	2	1/2	.178	5	50062	HEV-RN-R-50187
	3/16	7/32	2-1/2	3/4	.178	5	50077	HEV-RN-M-50187
	3/16	7/32	2-1/2	1-1/8	.178	5	50092	HEV-RN-L-50187
	3/16	7/32	2-1/2	1-5/16	.178	5	83015	HEV-RN-LX-50187
	3/16	7/32	3	1-1/2	.178	5	86373	HEV-RN-X-50187
1/4	1/4	3/8	4	3/4	.237	5	50107	HEV-RN-S-50250
	1/4	3/8	4	1-1/8	.237	5	50122	HEV-RN-R-50250
	1/4	3/4	4	1-1/8	.237	5	83016	HEV-RNR-R-50250
	1/4	3/8	4	1-5/8	.237	5	81782	HEV-RN-A-50250
	1/4	3/8	4	2-1/8	.237	5	50137	HEV-RN-M-50250
	1/4	3/4	4	2-1/8	.237	5	83017	HEV-RNR-M-50250
	1/4	3/8	4	2-1/2	.237	5	81783	HEV-RN-ML-50250
	1/4	3/4	4	2-1/2	.237	5	87533	HEV-RNR-ML-50250
	1/4	3/8	4-1/2	3	.237	5	83018	HEV-RN-L-50250
1/4	3/4	4-1/2	3	.237	5	87534	HEV-RNR-L-50250	
5/16	5/16	7/16	4	1-1/8	.296	5	86374	HEV-RN-R-50312
	5/16	7/16	4	1-3/4	.296	5	86375	HEV-RN-M-50312
	5/16	7/16	4	2-1/8	.296	5	86376	HEV-RN-ML-50312

* .0005 max TIR

continued on next page

5 FLUTE - SQUARE New Items!



HEV-RN-5

Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.* D1 ^{+0.000"} _{-.002"}	Shank Dia. D2 (h6)	Length of Cut L2 ^{+0.032"} _{-.000"}	Overall Length L1 ^{+0.062"} _{-.062"}	Reach (LBS) L3	Neck Diameter	Flutes	Aplus Coated	Tool Description
3/8	3/8	1/2	4	1-1/8	.356	5	50152	HEV-RN-S-50375
	3/8	1/2	4	1-5/8	.356	5	81784	HEV-RN-SR-50375
	3/8	1	4	1-5/8	.356	5	87535	HEV-RNR-SR-50375 new
	3/8	1/2	4	2-1/8	.356	5	50167	HEV-RN-R-50375
	3/8	1	4	2-1/8	.356	5	83019	HEV-RNR-R-50375
	3/8	1/2	6	2-1/2	.356	5	81785	HEV-RN-A-50375
	3/8	1	6	2-1/2	.356	5	87536	HEV-RNR-A-50375 new
	3/8	1/2	6	3-1/8	.356	5	50197	HEV-RN-M-50375
	3/8	1	6	3-1/8	.356	5	83020	HEV-RNR-M-50375
	3/8	1/2	6	3-5/8	.356	5	86377	HEV-RN-ML-50375
	3/8	1/2	6	4-1/8	.356	5	50212	HEV-RN-L-50375
3/8	1	6	4-1/8	.356	5	87537	HEV-RNR-L-50375 new	
1/2	1/2	5/8	4	1-1/2	.475	5	50227	HEV-RN-S-50500
	1/2	5/8	4	1-3/4	.475	5	81786	HEV-RN-SR-50500
	1/2	5/8	4	2-1/4	.475	5	50242	HEV-RN-R-50500
	1/2	1-1/4	4	2-1/4	.475	5	83021	HEV-RNR-R-50500
	1/2	5/8	5	2-3/4	.475	5	81787	HEV-RN-A-50500
	1/2	1-1/4	5	2-3/4	.475	5	86378	HEV-RNR-A-50500
	1/2	5/8	6	3-3/8	.475	5	50272	HEV-RN-M-50500
	1/2	1-1/4	6	3-3/8	.475	5	83022	HEV-RNR-M-50500
	1/2	5/8	6	4-1/8	.475	5	50287	HEV-RN-L-50500
	1/2	1-1/4	6	4-1/8	.475	5	83023	HEV-RNR-L-50500
	1/2	5/8	7	5	.475	5	83024	HEV-RN-X-50500
5/8	5/8	3/4	4	1-5/8	.593	5	50302	HEV-RN-S-50625
	5/8	3/4	6	2-3/8	.593	5	50317	HEV-RN-R-50625
	5/8	3/4	6	3-3/8	.593	5	50332	HEV-RN-M-50625
	5/8	3/4	6	4-1/8	.593	5	50347	HEV-RN-L-50625
3/4	3/4	1	4	2	.712	5	50362	HEV-RN-S-50750
	3/4	1-5/8	4	2	.712	5	86379	HEV-RNR-S-50750
	3/4	1	6	2-1/2	.712	5	50377	HEV-RN-R-50750
	3/4	1-5/8	6	2-1/2	.712	5	83025	HEV-RNR-R-50750
	3/4	1	6	2-7/8	.712	5	81788	HEV-RN-A-50750
	3/4	1	6	3-3/8	.712	5	50392	HEV-RN-M-50750
	3/4	1-5/8	6	3-3/8	.712	5	83026	HEV-RNR-M-50750
	3/4	1	6	4-1/8	.712	5	50407	HEV-RN-L-50750
	3/4	1-5/8	6	4-1/8	.712	5	86380	HEV-RNR-L-50750
3/4	1	7	4-3/4	.712	5	86381	HEV-RN-LX-50750	
1	1	1-1/4	6	2-5/8	.950	5	50437	HEV-RN-R-51000
	1	1-1/4	6	3-3/8	.950	5	50452	HEV-RN-M-51000
	1	1-1/4	6	4-1/8	.950	5	50467	HEV-RN-L-51000

* .0005 max TIR

HEV-RN-5

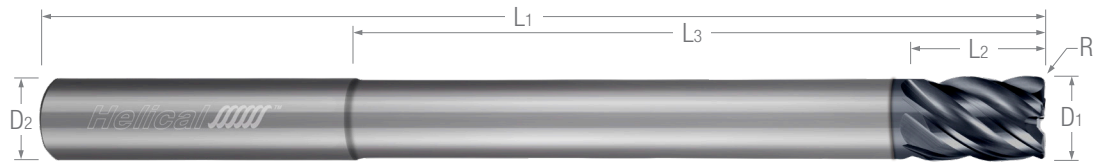


5 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Longer lengths of cut available for excellent performance in deep pocket High Efficiency Milling (HEM) applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 202 for *Tplus* coating



Cutter Dia.*	Shank Dia.	Corner Radius	LOC	OAL	Reach (LBS)	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
D ₁ ^{+0.000"} _{-.002"}	D ₂ (h6)	R ^{+0.002"} _{-.002"}	L ₂ ^{+0.032"} _{-.000"}	L ₁ ^{+0.062"} _{-.062"}	L ₃				
1/8	1/8	.010	5/32	2	3/8	.118	5	35017	HEV-RN-S-50125-R.010
	1/8	.010	5/32	2	1/2	.118	5	35032	HEV-RN-R-50125-R.010
	1/8	.010	5/32	2-1/2	3/4	.118	5	35047	HEV-RN-M-50125-R.010
	1/8	.010	5/32	2-1/2	1	.118	5	81789	HEV-RN-L-50125-R.010
	1/8	.010	5/32	2-1/2	1-1/4	.118	5	83027	HEV-RN-LX-50125-R.010
	1/8	.030	5/32	2	3/8	.118	5	51017	HEV-RN-S-50125-R.030
	1/8	.030	5/32	2	1/2	.118	5	51032	HEV-RN-R-50125-R.030
	1/8	.030	5/32	2-1/2	3/4	.118	5	51047	HEV-RN-M-50125-R.030
	1/8	.030	5/32	2-1/2	1	.118	5	83028	HEV-RN-L-50125-R.030
3/16	3/16	.010	7/32	2	1/2	.178	5	35062	HEV-RN-R-50187-R.010
	3/16	.010	7/32	2-1/2	3/4	.178	5	35077	HEV-RN-M-50187-R.010
	3/16	.010	7/32	2-1/2	1-1/8	.178	5	35092	HEV-RN-L-50187-R.010
	3/16	.010	7/32	2-1/2	1-5/16	.178	5	81790	HEV-RN-LX-50187-R.010
	3/16	.010	7/32	3	1-1/2	.178	5	83029	HEV-RN-X-50187-R.010
	3/16	.010	7/32	4	1-7/8	.178	5	86383	HEV-RN-Y-50187-R.010
	3/16	.030	7/32	2	1/2	.178	5	51062	HEV-RN-R-50187-R.030
	3/16	.030	7/32	2-1/2	3/4	.178	5	51077	HEV-RN-M-50187-R.030
	3/16	.030	7/32	2-1/2	1-1/8	.178	5	51092	HEV-RN-L-50187-R.030
	3/16	.030	7/32	2-1/2	1-5/16	.178	5	81791	HEV-RN-LX-50187-R.030
	3/16	.030	7/32	3	1-1/2	.178	5	83030	HEV-RN-X-50187-R.030
	3/16	.030	7/32	4	1-7/8	.178	5	86384	HEV-RN-Y-50187-R.030
1/4	1/4	.020	3/8	4	3/4	.237	5	35107	HEV-RN-S-50250-R.020
	1/4	.020	3/8	4	1-1/8	.237	5	35122	HEV-RN-R-50250-R.020
	1/4	.020	3/4	4	1-1/8	.237	5	83031	HEV-RNR-R-50250-R.020
	1/4	.020	3/8	4	1-5/8	.237	5	81792	HEV-RN-A-50250-R.020
	1/4	.020	3/4	4	1-5/8	.237	5	86386	HEV-RNR-A-50250-R.020
	1/4	.020	3/8	4	2-1/8	.237	5	35137	HEV-RN-M-50250-R.020
	1/4	.020	3/4	4	2-1/8	.237	5	83032	HEV-RNR-M-50250-R.020
	1/4	.020	3/8	4	2-1/2	.237	5	81793	HEV-RN-ML-50250-R.020
	1/4	.020	3/8	4-1/2	3	.237	5	83033	HEV-RN-L-50250-R.020
	1/4	.030	3/8	4	3/4	.237	5	51107	HEV-RN-S-50250-R.030
	1/4	.030	3/8	4	1-1/8	.237	5	51122	HEV-RN-R-50250-R.030
	1/4	.030	3/4	4	1-1/8	.237	5	86387	HEV-RNR-R-50250-R.030

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5 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck (cont.)



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Cutter Dia.* D1 ^{+0.000"} -0.002"	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} -0.002"	LOC L2 ^{+0.032"} -0.000"	OAL L1 ^{+0.062"} -0.062"	Reach (LBS) L3	Neck Dia.	Flutes	Aplus Coated	Tool Description
1/4	1/4	.030	3/8	4	2-1/8	.237	5	51137	HEV-RN-M-50250-R.030
	1/4	.030	3/4	4	2-1/8	.237	5	86388	HEV-RNR-M-50250-R.030
	1/4	.030	3/8	4	2-1/2	.237	5	83034	HEV-RN-ML-50250-R.030
	1/4	.060	3/8	4	3/4	.237	5	51108	HEV-RN-S-50250-R.060
	1/4	.060	3/8	4	1-1/8	.237	5	51123	HEV-RN-R-50250-R.060
	1/4	.060	3/8	4	2-1/8	.237	5	51138	HEV-RN-M-50250-R.060
	1/4	.060	3/8	4	2-1/2	.237	5	86389	HEV-RN-ML-50250-R.060
5/16	5/16	.030	7/16	4	1-1/8	.296	5	86390	HEV-RN-R-50312-R.030
	5/16	.030	7/16	4	1-3/4	.296	5	86391	HEV-RN-M-50312-R.030
	5/16	.030	7/16	4	2-1/8	.296	5	86392	HEV-RN-ML-50312-R.030
3/8	3/8	.020	1/2	4	1-1/8	.356	5	35152	HEV-RN-S-50375-R.020
	3/8	.020	1/2	4	1-5/8	.356	5	81794	HEV-RN-SR-50375-R.020
	3/8	.020	1/2	4	2-1/8	.356	5	35167	HEV-RN-R-50375-R.020
	3/8	.020	1	4	2-1/8	.356	5	83035	HEV-RNR-R-50375-R.020
	3/8	.020	1/2	6	2-1/2	.356	5	81795	HEV-RN-A-50375-R.020
	3/8	.020	1/2	6	3-1/8	.356	5	35197	HEV-RN-M-50375-R.020
	3/8	.020	1	6	3-1/8	.356	5	83036	HEV-RNR-M-50375-R.020
	3/8	.020	1/2	6	3-5/8	.356	5	86394	HEV-RN-ML-50375-R.020
	3/8	.030	1/2	4	1-1/8	.356	5	51152	HEV-RN-S-50375-R.030
	3/8	.030	1/2	4	1-5/8	.356	5	81796	HEV-RN-SR-50375-R.030
	3/8	.030	1/2	4	2-1/8	.356	5	51167	HEV-RN-R-50375-R.030
	3/8	.030	1/2	6	2-1/2	.356	5	81797	HEV-RN-A-50375-R.030
	3/8	.030	1/2	6	3-1/8	.356	5	51197	HEV-RN-M-50375-R.030
	3/8	.030	1/2	6	3-5/8	.356	5	86395	HEV-RN-ML-50375-R.030
	3/8	.030	1/2	6	4-1/8	.356	5	51212	HEV-RN-L-50375-R.030
	3/8	.060	1/2	4	1-1/8	.356	5	51153	HEV-RN-S-50375-R.060
	3/8	.060	1/2	4	1-5/8	.356	5	86396	HEV-RN-SR-50375-R.060
	3/8	.060	1/2	4	2-1/8	.356	5	51168	HEV-RN-R-50375-R.060
	3/8	.060	1/2	6	2-1/2	.356	5	86397	HEV-RN-A-50375-R.060
	3/8	.060	1/2	6	3-1/8	.356	5	51198	HEV-RN-M-50375-R.060
3/8	.090	1/2	4	1-1/8	.356	5	51154	HEV-RN-S-50375-R.090	
3/8	.090	1/2	4	2-1/8	.356	5	51169	HEV-RN-R-50375-R.090	
3/8	.090	1/2	6	3-1/8	.356	5	51199	HEV-RN-M-50375-R.090	
1/2	1/2	.030	5/8	4	1-1/2	.475	5	35227	HEV-RN-S-50500-R.030
	1/2	.030	5/8	4	1-3/4	.475	5	81798	HEV-RN-SR-50500-R.030
	1/2	.030	1-1/4	4	1-3/4	.475	5	86398	HEV-RNR-SR-50500-R.030
	1/2	.030	5/8	4	2-1/4	.475	5	35242	HEV-RN-R-50500-R.030
	1/2	.030	1-1/4	4	2-1/4	.475	5	83037	HEV-RNR-R-50500-R.030
	1/2	.030	5/8	5	2-3/4	.475	5	81799	HEV-RN-A-50500-R.030
	1/2	.030	1-1/4	5	2-3/4	.475	5	86399	HEV-RNR-A-50500-R.030
	1/2	.030	5/8	6	3-3/8	.475	5	35272	HEV-RN-M-50500-R.030
	1/2	.030	1-1/4	6	3-3/8	.475	5	83038	HEV-RNR-M-50500-R.030
	1/2	.030	5/8	6	4-1/8	.475	5	35287	HEV-RN-L-50500-R.030
	1/2	.030	1-1/4	6	4-1/8	.475	5	83039	HEV-RNR-L-50500-R.030
	1/2	.030	5/8	7	5	.475	5	83040	HEV-RN-X-50500-R.030
	1/2	.060	5/8	4	1-1/2	.475	5	51227	HEV-RN-S-50500-R.060
	1/2	.060	5/8	4	1-3/4	.475	5	86400	HEV-RN-SR-50500-R.060
	1/2	.060	5/8	4	2-1/4	.475	5	51242	HEV-RN-R-50500-R.060
	1/2	.060	5/8	5	2-3/4	.475	5	86401	HEV-RN-A-50500-R.060
	1/2	.060	5/8	6	3-3/8	.475	5	51272	HEV-RN-M-50500-R.060
	1/2	.060	5/8	6	4-1/8	.475	5	51287	HEV-RN-L-50500-R.060

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5 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck (cont.)

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Cutter Dia.* D1 $^{+.000}$ $_{-.002}$ "	Shank Dia. D2 (h6)	Corner Radius R $^{+.002}$ $_{-.002}$ "	LOC L2 $^{+.032}$ $_{-.000}$ "	OAL L1 $^{+.062}$ $_{-.062}$ "	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/2	1/2	.090	5/8	4	1-1/2	.475	5	51228	HEV-RN-S-50500-R.090
	1/2	.090	5/8	4	2-1/4	.475	5	51243	HEV-RN-R-50500-R.090
	1/2	.090	5/8	6	3-3/8	.475	5	51273	HEV-RN-M-50500-R.090
	1/2	.120	5/8	4	1-1/2	.475	5	51229	HEV-RN-S-50500-R.120
	1/2	.120	5/8	4	1-3/4	.475	5	86402	HEV-RN-SR-50500-R.120
	1/2	.120	5/8	4	2-1/4	.475	5	51244	HEV-RN-R-50500-R.120
	1/2	.120	5/8	5	2-3/4	.475	5	86403	HEV-RN-A-50500-R.120
	1/2	.120	5/8	6	3-3/8	.475	5	51274	HEV-RN-M-50500-R.120
5/8	5/8	.030	3/4	4	1-5/8	.593	5	35302	HEV-RN-S-50625-R.030
	5/8	.030	3/4	4	2	.593	5	86404	HEV-RN-SR-50625-R.030
	5/8	.030	3/4	6	2-3/8	.593	5	35317	HEV-RN-R-50625-R.030
	5/8	.030	3/4	6	3-3/8	.593	5	35332	HEV-RN-M-50625-R.030
	5/8	.030	3/4	6	3-3/4	.593	5	86405	HEV-RN-ML-50625-R.030
	5/8	.030	3/4	6	4-1/8	.593	5	35347	HEV-RN-L-50625-R.030
	5/8	.120	3/4	4	1-5/8	.593	5	51304	HEV-RN-S-50625-R.120
	5/8	.120	3/4	6	2-3/8	.593	5	51319	HEV-RN-R-50625-R.120
3/4	3/4	.030	1	4	2	.712	5	35362	HEV-RN-S-50750-R.030
	3/4	.030	1-5/8	4	2	.712	5	86407	HEV-RNR-S-50750-R.030
	3/4	.030	1	6	2-1/2	.712	5	35377	HEV-RN-R-50750-R.030
	3/4	.030	1-5/8	6	2-1/2	.712	5	83043	HEV-RNR-R-50750-R.030
	3/4	.030	1	6	2-7/8	.712	5	81800	HEV-RN-A-50750-R.030
	3/4	.030	1	6	3-3/8	.712	5	35392	HEV-RN-M-50750-R.030
	3/4	.030	1-5/8	6	3-3/8	.712	5	83044	HEV-RNR-M-50750-R.030
	3/4	.030	1	6	4-1/8	.712	5	35407	HEV-RN-L-50750-R.030
	3/4	.030	1-5/8	6	4-1/8	.712	5	86408	HEV-RNR-L-50750-R.030
	3/4	.030	1	7	4-3/4	.712	5	86409	HEV-RN-LX-50750-R.030
	3/4	.060	1	4	2	.712	5	51362	HEV-RN-S-50750-R.060
	3/4	.060	1	6	2-1/2	.712	5	51377	HEV-RN-R-50750-R.060
	3/4	.060	1	6	2-7/8	.712	5	86410	HEV-RN-A-50750-R.060
	3/4	.060	1	6	3-3/8	.712	5	51392	HEV-RN-M-50750-R.060
	3/4	.060	1	6	4-1/8	.712	5	51407	HEV-RN-L-50750-R.060
	3/4	.090	1	4	2	.712	5	51363	HEV-RN-S-50750-R.090
	3/4	.090	1	6	4-1/8	.712	5	51408	HEV-RN-L-50750-R.090
	3/4	.120	1	4	2	.712	5	51364	HEV-RN-S-50750-R.120
	3/4	.120	1	6	2-1/2	.712	5	51379	HEV-RN-R-50750-R.120
	3/4	.120	1	6	2-7/8	.712	5	86411	HEV-RN-A-50750-R.120
	3/4	.120	1	6	3-3/8	.712	5	51394	HEV-RN-M-50750-R.120
	3/4	.120	1	6	4-1/8	.712	5	51409	HEV-RN-L-50750-R.120
	3/4	.190	1	4	2	.712	5	51365	HEV-RN-S-50750-R.190
	3/4	.190	1	6	4-1/8	.712	5	51410	HEV-RN-L-50750-R.190
3/4	.250	1	4	2	.712	5	51366	HEV-RN-S-50750-R.250	
3/4	.250	1	6	2-1/2	.712	5	51381	HEV-RN-R-50750-R.250	
3/4	.250	1	6	2-7/8	.712	5	81801	HEV-RN-A-50750-R.250	
3/4	.250	1	6	3-3/8	.712	5	51396	HEV-RN-M-50750-R.250	
3/4	.250	1	6	4-1/8	.712	5	51411	HEV-RN-L-50750-R.250	
1	1	.030	1-1/4	4	2-1/4	.950	5	35422	HEV-RN-S-51000-R.030
	1	.030	1-1/4	6	2-5/8	.950	5	35437	HEV-RN-R-51000-R.030
	1	.030	1-1/4	6	3-3/8	.950	5	35452	HEV-RN-M-51000-R.030
	1	.030	1-1/4	6	4-1/8	.950	5	35467	HEV-RN-L-51000-R.030

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SPEEDS & FEEDS

5 Flute - Variable Pitch



HEV-5 / HSM-5

HEV-5 / HEV-RN-5 / HSM-5

Material Guide		Hardness	SFM	Inches per Tooth (IPT)																							
				1/16			1/8			3/16			1/4			3/8			1/2			3/4			1		
				Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0005	.0008	.0009	.0009	.0015	.0018	.0014	.0021	.0020	.0018	.0029	.0022	.0027	.0043	.0026	.0035	.0056	.0030	.0051	.0080	.0036	.0065	.0102	.0044
		75 - 98 HRB	445	.0004	.0006	.0008	.0007	.0011	.0015	.0010	.0015	.0017	.0013	.0021	.0019	.0020	.0031	.0022	.0026	.0041	.0026	.0037	.0059	.0031	.0047	.0075	.0037
		21 - 36 HRC	400	.0002	.0004	.0006	.0004	.0007	.0012	.0007	.0010	.0014	.0009	.0014	.0015	.0013	.0020	.0018	.0017	.0026	.0021	.0024	.0038	.0025	.0031	.0048	.0030
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0003	.0005	.0007	.0006	.0009	.0014	.0009	.0013	.0016	.0012	.0018	.0018	.0017	.0027	.0021	.0022	.0035	.0024	.0032	.0051	.0029	.0041	.0065	.0035
		21 - 36 HRC	340	.0002	.0004	.0006	.0004	.0007	.0012	.0007	.0010	.0013	.0009	.0013	.0015	.0013	.0020	.0018	.0017	.0026	.0021	.0024	.0038	.0025	.0030	.0048	.0030
		36 - 50 HRC	260	.0002	.0003	.0006	.0004	.0006	.0011	.0006	.0009	.0013	.0008	.0012	.0014	.0011	.0017	.0017	.0015	.0023	.0019	.0021	.0033	.0023	.0027	.0042	.0028
TOOL STEEL	A2, H13, L6, P20, S7	> 50 HRC	155	.0002	.0003	.0005	.0003	.0005	.0010	.0005	.0007	.0011	.0006	.0009	.0013	.0009	.0014	.0015	.0011	.0018	.0017	.0017	.0026	.0020	.0021	.0033	.0025
		75 - 98 HRB	340	.0003	.0005	.0007	.0006	.0009	.0014	.0009	.0013	.0016	.0012	.0018	.0018	.0017	.0027	.0021	.0022	.0035	.0024	.0032	.0051	.0029	.0041	.0065	.0035
		21 - 36 HRC	250	.0003	.0004	.0006	.0005	.0007	.0012	.0007	.0011	.0014	.0009	.0015	.0016	.0014	.0022	.0018	.0018	.0028	.0021	.0026	.0040	.0025	.0033	.0051	.0031
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	36 - 50 HRC	145	.0002	.0003	.0006	.0004	.0006	.0011	.0005	.0008	.0012	.0007	.0011	.0014	.0011	.0017	.0016	.0014	.0022	.0019	.0020	.0031	.0023	.0026	.0040	.0027
		> 50 HRC	85	.0002	.0003	.0005	.0003	.0005	.0010	.0005	.0007	.0011	.0006	.0009	.0013	.0009	.0014	.0015	.0011	.0018	.0017	.0016	.0026	.0020	.0021	.0033	.0025
		75 - 98 HRB	290	.0004	.0006	.0008	.0008	.0012	.0016	.0011	.0018	.0018	.0015	.0024	.0020	.0023	.0035	.0024	.0029	.0046	.0028	.0042	.0066	.0033	.0054	.0085	.0040
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0003	.0005	.0007	.0006	.0009	.0014	.0009	.0013	.0016	.0011	.0018	.0018	.0017	.0026	.0020	.0022	.0034	.0024	.0031	.0049	.0028	.0040	.0063	.0034
		21 - 36 HRC	225	.0003	.0004	.0007	.0005	.0008	.0013	.0007	.0011	.0014	.0009	.0015	.0016	.0014	.0022	.0019	.0018	.0029	.0021	.0026	.0041	.0026	.0033	.0052	.0031
		36 - 50 HRC	150	.0002	.0004	.0006	.0004	.0007	.0012	.0006	.0010	.0013	.0008	.0013	.0015	.0012	.0019	.0017	.0016	.0026	.0020	.0023	.0037	.0024	.0030	.0046	.0030
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0003	.0005	.0007	.0006	.0009	.0014	.0009	.0013	.0016	.0012	.0018	.0018	.0017	.0027	.0021	.0023	.0035	.0024	.0032	.0051	.0029	.0041	.0065	.0035
		21 - 36 HRC	280	.0003	.0004	.0007	.0005	.0008	.0013	.0008	.0012	.0015	.0010	.0016	.0017	.0015	.0024	.0019	.0020	.0031	.0022	.0028	.0044	.0027	.0036	.0056	.0033
		36 - 50 HRC	145	.0002	.0003	.0006	.0004	.0006	.0011	.0006	.0009	.0013	.0007	.0012	.0014	.0011	.0017	.0016	.0014	.0023	.0019	.0021	.0032	.0023	.0026	.0041	.0028
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0002	.0004	.0006	.0004	.0007	.0012	.0006	.0010	.0013	.0009	.0013	.0015	.0013	.0020	.0018	.0017	.0026	.0021	.0024	.0037	.0025	.0030	.0048	.0030
		36 - 50 HRC	145	.0002	.0003	.0006	.0004	.0006	.0011	.0006	.0009	.0013	.0007	.0012	.0014	.0011	.0017	.0016	.0014	.0023	.0019	.0021	.0032	.0023	.0026	.0041	.0028
		75 - 98 HRB	410	.0005	.0008	.0009	.0010	.0015	.0018	.0014	.0022	.0020	.0019	.0029	.0023	.0028	.0044	.0026	.0036	.0057	.0030	.0052	.0082	.0037	.0066	.0104	.0044
GRAY CAST IRON	SAE J431, ASTM A48	21 - 36 HRC	370	.0003	.0004	.0007	.0005	.0008	.0013	.0008	.0012	.0015	.0010	.0016	.0017	.0015	.0024	.0019	.0020	.0031	.0022	.0028	.0045	.0027	.0036	.0057	.0033
		75 - 98 HRB	345	.0003	.0005	.0007	.0006	.0010	.0014	.0009	.0014	.0016	.0012	.0019	.0018	.0018	.0028	.0021	.0023	.0036	.0024	.0033	.0052	.0029	.0042	.0066	.0035
		21 - 36 HRC	335	.0003	.0004	.0007	.0005	.0008	.0013	.0008	.0012	.0015	.0010	.0016	.0017	.0015	.0024	.0019	.0020	.0031	.0022	.0029	.0045	.0027	.0036	.0057	.0033
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	310	.0003	.0005	.0008	.0006	.0010	.0015	.0009	.0014	.0016	.0012	.0020	.0018	.0018	.0029	.0021	.0024	.0038	.0025	.0034	.0054	.0029	.0044	.0069	.0036
		21 - 36 HRC	260	.0002	.0004	.0006	.0004	.0007	.0012	.0006	.0010	.0013	.0008	.0013	.0015	.0012	.0019	.0017	.0016	.0025	.0020	.0023	.0036	.0024	.0029	.0046	.0029
		36 - 50 HRC	135	.0002	.0002	.0005	.0003	.0004	.0009	.0004	.0006	.0010	.0005	.0008	.0012	.0008	.0012	.0014	.0010	.0016	.0016	.0014	.0023	.0019	.0018	.0029	.0023
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	< 75 HRB	285	.0004	.0007	.0009	.0008	.0013	.0017	.0012	.0018	.0019	.0016	.0025	.0021	.0024	.0037	.0024	.0031	.0049	.0028	.0044	.0070	.0034	.0056	.0089	.0047
		75 - 98 HRB	250	.0004	.0006	.0008	.0007	.0011	.0015	.0010	.0015	.0017	.0013	.0021	.0019	.0020	.0031	.0022	.0026	.0041	.0026	.0037	.0058	.0031	.0047	.0074	.0041
		21 - 36 HRC	80	.0002	.0003	.0006	.0004	.0006	.0012	.0006	.0009	.0013	.0008	.0013	.0015	.0012	.0019	.0017	.0016	.0025	.0020	.0023	.0035	.0024	.0029	.0045	.0029
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	21 - 36 HRC	75	.0002	.0003	.0006	.0004	.0006	.0012	.0006	.0009	.0013	.0008	.0012	.0015	.0012	.0018	.0017	.0015	.0024	.0020	.0022	.0034	.0023	.0028	.0043	.0028
		36 - 50 HRC	70	.0002	.0003	.0005	.0003	.0005	.0010	.0005	.0008	.0012	.0007	.0010	.0014	.0010	.0015	.0015	.0013	.0020	.0018	.0019	.0029	.0022	.0023	.0037	.0026
		75 - 98 HRB	80	.0002	.0003	.0006	.0004	.0006	.0012	.0006	.0009	.0013	.0008	.0013	.0015	.0012	.0019	.0017	.0016	.0025	.0020	.0023	.0035	.0024	.0029	.0045	.0029
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0006	.0009	.0010	.0011	.0017	.0019	.0017	.0025	.0022	.0022	.0035	.0025	.0033	.0051	.0028	.0043	.0067	.0033	.0061	.0096	.0039	.0078	.0122	.0048
		75 - 98 HRB	275	.0005	.0008	.0009	.0009	.0015	.0018	.0014	.0021	.0020	.0018	.0029	.0023	.0027	.0043	.0026	.0036	.0056	.0030	.0051	.0081	.0036	.0065	.0103	.0044
		21 - 36 HRC	250	.0004	.0006	.0008	.0007	.0011	.0015	.0010	.0016	.0017	.0014	.0022	.0020	.0021	.0032	.0022	.0027	.0042	.0026	.0038	.0060	.0031	.0049	.0077	.0038
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0003	.0005	.0007	.0006	.0009	.0014	.0008	.0013	.0015	.0011	.0017	.0017	.0016	.0025	.0020	.0021	.0033	.0023	.0030	.0048	.0028	.0039	.0061	.0034
		36 - 50 HRC	160	.0003	.0004	.0007	.0005	.0008	.0013	.0008	.0012	.0015	.0010	.0016	.0017	.0015	.0023	.0019	.0019	.0030	.0022	.0028	.0043	.0027	.0035	.0055	.0032
		75 - 98 HRB	210	.0003	.0004	.0006	.0005	.0007	.0012	.0007	.0011	.0014	.0009	.0015	.0016	.0014	.0021	.0018	.0018	.0028	.0022	.0026	.0040	.0026	.0032	.0051	.0031
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	21 - 36 HRC	170	.0003	.0004	.0006	.0005	.0007	.0012	.0007	.0011	.0014	.0009	.0015	.0016	.0013	.0021	.0018	.0017	.0027	.0021	.0025	.0039	.0025	.0031	.0050	.0030
		> 50 HRC	65	.0002	.0003	.0005	.0003	.0005	.0010	.0005	.0007	.0011	.0006	.0010	.0013	.0009	.0014	.0015	.0012	.0018	.0017	.0017	.0026	.0021	.0021	.0034	.0025
		75 - 98 HRB	250	.0004	.0006	.0008	.0007	.0011	.0015	.0010	.0015	.0017	.0013	.0021	.0019	.0020	.0031	.0022	.0026	.0041	.0026	.0037	.0058	.0031	.0047	.0074	.0041

5 Flute

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	30%-75% Diameter	100% Diameter
	≥ 35 HRC	25%-50% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	15%-30% Diameter
	≥ 35 HRC	Up to Max LOC	10%-20% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

For diameters, please go to HelicalTool.com

NOTES:
Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

HEV-6

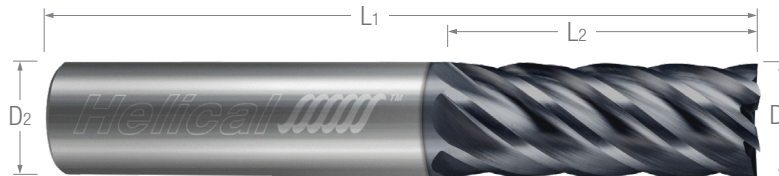


6 FLUTE - SQUARE

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 204 for *Tplus* coating



Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	1/4	1-1/2	6	84382	HEV-S-60125
	1/8	3/8	2	6	84383	HEV-SR-60125
	1/8	1/2	2-1/2	6	84384	HEV-R-60125
	1/8	5/8	2-1/2	6	84385	HEV-A-60125
3/16	3/16	5/16	2	6	84386	HEV-S-60187
	3/16	7/16	2	6	84387	HEV-SR-60187
	3/16	9/16	2-1/2	6	84388	HEV-R-60187
	3/16	3/4	2-1/2	6	84389	HEV-M-60187
1/4	1/4	3/8	2	6	59250	HEV-S-60250
	1/4	1/2	2-1/2	6	59251	HEV-SR-60250
	1/4	3/4	2-1/2	6	59252	HEV-R-60250
	1/4	1	3	6	59253	HEV-M-60250
	1/4	1-1/4	3	6	59254	HEV-L-60250
	1/4	1-1/2	3	6	82565	HEV-LX-60250
5/16	5/16	7/16	2	6	59255	HEV-S-60312
	5/16	3/4	2-1/2	6	59256	HEV-R-60312
	5/16	1	3	6	59257	HEV-M-60312
3/8	3/8	1/2	2	6	59258	HEV-S-60375
	3/8	3/4	2-1/2	6	82566	HEV-SR-60375
	3/8	1	3	6	59259	HEV-R-60375
	3/8	1-1/4	3	6	59260	HEV-M-60375
	3/8	1-1/2	3-1/2	6	59261	HEV-L-60375
	3/8	2	4	6	82567	HEV-LX-60375
1/2	1/2	5/8	2-1/2	6	59262	HEV-S-60500
	1/2	1	3	6	59263	HEV-SR-60500
	1/2	1-1/4	3	6	59264	HEV-R-60500
	1/2	1-5/8	4	6	59265	HEV-M-60500
	1/2	2	4	6	59266	HEV-L-60500
	1/2	2-1/2	5	6	82568	HEV-LX-60500
	1/2	3-1/8	6	6	84986	HEV-X-60500
	1/2	3-1/4	6	6	84987	HEV-LX-60625
5/8	5/8	3/4	3	6	59267	HEV-S-60625
	5/8	1-1/4	3-1/2	6	59268	HEV-SR-60625
	5/8	1-5/8	3-1/2	6	59269	HEV-R-60625
	5/8	2	4	6	59270	HEV-M-60625
	5/8	2-1/2	5	6	59271	HEV-L-60625
	5/8	3-1/4	6	6	84987	HEV-LX-60625

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6 FLUTE - SQUARE

Variable Pitch (cont.)



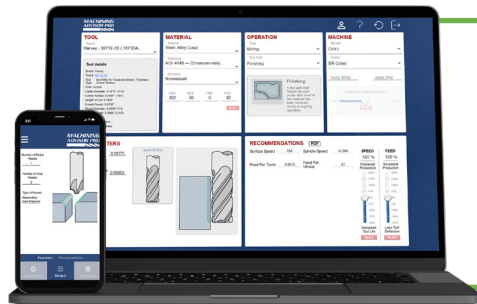
HEV-6

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Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Aplus Coated	Tool Description
3/4	3/4	1	3	6	59272	HEV-S-60750
	3/4	1-5/8	4	6	59273	HEV-R-60750
	3/4	2-1/4	5	6	59274	HEV-M-60750
	3/4	2-3/4	5	6	59275	HEV-L-60750
	3/4	3-1/4	6	6	59276	HEV-LX-60750
	3/4	4	6-1/2	6	84988	HEV-X-60750
1	1	1-1/4	4	6	84989	HEV-S-61000
	1	2	4-1/2	6	59277	HEV-R-61000
	1	2-5/8	5	6	59278	HEV-M-61000
	1	3-1/4	6	6	59279	HEV-L-61000
	1	4-1/4	7	6	84990	HEV-X-61000

*.0005 max TIR

6 Flute



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MHEV-6

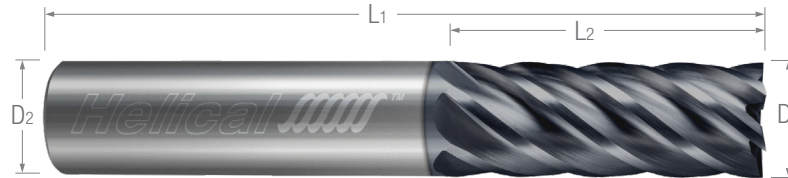
METRIC



6 FLUTE - SQUARE - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.00 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	$D_2 \text{ (h6)}$	$L_2 \begin{smallmatrix} +.80 \text{ mm} \\ -.00 \text{ mm} \end{smallmatrix}$	$L_1 \begin{smallmatrix} +1.60 \text{ mm} \\ -1.60 \text{ mm} \end{smallmatrix}$			
6 mm	6.00 mm	9.00 mm	63 mm	6	59574	MHEV-015-60600
	6.00 mm	12.00 mm	63 mm	6	59592	MHEV-020-60600
	6.00 mm	18.00 mm	63 mm	6	59626	MHEV-030-60600
8 mm	8.00 mm	12.00 mm	63 mm	6	59577	MHEV-015-60800
	8.00 mm	16.00 mm	63 mm	6	59595	MHEV-020-60800
	8.00 mm	24.00 mm	75 mm	6	59629	MHEV-030-60800
10 mm	10.00 mm	15.00 mm	63 mm	6	59580	MHEV-015-61000
	10.00 mm	20.00 mm	63 mm	6	59598	MHEV-020-61000
	10.00 mm	25.00 mm	75 mm	6	59612	MHEV-025-61000
12 mm	12.00 mm	18.00 mm	75 mm	6	59583	MHEV-015-61200
	12.00 mm	24.00 mm	75 mm	6	59601	MHEV-020-61200
	12.00 mm	30.00 mm	75 mm	6	59615	MHEV-025-61200
16 mm	16.00 mm	24.00 mm	89 mm	6	59586	MHEV-015-61600
	16.00 mm	32.00 mm	89 mm	6	59604	MHEV-020-61600
	16.00 mm	40.00 mm	89 mm	6	59618	MHEV-025-61600
20 mm	20.00 mm	30.00 mm	89 mm	6	59589	MHEV-015-62000
	20.00 mm	40.00 mm	100 mm	6	59607	MHEV-020-62000
	20.00 mm	50.00 mm	125 mm	6	59621	MHEV-025-62000
25 mm	25.00 mm	50.00 mm	125 mm	6	59610	MHEV-020-62500
	25.00 mm	64.00 mm	125 mm	6	59624	MHEV-025-62500

* .013 mm max TIR

6 FLUTE - BALL

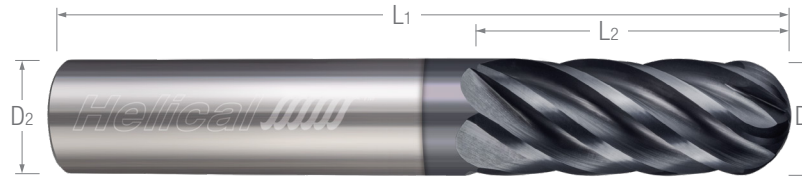
Variable Pitch



HEV-6

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 207 for *Tplus* coating



Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	1/4	1-1/2	6	84406	HEV-S-60125-BN
	1/8	3/8	2	6	84407	HEV-SR-60125-BN
	1/8	1/2	2-1/2	6	84408	HEV-R-60125-BN
	1/8	5/8	2-1/2	6	84409	HEV-A-60125-BN
3/16	3/16	5/16	2	6	84410	HEV-S-60187-BN
	3/16	7/16	2	6	84411	HEV-SR-60187-BN
	3/16	9/16	2-1/2	6	84412	HEV-R-60187-BN
	3/16	3/4	2-1/2	6	84413	HEV-M-60187-BN
1/4	1/4	3/8	2	6	59434	HEV-S-60250-BN
	1/4	1/2	2-1/2	6	59435	HEV-SR-60250-BN
	1/4	3/4	2-1/2	6	59436	HEV-R-60250-BN
	1/4	1	3	6	59437	HEV-M-60250-BN
	1/4	1-1/4	3	6	59438	HEV-L-60250-BN
	1/4	1-1/2	3	6	83361	HEV-LX-60250-BN
5/16	5/16	7/16	2	6	59439	HEV-S-60312-BN
	5/16	3/4	2-1/2	6	59440	HEV-R-60312-BN
	5/16	1	3	6	59441	HEV-M-60312-BN
3/8	3/8	1/2	2	6	59442	HEV-S-60375-BN
	3/8	3/4	2-1/2	6	82592	HEV-SR-60375-BN
	3/8	1	3	6	59443	HEV-R-60375-BN
	3/8	1-1/4	3	6	59444	HEV-M-60375-BN
	3/8	1-1/2	3-1/2	6	59445	HEV-L-60375-BN
	3/8	2	4	6	83362	HEV-LX-60375-BN
1/2	1/2	5/8	2-1/2	6	59446	HEV-S-60500-BN
	1/2	1	3	6	59447	HEV-SR-60500-BN
	1/2	1-1/4	3	6	59448	HEV-R-60500-BN
	1/2	1-5/8	4	6	59449	HEV-M-60500-BN
	1/2	2	4	6	59450	HEV-L-60500-BN
	1/2	2-1/2	5	6	82593	HEV-LX-60500-BN
5/8	5/8	3/4	3	6	59451	HEV-S-60625-BN
	5/8	1-1/4	3-1/2	6	59452	HEV-SR-60625-BN
	5/8	1-5/8	3-1/2	6	59453	HEV-R-60625-BN
3/4	3/4	1	3	6	59454	HEV-S-60750-BN
	3/4	1-5/8	4	6	59455	HEV-R-60750-BN
	3/4	2-1/4	5	6	59456	HEV-M-60750-BN
	3/4	2-3/4	5	6	83363	HEV-L-60750-BN
1	1	2	4-1/2	6	59457	HEV-R-61000-BN
	1	2-5/8	5	6	82594	HEV-M-61000-BN

*.0005 max TIR

HEV-6



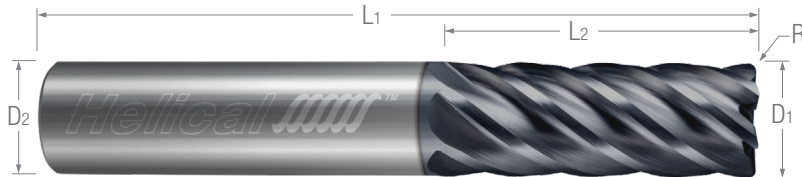
New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 208 for *Tplus* coating



Cutter Diameter* D1 $^{+0.000}$ $_{-0.002}$ "	Shank Diameter D2 (h6)	Corner Radius R $^{+0.002}$ $_{-0.002}$ "	Length of Cut L2 $^{+0.032}$ $_{-0.000}$ "	Overall Length L1 $^{+0.062}$ $_{-0.062}$ "	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	6	84390	HEV-S-60125-R.010
	1/8	.010	3/8	2	6	84391	HEV-SR-60125-R.010
	1/8	.010	1/2	2-1/2	6	84392	HEV-R-60125-R.010
	1/8	.010	5/8	2-1/2	6	84393	HEV-A-60125-R.010
	1/8	.030	1/4	1-1/2	6	84394	HEV-S-60125-R.030
	1/8	.030	3/8	2	6	84395	HEV-SR-60125-R.030
	1/8	.030	1/2	2-1/2	6	84396	HEV-R-60125-R.030
	1/8	.030	5/8	2-1/2	6	84397	HEV-A-60125-R.030
3/16	3/16	.010	5/16	2	6	84398	HEV-S-60187-R.010
	3/16	.010	7/16	2	6	84399	HEV-SR-60187-R.010
	3/16	.010	9/16	2-1/2	6	84400	HEV-R-60187-R.010
	3/16	.010	3/4	2-1/2	6	84401	HEV-M-60187-R.010
	3/16	.030	5/16	2	6	84402	HEV-S-60187-R.030
	3/16	.030	7/16	2	6	84403	HEV-SR-60187-R.030
	3/16	.030	9/16	2-1/2	6	84404	HEV-R-60187-R.030
	3/16	.030	3/4	2-1/2	6	84405	HEV-M-60187-R.030
1/4	1/4	.010	3/8	2	6	84995	HEV-S-60250-R.010
	1/4	.010	1/2	2-1/2	6	84996	HEV-SR-60250-R.010
	1/4	.010	3/4	2-1/2	6	84997	HEV-R-60250-R.010
	1/4	.010	1	3	6	87550	HEV-M-60250-R.010
	1/4	.010	1-1/4	3	6	87551	HEV-L-60250-R.010
	1/4	.010	1-1/2	3	6	87552	HEV-LX-60250-R.010
	1/4	.020	3/8	2	6	59280	HEV-S-60250-R.020
	1/4	.020	1/2	2-1/2	6	59283	HEV-SR-60250-R.020
	1/4	.020	3/4	2-1/2	6	59286	HEV-R-60250-R.020
	1/4	.020	1	3	6	59289	HEV-M-60250-R.020
	1/4	.020	1-1/4	3	6	59292	HEV-L-60250-R.020
	1/4	.020	1-1/2	3	6	82569	HEV-LX-60250-R.020
	1/4	.030	3/8	2	6	59281	HEV-S-60250-R.030
	1/4	.030	1/2	2-1/2	6	59284	HEV-SR-60250-R.030
	1/4	.030	3/4	2-1/2	6	59287	HEV-R-60250-R.030
	1/4	.030	1	3	6	59290	HEV-M-60250-R.030
	1/4	.030	1-1/4	3	6	59293	HEV-L-60250-R.030
	1/4	.030	1-1/2	3	6	87553	HEV-LX-60250-R.030

new
new
new

new

*.0005 max TIR

continued on next page



Speeds & Feeds on Page 152

6 FLUTE - CORNER RADIUS

New Items!



HEV-6

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.000"} _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} _{-.002"}	Length of Cut L2 ^{+0.032"} _{-.000"}	Overall Length L1 ^{+0.062"} _{-.062"}	Flutes	Aplus Coated	Tool Description
1/4	1/4	.060	3/8	2	6	59282	HEV-S-60250-R.060
	1/4	.060	1/2	2-1/2	6	59285	HEV-SR-60250-R.060
	1/4	.060	3/4	2-1/2	6	59288	HEV-R-60250-R.060
	1/4	.060	1	3	6	59291	HEV-M-60250-R.060
	1/4	.060	1-1/4	3	6	59294	HEV-L-60250-R.060
	1/4	.060	1-1/2	3	6	82570	HEV-LX-60250-R.060
5/16	5/16	.010	7/16	2	6	87554	HEV-S-60312-R.010
	5/16	.010	3/4	2-1/2	6	87555	HEV-R-60312-R.010
	5/16	.010	1	3	6	87556	HEV-M-60312-R.010
	5/16	.020	7/16	2	6	59295	HEV-S-60312-R.020
	5/16	.020	3/4	2-1/2	6	59298	HEV-R-60312-R.020
	5/16	.020	1	3	6	59301	HEV-M-60312-R.020
	5/16	.030	7/16	2	6	59296	HEV-S-60312-R.030
	5/16	.030	3/4	2-1/2	6	59299	HEV-R-60312-R.030
	5/16	.030	1	3	6	59302	HEV-M-60312-R.030
	5/16	.060	7/16	2	6	59297	HEV-S-60312-R.060
	5/16	.060	3/4	2-1/2	6	59300	HEV-R-60312-R.060
	5/16	.060	1	3	6	59303	HEV-M-60312-R.060
3/8	3/8	.010	1/2	2	6	84998	HEV-S-60375-R.010
	3/8	.010	3/4	2-1/2	6	84999	HEV-SR-60375-R.010
	3/8	.010	1	3	6	86000	HEV-R-60375-R.010
	3/8	.010	1-1/4	3	6	86001	HEV-M-60375-R.010
	3/8	.010	1-1/2	3-1/2	6	87557	HEV-L-60375-R.010
	3/8	.010	2	4	6	87558	HEV-LX-60375-R.010
	3/8	.020	1/2	2	6	59304	HEV-S-60375-R.020
	3/8	.020	3/4	2-1/2	6	82571	HEV-SR-60375-R.020
	3/8	.020	1	3	6	59308	HEV-R-60375-R.020
	3/8	.020	1-1/4	3	6	59312	HEV-M-60375-R.020
	3/8	.020	1-1/2	3-1/2	6	59316	HEV-L-60375-R.020
	3/8	.020	2	4	6	83318	HEV-LX-60375-R.020
	3/8	.030	1/2	2	6	59305	HEV-S-60375-R.030
	3/8	.030	3/4	2-1/2	6	82572	HEV-SR-60375-R.030
	3/8	.030	1	3	6	59309	HEV-R-60375-R.030
	3/8	.030	1-1/4	3	6	59313	HEV-M-60375-R.030
	3/8	.030	1-1/2	3-1/2	6	59317	HEV-L-60375-R.030
	3/8	.030	2	4	6	82573	HEV-LX-60375-R.030
	3/8	.060	1/2	2	6	59306	HEV-S-60375-R.060
	3/8	.060	3/4	2-1/2	6	82574	HEV-SR-60375-R.060
	3/8	.060	1	3	6	59310	HEV-R-60375-R.060
	3/8	.060	1-1/4	3	6	59314	HEV-M-60375-R.060
	3/8	.060	1-1/2	3-1/2	6	59318	HEV-L-60375-R.060
	3/8	.060	2	4	6	82575	HEV-LX-60375-R.060
	3/8	.090	1/2	2	6	59307	HEV-S-60375-R.090
	3/8	.090	3/4	2-1/2	6	82576	HEV-SR-60375-R.090
	3/8	.090	1	3	6	59311	HEV-R-60375-R.090
	3/8	.090	1-1/4	3	6	59315	HEV-M-60375-R.090
	3/8	.090	1-1/2	3-1/2	6	59319	HEV-L-60375-R.090
	3/8	.090	2	4	6	82577	HEV-LX-60375-R.090

new
new
new

new
new

* .0005 max TIR

continued on next page

HEV-6



New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

	Cutter Diameter* D1 $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	Shank Diameter D2 (h6)	Corner Radius R $\begin{smallmatrix} +.002" \\ -.002" \end{smallmatrix}$	Length of Cut L2 $\begin{smallmatrix} +.032" \\ -.000" \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +.062" \\ -.062" \end{smallmatrix}$	Flutes	Aplus Coated	Tool Description
new	3/8	3/8	.125	1/2	2	6	87559	HEV-S-60375-R.125
new		3/8	.125	3/4	2-1/2	6	87560	HEV-SR-60375-R.125
new		3/8	.125	1	3	6	87561	HEV-R-60375-R.125
new		3/8	.125	1-1/4	3	6	87562	HEV-M-60375-R.125
	1/2	1/2	.010	5/8	2-1/2	6	83319	HEV-S-60500-R.010
		1/2	.010	1	3	6	82578	HEV-SR-60500-R.010
		1/2	.010	1-1/4	3	6	82579	HEV-R-60500-R.010
		1/2	.010	1-5/8	4	6	86002	HEV-M-60500-R.010
new		1/2	.010	2	4	6	87563	HEV-L-60500-R.010
new		1/2	.010	2-1/2	5	6	87564	HEV-LX-60500-R.010
		1/2	.015	5/8	2-1/2	6	83320	HEV-S-60500-R.015
		1/2	.015	1	3	6	82580	HEV-SR-60500-R.015
		1/2	.015	1-1/4	3	6	82581	HEV-R-60500-R.015
		1/2	.015	1-5/8	4	6	86003	HEV-M-60500-R.015
new		1/2	.015	2	4	6	87565	HEV-L-60500-R.015
new		1/2	.015	2-1/2	5	6	87566	HEV-LX-60500-R.015
new		1/2	.020	5/8	2-1/2	6	87567	HEV-S-60500-R.020
		1/2	.020	1	3	6	82582	HEV-SR-60500-R.020
		1/2	.020	1-1/4	3	6	82583	HEV-R-60500-R.020
new		1/2	.020	2	4	6	87568	HEV-L-60500-R.020
new		1/2	.020	2-1/2	5	6	87569	HEV-LX-60500-R.020
		1/2	.030	5/8	2-1/2	6	59320	HEV-S-60500-R.030
		1/2	.030	1	3	6	59324	HEV-SR-60500-R.030
		1/2	.030	1-1/4	3	6	59328	HEV-R-60500-R.030
		1/2	.030	1-5/8	4	6	59332	HEV-M-60500-R.030
		1/2	.030	2	4	6	59336	HEV-L-60500-R.030
		1/2	.030	2-1/2	5	6	82584	HEV-LX-60500-R.030
		1/2	.030	3-1/8	6	6	86004	HEV-X-60500-R.030
		1/2	.060	5/8	2-1/2	6	59321	HEV-S-60500-R.060
		1/2	.060	1	3	6	59325	HEV-SR-60500-R.060
		1/2	.060	1-1/4	3	6	59329	HEV-R-60500-R.060
		1/2	.060	1-5/8	4	6	59333	HEV-M-60500-R.060
		1/2	.060	2	4	6	59337	HEV-L-60500-R.060
		1/2	.060	2-1/2	5	6	82585	HEV-LX-60500-R.060
		1/2	.090	5/8	2-1/2	6	59322	HEV-S-60500-R.090
		1/2	.090	1	3	6	59326	HEV-SR-60500-R.090
		1/2	.090	1-1/4	3	6	59330	HEV-R-60500-R.090
		1/2	.090	1-5/8	4	6	59334	HEV-M-60500-R.090
		1/2	.090	2	4	6	59338	HEV-L-60500-R.090
		1/2	.090	2-1/2	5	6	82586	HEV-LX-60500-R.090
new		1/2	.120	5/8	2-1/2	6	87570	HEV-S-60500-R.120
new		1/2	.120	1	3	6	87571	HEV-SR-60500-R.120
new		1/2	.120	1-1/4	3	6	87572	HEV-R-60500-R.120
new		1/2	.120	1-5/8	4	6	87573	HEV-M-60500-R.120
	1/2	.125	5/8	2-1/2	6	59323	HEV-S-60500-R.125	
	1/2	.125	1	3	6	59327	HEV-SR-60500-R.125	
	1/2	.125	1-1/4	3	6	59331	HEV-R-60500-R.125	
	1/2	.125	1-5/8	4	6	59335	HEV-M-60500-R.125	
	1/2	.125	2	4	6	59339	HEV-L-60500-R.125	
	1/2	.125	2-1/2	5	6	83321	HEV-LX-60500-R.125	

*.0005 max TIR

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6 FLUTE - CORNER RADIUS

New Items!



HEV-6

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D ₁ ^{+0.001} -0.002	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002} -0.002	Length of Cut L ₂ ^{+0.032} -0.000	Overall Length L ₁ ^{+0.062} -0.062	Flutes	Aplus Coated	Tool Description
5/8	5/8	.030	3/4	3	6	59340	HEV-S-60625-R.030
	5/8	.030	1-1/4	3-1/2	6	59341	HEV-SR-60625-R.030
	5/8	.030	1-5/8	3-1/2	6	59345	HEV-R-60625-R.030
	5/8	.030	2	4	6	59349	HEV-M-60625-R.030
	5/8	.030	2-1/2	5	6	59353	HEV-L-60625-R.030
	5/8	.060	3/4	3	6	87574	HEV-S-60625-R.060
	5/8	.060	1-1/4	3-1/2	6	59342	HEV-SR-60625-R.060
	5/8	.060	1-5/8	3-1/2	6	59346	HEV-R-60625-R.060
	5/8	.060	2	4	6	59350	HEV-M-60625-R.060
	5/8	.060	2-1/2	5	6	87575	HEV-L-60625-R.060
	5/8	.090	1-1/4	3-1/2	6	59343	HEV-SR-60625-R.090
	5/8	.090	1-5/8	3-1/2	6	59347	HEV-R-60625-R.090
	5/8	.090	2	4	6	59351	HEV-M-60625-R.090
	5/8	.125	3/4	3	6	87576	HEV-S-60625-R.125
	5/8	.125	1-1/4	3-1/2	6	59344	HEV-SR-60625-R.125
	5/8	.125	1-5/8	3-1/2	6	59348	HEV-R-60625-R.125
5/8	.125	2	4	6	59352	HEV-M-60625-R.125	
5/8	.125	2-1/2	5	6	86005	HEV-L-60625-R.125	
3/4	3/4	.030	1	3	6	59354	HEV-S-60750-R.030
	3/4	.030	1-5/8	4	6	59360	HEV-R-60750-R.030
	3/4	.030	2-1/4	5	6	59366	HEV-M-60750-R.030
	3/4	.030	2-3/4	5	6	59372	HEV-L-60750-R.030
	3/4	.030	3-1/4	6	6	59378	HEV-LX-60750-R.030
	3/4	.030	4	6-1/2	6	86006	HEV-X-60750-R.030
	3/4	.060	1	3	6	59355	HEV-S-60750-R.060
	3/4	.060	1-5/8	4	6	59361	HEV-R-60750-R.060
	3/4	.060	2-1/4	5	6	59367	HEV-M-60750-R.060
	3/4	.060	2-3/4	5	6	59373	HEV-L-60750-R.060
	3/4	.060	3-1/4	6	6	83322	HEV-LX-60750-R.060
	3/4	.090	1	3	6	59356	HEV-S-60750-R.090
	3/4	.090	1-5/8	4	6	59362	HEV-R-60750-R.090
	3/4	.090	2-1/4	5	6	59368	HEV-M-60750-R.090
	3/4	.090	2-3/4	5	6	59374	HEV-L-60750-R.090
	3/4	.120	1	3	6	87577	HEV-S-60750-R.120
	3/4	.120	1-5/8	4	6	87578	HEV-R-60750-R.120
	3/4	.120	2-1/4	5	6	87579	HEV-M-60750-R.120
	3/4	.125	1	3	6	59357	HEV-S-60750-R.125
	3/4	.125	1-5/8	4	6	59363	HEV-R-60750-R.125
	3/4	.125	2-1/4	5	6	59369	HEV-M-60750-R.125
	3/4	.125	2-3/4	5	6	59375	HEV-L-60750-R.125
	3/4	.190	1	3	6	59358	HEV-S-60750-R.190
	3/4	.190	1-5/8	4	6	59364	HEV-R-60750-R.190
	3/4	.190	2-1/4	5	6	59370	HEV-M-60750-R.190
	3/4	.190	2-3/4	5	6	59376	HEV-L-60750-R.190
	3/4	.250	1	3	6	59359	HEV-S-60750-R.250
	3/4	.250	1-5/8	4	6	59365	HEV-R-60750-R.250
	3/4	.250	2-1/4	5	6	59371	HEV-M-60750-R.250
	3/4	.250	2-3/4	5	6	59377	HEV-L-60750-R.250
	3/4	.250	3-1/4	6	6	83323	HEV-LX-60750-R.250

* .0005 max TIR

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6 Flute

HEV-6



New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

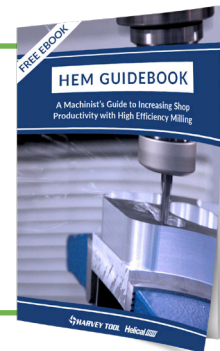
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Cutter Diameter* $D_1^{+.000''}$ $-.002''$	Shank Diameter $D_2 (h6)$	Corner Radius $R^{+.002''}$ $-.002''$	Length of Cut $L_2^{+.032''}$ $-.000''$	Overall Length $L_1^{+.062''}$ $-.062''$	Flutes	Aplus Coated	Tool Description
1	1	.030	2	4-1/2	6	59379	HEV-R-61000-R.030
	1	.030	2-5/8	5	6	59383	HEV-M-61000-R.030
	1	.030	3-1/4	6	6	59387	HEV-L-61000-R.030
	1	.060	2	4-1/2	6	59380	HEV-R-61000-R.060
	1	.060	2-5/8	5	6	59384	HEV-M-61000-R.060
	1	.060	3-1/4	6	6	59388	HEV-L-61000-R.060
	1	.125	2	4-1/2	6	59381	HEV-R-61000-R.125
	1	.125	2-5/8	5	6	59385	HEV-M-61000-R.125
	1	.125	3-1/4	6	6	59389	HEV-L-61000-R.125
	1	.250	2	4-1/2	6	59382	HEV-R-61000-R.250
	1	.250	2-5/8	5	6	59386	HEV-M-61000-R.250
	1	.250	3-1/4	6	6	59390	HEV-L-61000-R.250

*.0005 max TIR

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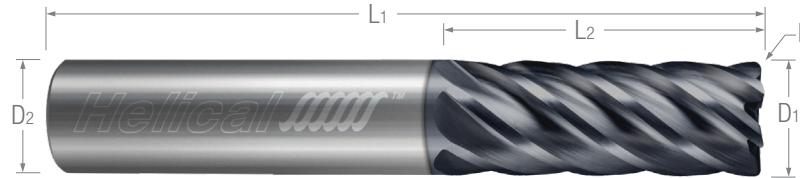
6 FLUTE - CORNER RADIUS - METRIC

Variable Pitch



MHEV-6 METRIC

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 ^{+0.00 mm} / _{-.05 mm}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.05 mm} / _{-.05 mm}	Length of Cut L2 ^{+0.80 mm} / _{-.00 mm}	Overall Length L1 ^{+1.6 mm} / _{-.16 mm}	Flutes	<i>Aplus</i> Coated	Tool Description
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	6	59575	MHEV-015-60600-R0.50
	6.00 mm	.50 mm	12.00 mm	63 mm	6	59593	MHEV-020-60600-R0.50
	6.00 mm	.50 mm	18.00 mm	63 mm	6	59627	MHEV-030-60600-R0.50
	6.00 mm	1.00 mm	9.00 mm	63 mm	6	59576	MHEV-015-60600-R1.00
	6.00 mm	1.00 mm	12.00 mm	63 mm	6	59594	MHEV-020-60600-R1.00
	6.00 mm	1.00 mm	18.00 mm	63 mm	6	59628	MHEV-030-60600-R1.00
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	6	59578	MHEV-015-60800-R0.50
	8.00 mm	.50 mm	16.00 mm	63 mm	6	59596	MHEV-020-60800-R0.50
	8.00 mm	.50 mm	24.00 mm	75 mm	6	59630	MHEV-030-60800-R0.50
	8.00 mm	1.00 mm	12.00 mm	63 mm	6	59579	MHEV-015-60800-R1.00
	8.00 mm	1.00 mm	16.00 mm	63 mm	6	59597	MHEV-020-60800-R1.00
	8.00 mm	1.00 mm	24.00 mm	75 mm	6	59631	MHEV-030-60800-R1.00
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	6	59581	MHEV-015-61000-R0.50
	10.00 mm	.50 mm	20.00 mm	63 mm	6	59599	MHEV-020-61000-R0.50
	10.00 mm	.50 mm	25.00 mm	75 mm	6	59613	MHEV-025-61000-R0.50
	10.00 mm	1.00 mm	15.00 mm	63 mm	6	59582	MHEV-015-61000-R1.00
	10.00 mm	1.00 mm	20.00 mm	63 mm	6	59600	MHEV-020-61000-R1.00
	10.00 mm	1.00 mm	25.00 mm	75 mm	6	59614	MHEV-025-61000-R1.00
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	6	59584	MHEV-015-61200-R0.50
	12.00 mm	.50 mm	24.00 mm	75 mm	6	59602	MHEV-020-61200-R0.50
	12.00 mm	.50 mm	30.00 mm	75 mm	6	59616	MHEV-025-61200-R0.50
	12.00 mm	1.00 mm	18.00 mm	75 mm	6	59585	MHEV-015-61200-R1.00
	12.00 mm	1.00 mm	24.00 mm	75 mm	6	59603	MHEV-020-61200-R1.00
	12.00 mm	1.00 mm	30.00 mm	75 mm	6	59617	MHEV-025-61200-R1.00
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	6	59587	MHEV-015-61600-R0.50
	16.00 mm	.50 mm	32.00 mm	89 mm	6	59605	MHEV-020-61600-R0.50
	16.00 mm	.50 mm	40.00 mm	89 mm	6	59619	MHEV-025-61600-R0.50
	16.00 mm	1.00 mm	24.00 mm	89 mm	6	59588	MHEV-015-61600-R1.00
	16.00 mm	1.00 mm	32.00 mm	89 mm	6	59606	MHEV-020-61600-R1.00
	16.00 mm	1.00 mm	40.00 mm	89 mm	6	59620	MHEV-025-61600-R1.00
20 mm	20.00 mm	.50 mm	30.00 mm	89 mm	6	59590	MHEV-015-62000-R0.50
	20.00 mm	.50 mm	40.00 mm	100 mm	6	59608	MHEV-020-62000-R0.50
	20.00 mm	.50 mm	50.00 mm	125 mm	6	59622	MHEV-025-62000-R0.50
	20.00 mm	1.00 mm	30.00 mm	89 mm	6	59591	MHEV-015-62000-R1.00
	20.00 mm	1.00 mm	40.00 mm	100 mm	6	59609	MHEV-020-62000-R1.00
	20.00 mm	1.00 mm	50.00 mm	125 mm	6	59623	MHEV-025-62000-R1.00
25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	6	59611	MHEV-020-62500-R1.00
	25.00 mm	1.00 mm	64.00 mm	125 mm	6	59625	MHEV-025-62500-R1.00

* .013 mm max TIR

HEV-RN-6



New Items!

6 FLUTE - SQUARE

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 212 for *Tplus* coating



Cutter Dia.* D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Dia. D2 (h6)	Length of Cut L2 $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Reach (LBS) L3	Neck Diameter	Flutes	<i>Aplus</i> Coated	Tool Description
new new new new new new 1/8	1/8	5/32	2	3/8	.118	6	87596	HEV-RN-S-60125
	1/8	5/32	2	5/8	.118	6	87597	HEV-RN-R-60125
	1/8	5/32	2-1/2	1	.118	6	87598	HEV-RN-M-60125
new new new new new new 3/16	3/16	7/32	2	1/2	.178	6	87599	HEV-RN-S-60187
	3/16	7/32	2-1/2	1	.178	6	87600	HEV-RN-R-60187
	3/16	7/32	3	1-1/2	.178	6	87601	HEV-RN-M-60187
1/4	1/4	3/8	4	3/4	.237	6	82597	HEV-RN-S-60250
	1/4	3/8	4	1-1/8	.237	6	82598	HEV-RN-R-60250
	1/4	3/8	4	2-1/8	.237	6	82599	HEV-RN-M-60250
3/8	3/8	1/2	4	1-1/8	.356	6	82600	HEV-RN-S-60375
	3/8	1/2	4	2-1/8	.356	6	82601	HEV-RN-R-60375
	3/8	1/2	6	3-1/8	.356	6	82602	HEV-RN-M-60375
1/2	1/2	5/8	4	1-1/2	.475	6	82603	HEV-RN-S-60500
	1/2	5/8	4	2-1/4	.475	6	82604	HEV-RN-R-60500
	1/2	5/8	6	3-3/8	.475	6	82605	HEV-RN-M-60500
	1/2	5/8	6	4-1/8	.475	6	82606	HEV-RN-L-60500
3/4	3/4	1	4	2	.712	6	82607	HEV-RN-S-60750
	3/4	1	6	2-1/2	.712	6	82608	HEV-RN-R-60750
	3/4	1	6	3-3/8	.712	6	82609	HEV-RN-M-60750

*.0005 max TIR



Speeds & Feeds on Page 152

6 FLUTE - BALL New Items!



HEV-RN-6

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 213 for *Tplus* coating



Cutter Dia.* D1 ^{+0.001} / _{-.002} "	Shank Dia. D2 (h6)	Length of Cut L2 ^{+0.032} / _{-.000} "	Overall Length L1 ^{+0.062} / _{-.062} "	Reach (LBS) L3	Neck Diameter	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	5/32	2	3/8	.118	6	87602	HEV-RN-S-60125-BN
	1/8	5/32	2	5/8	.118	6	87603	HEV-RN-R-60125-BN
	1/8	5/32	2-1/2	1	.118	6	87604	HEV-RN-M-60125-BN
3/16	3/16	7/32	2	1/2	.178	6	87605	HEV-RN-S-60187-BN
	3/16	7/32	2-1/2	1	.178	6	87606	HEV-RN-R-60187-BN
	3/16	7/32	3	1-1/2	.178	6	87607	HEV-RN-M-60187-BN
1/4	1/4	3/8	4	3/4	.237	6	82634	HEV-RN-S-60250-BN
	1/4	3/8	4	1-1/8	.237	6	82635	HEV-RN-R-60250-BN
	1/4	3/8	4	2-1/8	.237	6	82636	HEV-RN-M-60250-BN
3/8	3/8	1/2	4	1-1/8	.356	6	82637	HEV-RN-S-60375-BN
	3/8	1/2	4	2-1/8	.356	6	82638	HEV-RN-R-60375-BN
	3/8	1/2	6	3-1/8	.356	6	82639	HEV-RN-M-60375-BN
1/2	1/2	5/8	4	1-1/2	.475	6	82640	HEV-RN-S-60500-BN
	1/2	5/8	4	2-1/4	.475	6	82641	HEV-RN-R-60500-BN
	1/2	5/8	6	3-3/8	.475	6	82642	HEV-RN-M-60500-BN
	1/2	5/8	6	4-1/8	.475	6	82643	HEV-RN-L-60500-BN
3/4	3/4	1	4	2	.712	6	82644	HEV-RN-S-60750-BN
	3/4	1	6	2-1/2	.712	6	82645	HEV-RN-R-60750-BN
	3/4	1	6	3-3/8	.712	6	82646	HEV-RN-M-60750-BN

new
new
new
new
new
new

*.0005 max TIR

HEV-RN-6



6 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 214 for *Tplus* coating



Cutter Dia.* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Dia. D_2 (h6)	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	LOC $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	OAL $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Reach (LBS) L_3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.020	3/8	4	3/4	.237	6	82610	HEV-RN-S-60250-R.020
	1/4	.020	3/8	4	1-1/8	.237	6	82611	HEV-RN-R-60250-R.020
	1/4	.020	3/8	4	2-1/8	.237	6	82612	HEV-RN-M-60250-R.020
3/8	3/8	.020	1/2	4	1-1/8	.356	6	82613	HEV-RN-S-60375-R.020
	3/8	.020	1/2	4	2-1/8	.356	6	82614	HEV-RN-R-60375-R.020
	3/8	.020	1/2	6	3-1/8	.356	6	82615	HEV-RN-M-60375-R.020
1/2	1/2	.030	5/8	4	1-1/2	.475	6	82616	HEV-RN-S-60500-R.030
	1/2	.030	5/8	4	2-1/4	.475	6	82617	HEV-RN-R-60500-R.030
	1/2	.030	5/8	6	3-3/8	.475	6	82618	HEV-RN-M-60500-R.030
	1/2	.030	5/8	6	4-1/8	.475	6	82619	HEV-RN-L-60500-R.030
	1/2	.060	5/8	4	1-1/2	.475	6	82620	HEV-RN-S-60500-R.060
	1/2	.060	5/8	4	2-1/4	.475	6	82621	HEV-RN-R-60500-R.060
	1/2	.060	5/8	6	3-3/8	.475	6	82622	HEV-RN-M-60500-R.060
	1/2	.060	5/8	6	4-1/8	.475	6	82623	HEV-RN-L-60500-R.060
	1/2	.125	5/8	4	1-1/2	.475	6	82624	HEV-RN-S-60500-R.125
	1/2	.125	5/8	4	2-1/4	.475	6	82625	HEV-RN-R-60500-R.125
	1/2	.125	5/8	6	3-3/8	.475	6	82626	HEV-RN-M-60500-R.125
3/4	3/4	.030	1	4	2	.712	6	82628	HEV-RN-S-60750-R.030
	3/4	.030	1	6	2-1/2	.712	6	82629	HEV-RN-R-60750-R.030
	3/4	.030	1	6	3-3/8	.712	6	82630	HEV-RN-M-60750-R.030
	3/4	.060	1	4	2	.712	6	82631	HEV-RN-S-60750-R.060
	3/4	.060	1	6	2-1/2	.712	6	82632	HEV-RN-R-60750-R.060
	3/4	.060	1	6	3-3/8	.712	6	82633	HEV-RN-M-60750-R.060

* .0005 max TIR



SPEEDS & FEEDS

6 Flute - Variable Pitch



HEV-6

HEV-6 / HEV-RN-6																	
Material Guide		Hardness	SFM	1/8		3/16		1/4		3/8		1/2		3/4		1	
				Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin
				CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB 75 - 98 HRB 21 - 36 HRC	455 445 400	.0014 .0010 .0007	.0017 .0014 .0012	.0020 .0015 .0010	.0019 .0016 .0013	.0028 .0020 .0013	.0022 .0018 .0015	.0041 .0030 .0020	.0025 .0021 .0017	.0054 .0039 .0025	.0029 .0025 .0020
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC > 50 HRC	390 340 260 155	.0009 .0007 .0006 .0005	.0013 .0011 .0011 .0010	.0013 .0010 .0008 .0007	.0015 .0013 .0012 .0011	.0018 .0013 .0011 .0009	.0017 .0015 .0014 .0012	.0026 .0020 .0017 .0013	.0020 .0019 .0016 .0014	.0034 .0025 .0022 .0017	.0023 .0020 .0018 .0016	.0049 .0036 .0032 .0025	.0027 .0023 .0022 .0019	.0063 .0047 .0041 .0032	.0033 .0028 .0027 .0024
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC > 50 HRC	340 250 145 85	.0009 .0007 .0006 .0005	.0013 .0012 .0011 .0010	.0013 .0010 .0008 .0007	.0015 .0013 .0012 .0011	.0018 .0014 .0011 .0009	.0017 .0015 .0014 .0012	.0026 .0020 .0016 .0013	.0020 .0017 .0015 .0014	.0034 .0027 .0021 .0017	.0023 .0020 .0018 .0016	.0049 .0039 .0030 .0025	.0027 .0024 .0022 .0019	.0063 .0050 .0039 .0032	.0033 .0029 .0026 .0023
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB 75 - 98 HRB 21 - 36 HRC 36 - 50 HRC > 50 HRC	290 255 175 150 55	.0012 .0008 .0007 .0006 .0004	.0015 .0013 .0012 .0011 .0009	.0017 .0012 .0010 .0009 .0006	.0017 .0014 .0013 .0013 .0010	.0023 .0016 .0014 .0013 .0008	.0020 .0016 .0015 .0014 .0011	.0034 .0023 .0021 .0019 .0012	.0022 .0019 .0018 .0017 .0013	.0045 .0031 .0027 .0025 .0015	.0026 .0022 .0020 .0019 .0015	.0064 .0044 .0039 .0035 .0022	.0031 .0026 .0025 .0023 .0018	.0082 .0056 .0051 .0045 .0028	.0038 .0031 .0030 .0028 .0022
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	265 225 180	.0009 .0008 .0006	.0013 .0013 .0011	.0013 .0011 .0009	.0015 .0014 .0012	.0017 .0015 .0012	.0017 .0016 .0014	.0025 .0023 .0018	.0019 .0018 .0016	.0033 .0030 .0024	.0023 .0021 .0019	.0048 .0043 .0034	.0027 .0026 .0023	.0061 .0055 .0044	.0033 .0031 .0028
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB 21 - 36 HRC	300 280	.0009 .0008	.0013 .0013	.0013 .0011	.0015 .0014	.0018 .0015	.0017 .0016	.0026 .0023	.0020 .0018	.0034 .0030	.0023 .0021	.0049 .0043	.0027 .0025	.0063 .0055	.0033 .0031
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC 36 - 50 HRC	200 145	.0007 .0006	.0011 .0011	.0010 .0008	.0013 .0012	.0013 .0011	.0015 .0014	.0019 .0017	.0017 .0016	.0025 .0022	.0020 .0018	.0036 .0031	.0023 .0022	.0046 .0040	.0028 .0027
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB 21 - 36 HRC	410 370	.0014 .0008	.0017 .0013	.0021 .0011	.0019 .0014	.0029 .0015	.0022 .0016	.0042 .0023	.0025 .0018	.0055 .0030	.0029 .0021	.0079 .0043	.0035 .0025	.0102 .0055	.0042 .0031
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB 21 - 36 HRC	345 335	.0009 .0008	.0014 .0013	.0013 .0011	.0015 .0014	.0018 .0016	.0017 .0016	.0027 .0023	.0020 .0018	.0035 .0030	.0023 .0021	.0050 .0043	.0028 .0026	.0065 .0056	.0034 .0031
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	310 260 135	.0009 .0006 .0004	.0014 .0011 .0009	.0014 .0009 .0006	.0015 .0013 .0010	.0019 .0012 .0008	.0018 .0014 .0011	.0028 .0019 .0012	.0020 .0019 .0017	.0036 .0024 .0015	.0024 .0019 .0015	.0052 .0035 .0022	.0028 .0023 .0018	.0067 .0044 .0028	.0034 .0028 .0022
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB 75 - 98 HRB	285 250	.0012 .0010	.0016 .0014	.0018 .0015	.0018 .0016	.0024 .0020	.0020 .0018	.0036 .0030	.0023 .0021	.0047 .0039	.0027 .0025	.0067 .0056	.0032 .0029	.0086 .0072	.0039 .0036
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	80 75 70	.0006 .0006 .0005	.0011 .0011 .0010	.0009 .0009 .0007	.0013 .0012 .0011	.0012 .0012 .0010	.0014 .0014 .0013	.0018 .0017 .0015	.0016 .0016 .0015	.0024 .0023 .0020	.0019 .0019 .0017	.0034 .0033 .0028	.0023 .0023 .0021	.0044 .0042 .0036	.0028 .0027 .0025
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB 75 - 98 HRB 21 - 36 HRC	300 275 250	.0017 .0014 .0011	.0019 .0017 .0015	.0024 .0021 .0015	.0021 .0019 .0017	.0033 .0028 .0021	.0024 .0022 .0019	.0049 .0041 .0031	.0027 .0025 .0022	.0065 .0054 .0041	.0032 .0029 .0025	.0093 .0078 .0058	.0038 .0035 .0030	.0119 .0100 .0075	.0046 .0042 .0036
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC 36 - 50 HRC	180 160	.0009 .0008	.0013 .0012	.0012 .0011	.0015 .0014	.0017 .0015	.0017 .0016	.0024 .0022	.0019 .0018	.0032 .0029	.0022 .0021	.0046 .0042	.0027 .0025	.0059 .0054	.0032 .0031
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB 21 - 36 HRC 36 - 50 HRC	210 170 65	.0007 .0007 .0005	.0012 .0012 .0010	.0010 .0010 .0007	.0013 .0013 .0011	.0014 .0014 .0009	.0015 .0015 .0012	.0021 .0020 .0014	.0018 .0017 .0014	.0027 .0026 .0018	.0021 .0020 .0017	.0039 .0038 .0025	.0024 .0024 .0020	.0050 .0048 .0033	.0030 .0029 .0024

6 Flute

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	15%-25% Diameter
	≥ 35 HRC	Up to Max LOC	10%-20% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:
 Hardness Scales: HRB = Rockwell B
 HRC = Rockwell C
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

HEV-7

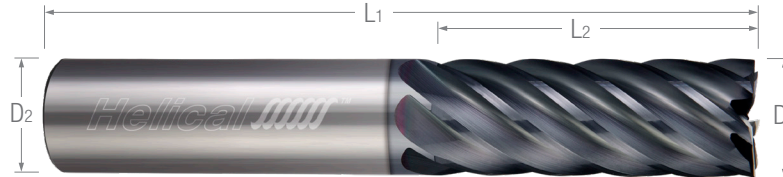


7 FLUTE - SQUARE

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 215 for *Tplus* coating



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1^{+.000/-0.002}$	D_2 (h6)	$L_2^{+.032/-0.000}$	$L_1^{+.062/-0.062}$			
1/8	1/8	1/4	1-1/2	7	84414	HEV-S-70125
	1/8	3/8	2	7	84415	HEV-SR-70125
	1/8	1/2	2-1/2	7	84416	HEV-R-70125
	1/8	5/8	2-1/2	7	84417	HEV-A-70125
3/16	3/16	5/16	2	7	84418	HEV-S-70187
	3/16	7/16	2	7	84419	HEV-SR-70187
	3/16	9/16	2-1/2	7	84420	HEV-R-70187
	3/16	3/4	2-1/2	7	84421	HEV-M-70187
1/4	1/4	3/8	2	7	26107	HEV-S-70250
	1/4	1/2	2	7	26122	HEV-SR-70250
	1/4	3/4	2-1/2	7	26137	HEV-R-70250
	1/4	1	3	7	26152	HEV-M-70250
	1/4	1-1/4	3	7	82647	HEV-L-70250
5/16	5/16	7/16	2	7	82648	HEV-S-70312
	5/16	3/4	2-1/2	7	82649	HEV-R-70312
	5/16	1	3	7	82650	HEV-M-70312
3/8	3/8	1/2	2	7	26212	HEV-S-70375
	3/8	3/4	2-1/2	7	26227	HEV-SR-70375
	3/8	1	2-1/2	7	26242	HEV-R-70375
	3/8	1-1/2	3-1/2	7	26247	HEV-L-70375
	3/8	2	4	7	82651	HEV-LX-70375
1/2	1/2	5/8	2-1/2	7	26257	HEV-S-70500
	1/2	1	3	7	26272	HEV-SR-70500
	1/2	1-1/4	3	7	26287	HEV-R-70500
	1/2	1-5/8	4	7	26302	HEV-M-70500
	1/2	2	4	7	26307	HEV-L-70500
	1/2	2-1/2	5	7	82652	HEV-LX-70500
	1/2	3-1/8	6	7	82653	HEV-X-70500
5/8	5/8	3/4	3	7	26317	HEV-S-70625
	5/8	1-1/4	3-1/2	7	26322	HEV-SR-70625
	5/8	1-5/8	4	7	26332	HEV-R-70625
	5/8	2-1/8	4	7	26347	HEV-M-70625
	5/8	2-1/2	5	7	83373	HEV-L-70625

*.0005 max TIR

continued on next page

7 FLUTE - SQUARE

Variable Pitch (cont.)

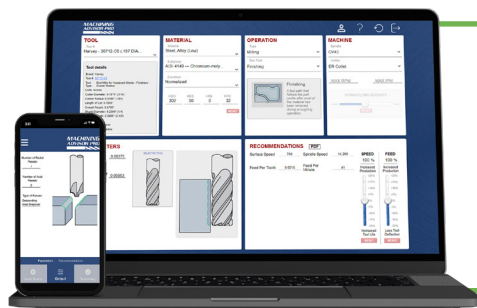


HEV-7

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Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Aplus Coated	Tool Description
3/4	3/4	1	3	7	26362	HEV-S-70750
	3/4	1-1/4	3-1/2	7	26367	HEV-SR-70750
	3/4	1-5/8	4	7	26377	HEV-R-70750
	3/4	2-1/4	5	7	26392	HEV-M-70750
	3/4	2-3/4	5	7	83374	HEV-L-70750
	3/4	3-1/4	6	7	82654	HEV-LX-70750
1	1	1-1/4	4	7	26407	HEV-S-71000
	1	2	5	7	26422	HEV-R-71000
	1	3-1/4	6	7	26442	HEV-L-71000

* .0005 max TIR



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MHEV-7

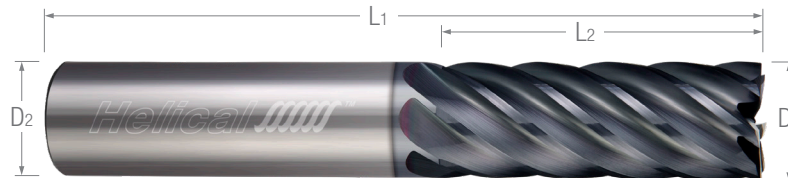
METRIC



7 FLUTE - SQUARE - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.00 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	$D_2 \text{ (h6)}$	$L_2 \begin{smallmatrix} +.80 \text{ mm} \\ -.00 \text{ mm} \end{smallmatrix}$	$L_1 \begin{smallmatrix} +1.60 \text{ mm} \\ -1.60 \text{ mm} \end{smallmatrix}$			
6 mm	6.00 mm	9.00 mm	63 mm	7	59632	MHEV-015-70600
	6.00 mm	12.00 mm	63 mm	7	59650	MHEV-020-70600
	6.00 mm	18.00 mm	63 mm	7	59684	MHEV-030-70600
8 mm	8.00 mm	12.00 mm	63 mm	7	59635	MHEV-015-70800
	8.00 mm	16.00 mm	63 mm	7	59653	MHEV-020-70800
	8.00 mm	24.00 mm	75 mm	7	59687	MHEV-030-70800
10 mm	10.00 mm	15.00 mm	63 mm	7	59638	MHEV-015-71000
	10.00 mm	20.00 mm	63 mm	7	59656	MHEV-020-71000
	10.00 mm	25.00 mm	75 mm	7	59670	MHEV-025-71000
12 mm	12.00 mm	18.00 mm	75 mm	7	59641	MHEV-015-71200
	12.00 mm	24.00 mm	75 mm	7	59659	MHEV-020-71200
	12.00 mm	30.00 mm	75 mm	7	59673	MHEV-025-71200
16 mm	16.00 mm	24.00 mm	89 mm	7	59644	MHEV-015-71600
	16.00 mm	32.00 mm	89 mm	7	59662	MHEV-020-71600
	16.00 mm	40.00 mm	89 mm	7	59676	MHEV-025-71600
20 mm	20.00 mm	30.00 mm	89 mm	7	59647	MHEV-015-72000
	20.00 mm	40.00 mm	100 mm	7	59665	MHEV-020-72000
	20.00 mm	50.00 mm	125 mm	7	59679	MHEV-025-72000
25 mm	25.00 mm	50.00 mm	125 mm	7	59668	MHEV-020-72500
	25.00 mm	64.00 mm	125 mm	7	59682	MHEV-025-72500

* .013 mm max TIR

7 FLUTE - CORNER RADIUS

New Items!

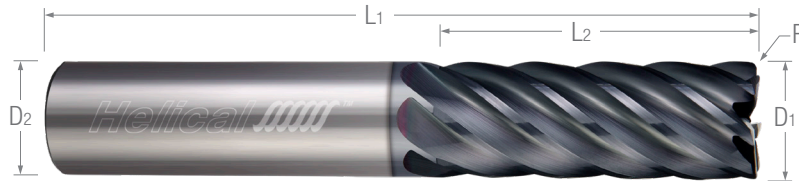


HEV-7

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 216 for *Tplus* coating



Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	7	84422	HEV-S-70125-R.010
	1/8	.010	3/8	2	7	84423	HEV-SR-70125-R.010
	1/8	.010	1/2	2-1/2	7	84424	HEV-R-70125-R.010
	1/8	.010	5/8	2-1/2	7	84425	HEV-A-70125-R.010
	1/8	.030	1/4	1-1/2	7	84426	HEV-S-70125-R.030
	1/8	.030	3/8	2	7	84427	HEV-SR-70125-R.030
	1/8	.030	1/2	2-1/2	7	84428	HEV-R-70125-R.030
	1/8	.030	5/8	2-1/2	7	84429	HEV-A-70125-R.030
3/16	3/16	.010	5/16	2	7	84430	HEV-S-70187-R.010
	3/16	.010	7/16	2	7	84431	HEV-SR-70187-R.010
	3/16	.010	9/16	2-1/2	7	84432	HEV-R-70187-R.010
	3/16	.010	3/4	2-1/2	7	84433	HEV-M-70187-R.010
	3/16	.030	5/16	2	7	84434	HEV-S-70187-R.030
	3/16	.030	7/16	2	7	84435	HEV-SR-70187-R.030
	3/16	.030	9/16	2-1/2	7	84436	HEV-R-70187-R.030
	3/16	.030	3/4	2-1/2	7	84437	HEV-M-70187-R.030
1/4	1/4	.010	3/8	2	7	83376	HEV-S-70250-R.010
	1/4	.010	1/2	2	7	83377	HEV-SR-70250-R.010
	1/4	.010	3/4	2-1/2	7	83378	HEV-R-70250-R.010
	1/4	.010	1	3	7	83379	HEV-M-70250-R.010
	1/4	.010	1-1/4	3	7	86040	HEV-L-70250-R.010
	1/4	.020	3/8	2	7	27107	HEV-S-70250-R.020
	1/4	.020	1/2	2	7	27122	HEV-SR-70250-R.020
	1/4	.020	3/4	2-1/2	7	27137	HEV-R-70250-R.020
	1/4	.020	1	3	7	27152	HEV-M-70250-R.020
	1/4	.020	1-1/4	3	7	82655	HEV-L-70250-R.020
	1/4	.020	1-1/2	3	7	86041	HEV-LX-70250-R.020
	1/4	.030	3/8	2	7	87106	HEV-S-70250-R.030
	1/4	.030	1/2	2	7	87107	HEV-SR-70250-R.030
	1/4	.030	3/4	2-1/2	7	87108	HEV-R-70250-R.030
	1/4	.030	1	3	7	87109	HEV-M-70250-R.030
	1/4	.030	1-1/4	3	7	87110	HEV-L-70250-R.030
	1/4	.060	3/8	2	7	81807	HEV-S-70250-R.060
	1/4	.060	1/2	2	7	81808	HEV-SR-70250-R.060
	1/4	.060	3/4	2-1/2	7	81809	HEV-R-70250-R.060
	1/4	.060	1	3	7	81810	HEV-M-70250-R.060
1/4	.060	1-1/4	3	7	87111	HEV-L-70250-R.060	

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*.0005 max TIR

continued on next page

HEV-7



New Items!

7 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description	
$D_1^{+.000^*}_{-.002^*}$	$D_2 (h6)$	$R^{+.002^*}_{-.002^*}$	$L_2^{+.032^*}_{-.000^*}$	$L_1^{+.062^*}_{-.062^*}$				
3/8	3/8	.010	1/2	2	7	83380	HEV-S-70375-R.010	
	3/8	.010	3/4	2-1/2	7	83381	HEV-SR-70375-R.010	
	3/8	.010	1	2-1/2	7	83382	HEV-R-70375-R.010	
	3/8	.010	1-1/4	3	7	86042	HEV-M-70375-R.010	
	3/8	.010	1-1/2	3-1/2	7	83383	HEV-L-70375-R.010	
	3/8	.020	1/2	2	7	27212	HEV-S-70375-R.020	
	3/8	.020	3/4	2-1/2	7	27227	HEV-SR-70375-R.020	
	3/8	.020	1	2-1/2	7	27242	HEV-R-70375-R.020	
	new	3/8	.020	1-1/4	3	87112	HEV-M-70375-R.020	
	3/8	.020	1-1/2	3-1/2	7	27247	HEV-L-70375-R.020	
	3/8	.020	2	4	7	82656	HEV-LX-70375-R.020	
	new	3/8	.030	1/2	2	87113	HEV-S-70375-R.030	
	new	3/8	.030	3/4	2-1/2	7	87114	HEV-SR-70375-R.030
	new	3/8	.030	1	2-1/2	7	87115	HEV-R-70375-R.030
	new	3/8	.030	1-1/4	3	7	87116	HEV-M-70375-R.030
	new	3/8	.030	1-1/2	3-1/2	7	87117	HEV-L-70375-R.030
	3/8	.060	1/2	2	7	81811	HEV-S-70375-R.060	
	3/8	.060	3/4	2-1/2	7	81812	HEV-SR-70375-R.060	
	3/8	.060	1	2-1/2	7	81813	HEV-R-70375-R.060	
	new	3/8	.060	1-1/4	3	87118	HEV-M-70375-R.060	
	new	3/8	.060	1-1/2	3-1/2	7	87119	HEV-L-70375-R.060
	new	3/8	.125	1/2	2	7	87120	HEV-S-70375-R.125
	new	3/8	.125	3/4	2-1/2	7	87121	HEV-SR-70375-R.125
	new	3/8	.125	1	2-1/2	7	87122	HEV-R-70375-R.125
new	3/8	.125	1-1/4	3	7	87123	HEV-M-70375-R.125	
new	3/8	.125	1-1/2	3-1/2	7	87124	HEV-L-70375-R.125	
1/2	1/2	.010	5/8	2-1/2	7	83384	HEV-S-70500-R.010	
	1/2	.010	1	3	7	83385	HEV-SR-70500-R.010	
	1/2	.010	1-1/4	3	7	83386	HEV-R-70500-R.010	
	1/2	.010	1-5/8	4	7	83387	HEV-M-70500-R.010	
	1/2	.010	2	4	7	83388	HEV-L-70500-R.010	
	new	1/2	.010	2-1/2	5	87125	HEV-LX-70500-R.010	
	1/2	.020	5/8	2-1/2	7	81814	HEV-S-70500-R.020	
	1/2	.020	1	3	7	81815	HEV-SR-70500-R.020	
	1/2	.020	1-1/4	3	7	81816	HEV-R-70500-R.020	
	1/2	.020	1-5/8	4	7	81817	HEV-M-70500-R.020	
	1/2	.020	2	4	7	81818	HEV-L-70500-R.020	
	new	1/2	.020	2-1/2	5	87126	HEV-LX-70500-R.020	
	1/2	.030	5/8	2-1/2	7	27257	HEV-S-70500-R.030	
	1/2	.030	1	3	7	27272	HEV-SR-70500-R.030	
	1/2	.030	1-1/4	3	7	27287	HEV-R-70500-R.030	
	1/2	.030	1-5/8	4	7	27302	HEV-M-70500-R.030	
	1/2	.030	2	4	7	27307	HEV-L-70500-R.030	
	1/2	.030	2-1/2	5	7	82657	HEV-LX-70500-R.030	
1/2	.030	3-1/8	6	7	82658	HEV-X-70500-R.030		

*.0005 max TIR

continued on next page



Speeds & Feeds on Page 163

7 FLUTE - CORNER RADIUS

New Items!



HEV-7

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.00"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.02"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Aplus Coated	Tool Description
1/2	1/2	.060	5/8	2-1/2	7	81819	HEV-S-70500-R.060
	1/2	.060	1	3	7	81820	HEV-SR-70500-R.060
	1/2	.060	1-1/4	3	7	81821	HEV-R-70500-R.060
	1/2	.060	1-5/8	4	7	81822	HEV-M-70500-R.060
	1/2	.060	2	4	7	81823	HEV-L-70500-R.060
	1/2	.060	2-1/2	5	7	87127	HEV-LX-70500-R.060
	1/2	.125	5/8	2-1/2	7	87128	HEV-S-70500-R.125
	1/2	.125	1	3	7	87129	HEV-SR-70500-R.125
	1/2	.125	1-1/4	3	7	87130	HEV-R-70500-R.125
	1/2	.125	1-5/8	4	7	87131	HEV-M-70500-R.125
1/2	.125	2	4	7	87132	HEV-L-70500-R.125	
5/8	5/8	.010	3/4	3	7	87133	HEV-S-70625-R.010
	5/8	.010	1-1/4	3-1/2	7	87134	HEV-SR-70625-R.010
	5/8	.010	1-5/8	4	7	87135	HEV-R-70625-R.010
	5/8	.010	2-1/8	4	7	87136	HEV-M-70625-R.010
	5/8	.030	3/4	3	7	27317	HEV-S-70625-R.030
	5/8	.030	1-1/4	3-1/2	7	27322	HEV-SR-70625-R.030
	5/8	.030	1-5/8	4	7	27332	HEV-R-70625-R.030
	5/8	.030	2-1/8	4	7	27347	HEV-M-70625-R.030
	5/8	.030	2-1/2	5	7	82659	HEV-L-70625-R.030
	5/8	.060	3/4	3	7	86043	HEV-S-70625-R.060
	5/8	.060	1-1/4	3-1/2	7	81824	HEV-SR-70625-R.060
	5/8	.060	1-5/8	4	7	81825	HEV-R-70625-R.060
5/8	.060	2-1/8	4	7	86044	HEV-M-70625-R.060	
3/4	3/4	.030	1	3	7	27362	HEV-S-70750-R.030
	3/4	.030	1-1/4	3-1/2	7	27367	HEV-SR-70750-R.030
	3/4	.030	1-5/8	4	7	27377	HEV-R-70750-R.030
	3/4	.030	2-1/4	5	7	27392	HEV-M-70750-R.030
	3/4	.030	2-3/4	5	7	82660	HEV-L-70750-R.030
	3/4	.030	3-1/4	6	7	82661	HEV-LX-70750-R.030
	3/4	.060	1	3	7	81826	HEV-S-70750-R.060
	3/4	.060	1-5/8	4	7	81827	HEV-R-70750-R.060
	3/4	.060	2-1/4	5	7	81828	HEV-M-70750-R.060
	3/4	.060	2-3/4	5	7	86045	HEV-L-70750-R.060
	3/4	.060	3-1/4	6	7	87137	HEV-LX-70750-R.060
	3/4	.125	1	3	7	87138	HEV-S-70750-R.125
	3/4	.125	1-5/8	4	7	87139	HEV-R-70750-R.125
	3/4	.125	2-1/4	5	7	87140	HEV-M-70750-R.125
	3/4	.250	1	3	7	87141	HEV-S-70750-R.250
	3/4	.250	1-5/8	4	7	87142	HEV-R-70750-R.250
	3/4	.250	2-1/4	5	7	87143	HEV-M-70750-R.250
1	1	.030	1-1/4	4	7	27407	HEV-S-71000-R.030
	1	.030	2	5	7	27422	HEV-R-71000-R.030
	1	.030	2-5/8	5	7	86046	HEV-M-71000-R.030
	1	.030	3-1/4	6	7	27442	HEV-L-71000-R.030
	1	.030	4-1/4	7	7	86047	HEV-X-71000-R.030

* .0005 max TIR

MHEV-7

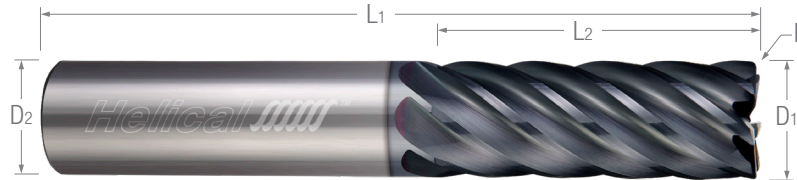
METRIC



7 FLUTE - CORNER RADIUS - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 $\begin{smallmatrix} +.00 \\ -.05 \end{smallmatrix}$ mm	Shank Diameter D2 (h6)	Corner Radius R $\begin{smallmatrix} +.05 \\ -.05 \end{smallmatrix}$ mm	Length of Cut L2 $\begin{smallmatrix} +.80 \\ -.00 \end{smallmatrix}$ mm	Overall Length L1 $\begin{smallmatrix} +1.60 \\ -1.60 \end{smallmatrix}$ mm	Flutes	<i>Aplus</i> Coated	Tool Description
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	7	59633	MHEV-015-70600-R0.50
	6.00 mm	.50 mm	12.00 mm	63 mm	7	59651	MHEV-020-70600-R0.50
	6.00 mm	.50 mm	18.00 mm	63 mm	7	59685	MHEV-030-70600-R0.50
	6.00 mm	1.00 mm	9.00 mm	63 mm	7	59634	MHEV-015-70600-R1.00
	6.00 mm	1.00 mm	12.00 mm	63 mm	7	59652	MHEV-020-70600-R1.00
	6.00 mm	1.00 mm	18.00 mm	63 mm	7	59686	MHEV-030-70600-R1.00
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	7	59636	MHEV-015-70800-R0.50
	8.00 mm	.50 mm	16.00 mm	63 mm	7	59654	MHEV-020-70800-R0.50
	8.00 mm	.50 mm	24.00 mm	75 mm	7	59688	MHEV-030-70800-R0.50
	8.00 mm	1.00 mm	12.00 mm	63 mm	7	59637	MHEV-015-70800-R1.00
	8.00 mm	1.00 mm	16.00 mm	63 mm	7	59655	MHEV-020-70800-R1.00
	8.00 mm	1.00 mm	24.00 mm	75 mm	7	59689	MHEV-030-70800-R1.00
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	7	59639	MHEV-015-71000-R0.50
	10.00 mm	.50 mm	20.00 mm	63 mm	7	59657	MHEV-020-71000-R0.50
	10.00 mm	.50 mm	25.00 mm	75 mm	7	59671	MHEV-025-71000-R0.50
	10.00 mm	1.00 mm	15.00 mm	63 mm	7	59640	MHEV-015-71000-R1.00
	10.00 mm	1.00 mm	20.00 mm	63 mm	7	59658	MHEV-020-71000-R1.00
	10.00 mm	1.00 mm	25.00 mm	75 mm	7	59672	MHEV-025-71000-R1.00
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	7	59642	MHEV-015-71200-R0.50
	12.00 mm	.50 mm	24.00 mm	75 mm	7	59660	MHEV-020-71200-R0.50
	12.00 mm	.50 mm	30.00 mm	75 mm	7	59674	MHEV-025-71200-R0.50
	12.00 mm	1.00 mm	18.00 mm	75 mm	7	59643	MHEV-015-71200-R1.00
	12.00 mm	1.00 mm	24.00 mm	75 mm	7	59661	MHEV-020-71200-R1.00
	12.00 mm	1.00 mm	30.00 mm	75 mm	7	59675	MHEV-025-71200-R1.00
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	7	59645	MHEV-015-71600-R0.50
	16.00 mm	.50 mm	32.00 mm	89 mm	7	59663	MHEV-020-71600-R0.50
	16.00 mm	.50 mm	40.00 mm	89 mm	7	59677	MHEV-025-71600-R0.50
	16.00 mm	1.00 mm	24.00 mm	89 mm	7	59646	MHEV-015-71600-R1.00
	16.00 mm	1.00 mm	32.00 mm	89 mm	7	59664	MHEV-020-71600-R1.00
	16.00 mm	1.00 mm	40.00 mm	89 mm	7	59678	MHEV-025-71600-R1.00

* .013 mm max TIR

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7 FLUTE - CORNER RADIUS - METRIC

Variable Pitch (cont.)



MHEV-7

METRIC

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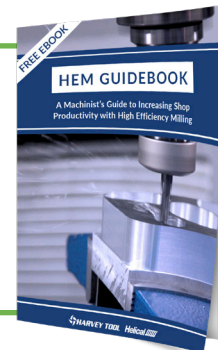
Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
$D_1 \begin{smallmatrix} +.00 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	$D_2 \text{ (h6)}$	$R \begin{smallmatrix} +.05 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.80 \text{ mm} \\ -.00 \text{ mm} \end{smallmatrix}$	$L_1 \begin{smallmatrix} +1.60 \text{ mm} \\ -1.60 \text{ mm} \end{smallmatrix}$			
20 mm	20.00 mm	.50 mm	30.00 mm	89 mm	7	59648	MHEV-015-72000-R0.50
	20.00 mm	.50 mm	40.00 mm	100 mm	7	59666	MHEV-020-72000-R0.50
	20.00 mm	.50 mm	50.00 mm	125 mm	7	59680	MHEV-025-72000-R0.50
	20.00 mm	1.00 mm	30.00 mm	89 mm	7	59649	MHEV-015-72000-R1.00
	20.00 mm	1.00 mm	40.00 mm	100 mm	7	59667	MHEV-020-72000-R1.00
	20.00 mm	1.00 mm	50.00 mm	125 mm	7	59681	MHEV-025-72000-R1.00
25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	7	59669	MHEV-020-72500-R1.00
	25.00 mm	1.00 mm	64.00 mm	125 mm	7	59683	MHEV-025-72500-R1.00

* .013 mm max TIR

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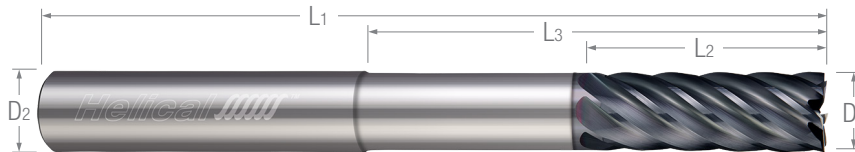
HEV-RN-7



7 FLUTE - SQUARE

Variable Pitch – Reduced Neck

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in deep pocket High Efficiency Milling (HEM) applications
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Dia. D_2 (h6)	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Reach (LBS) L_3	Neck Diameter	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	3/4	4	1-1/8	.237	7	83045	HEV-RNR-R-70250
	1/4	3/4	4	2-1/8	.237	7	83046	HEV-RNR-M-70250
3/8	3/8	1	4	2-1/8	.356	7	83047	HEV-RNR-R-70375
	3/8	1	6	3-1/8	.356	7	83048	HEV-RNR-M-70375
1/2	1/2	1-1/4	4	2-1/4	.475	7	83049	HEV-RNR-R-70500
	1/2	1-1/4	6	3-3/8	.475	7	83050	HEV-RNR-M-70500
	1/2	1-1/4	6	4-1/8	.475	7	83051	HEV-RNR-L-70500
3/4	3/4	1-5/8	6	2-1/2	.712	7	83052	HEV-RNR-R-70750
	3/4	1-5/8	6	3-3/8	.712	7	83053	HEV-RNR-M-70750

*.0005 max TIR



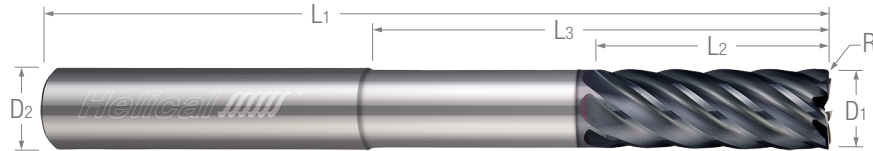
7 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck



HEV-RN-7

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in deep pocket High Efficiency Milling (HEM) applications
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.02"} / _{-.002"}	LOC L2 ^{+0.032"} / _{-.000"}	OAL L1 ^{+0.062"} / _{-.062"}	Reach (LBS) L3	Neck Dia.	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.020	3/4	4	1-1/8	.237	7	83054	HEV-RNR-R-70250-R.020
	1/4	.020	3/4	4	2-1/8	.237	7	83055	HEV-RNR-M-70250-R.020
3/8	3/8	.020	1	4	2-1/8	.356	7	83056	HEV-RNR-R-70375-R.020
	3/8	.020	1	6	3-1/8	.356	7	83057	HEV-RNR-M-70375-R.020
1/2	1/2	.030	1-1/4	4	2-1/4	.475	7	83058	HEV-RNR-R-70500-R.030
	1/2	.030	1-1/4	6	3-3/8	.475	7	83059	HEV-RNR-M-70500-R.030
	1/2	.030	1-1/4	6	4-1/8	.475	7	83060	HEV-RNR-L-70500-R.030
	1/2	.060	1-1/4	4	2-1/4	.475	7	83061	HEV-RNR-R-70500-R.060
	1/2	.060	1-1/4	6	3-3/8	.475	7	83062	HEV-RNR-M-70500-R.060
	1/2	.060	1-1/4	6	4-1/8	.475	7	83063	HEV-RNR-L-70500-R.060
3/4	3/4	.030	1-5/8	6	2-1/2	.712	7	83064	HEV-RNR-R-70750-R.030
	3/4	.030	1-5/8	6	3-3/8	.712	7	83065	HEV-RNR-M-70750-R.030
	3/4	.060	1-5/8	6	2-1/2	.712	7	83066	HEV-RNR-R-70750-R.060
	3/4	.060	1-5/8	6	3-3/8	.712	7	83067	HEV-RNR-M-70750-R.060

* .0005 max TIR

HEV-7



SPEEDS & FEEDS

7 Flute - Variable Pitch

HEV-7 / HEV-RN-7

Material Guide		Hardness	SFM														
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0016	.0017	.0024	.0019	.0031	.0022	.0047	.0025	.0060	.0029	.0087	.0035	.0111	.0043
		75 - 98 HRB	445	.0011	.0015	.0017	.0016	.0023	.0019	.0034	.0022	.0044	.0025	.0064	.0030	.0081	.0036
		21 - 36 HRC	400	.0007	.0012	.0011	.0013	.0015	.0015	.0022	.0017	.0028	.0020	.0041	.0024	.0053	.0029
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0010	.0014	.0015	.0015	.0020	.0018	.0030	.0020	.0038	.0023	.0055	.0028	.0070	.0034
		21 - 36 HRC	340	.0007	.0012	.0011	.0013	.0015	.0015	.0022	.0017	.0028	.0020	.0041	.0024	.0052	.0029
		36 - 50 HRC	260	.0006	.0011	.0010	.0012	.0013	.0014	.0019	.0016	.0025	.0019	.0036	.0023	.0046	.0027
		> 50 HRC	155	.0005	.0010	.0008	.0011	.0010	.0013	.0015	.0014	.0020	.0017	.0028	.0020	.0036	.0024
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0010	.0014	.0015	.0015	.0020	.0018	.0030	.0020	.0038	.0023	.0055	.0028	.0070	.0034
		21 - 36 HRC	250	.0008	.0012	.0012	.0013	.0016	.0016	.0023	.0018	.0030	.0021	.0044	.0025	.0056	.0030
		36 - 50 HRC	145	.0006	.0011	.0009	.0012	.0012	.0014	.0018	.0016	.0024	.0019	.0034	.0022	.0044	.0027
		> 50 HRC	85	.0005	.0010	.0008	.0011	.0010	.0012	.0015	.0014	.0019	.0016	.0028	.0020	.0036	.0024
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0013	.0016	.0020	.0018	.0026	.0020	.0039	.0023	.0050	.0027	.0072	.0032	.0092	.0039
		75 - 98 HRB	255	.0009	.0013	.0014	.0014	.0018	.0017	.0027	.0019	.0034	.0022	.0050	.0027	.0063	.0032
		21 - 36 HRC	175	.0008	.0012	.0012	.0014	.0016	.0016	.0024	.0018	.0031	.0021	.0045	.0025	.0057	.0030
		36 - 50 HRC	150	.0007	.0011	.0011	.0013	.0014	.0015	.0021	.0017	.0027	.0020	.0040	.0024	.0051	.0029
		> 50 HRC	55	.0004	.0009	.0007	.0010	.0009	.0012	.0013	.0013	.0017	.0016	.0025	.0018	.0031	.0022
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0010	.0013	.0015	.0015	.0019	.0017	.0029	.0020	.0037	.0023	.0054	.0028	.0069	.0034
		21 - 36 HRC	225	.0009	.0013	.0013	.0015	.0017	.0016	.0026	.0019	.0033	.0022	.0048	.0026	.0062	.0032
		36 - 50 HRC	180	.0007	.0012	.0011	.0013	.0014	.0015	.0021	.0017	.0027	.0020	.0039	.0023	.0049	.0028
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0010	.0014	.0015	.0015	.0020	.0018	.0030	.0020	.0038	.0023	.0055	.0028	.0071	.0034
		21 - 36 HRC	280	.0009	.0013	.0013	.0014	.0017	.0016	.0026	.0019	.0033	.0022	.0048	.0026	.0061	.0032
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0007	.0012	.0011	.0013	.0015	.0015	.0022	.0017	.0028	.0020	.0041	.0024	.0052	.0029
		36 - 50 HRC	145	.0006	.0011	.0010	.0012	.0013	.0014	.0019	.0016	.0024	.0019	.0035	.0022	.0045	.0027
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0016	.0017	.0024	.0020	.0032	.0022	.0048	.0026	.0062	.0030	.0090	.0036	.0114	.0043
		21 - 36 HRC	370	.0009	.0013	.0013	.0014	.0017	.0016	.0026	.0019	.0033	.0022	.0049	.0026	.0062	.0032
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0010	.0014	.0015	.0015	.0020	.0018	.0030	.0020	.0039	.0024	.0057	.0028	.0072	.0034
		21 - 36 HRC	335	.0009	.0013	.0013	.0014	.0017	.0016	.0026	.0019	.0034	.0022	.0049	.0026	.0062	.0032
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0011	.0014	.0016	.0016	.0021	.0018	.0032	.0021	.0041	.0024	.0059	.0029	.0075	.0035
		21 - 36 HRC	260	.0007	.0011	.0011	.0013	.0014	.0015	.0021	.0017	.0027	.0020	.0039	.0023	.0050	.0028
		36 - 50 HRC	135	.0005	.0009	.0007	.0010	.0009	.0012	.0013	.0014	.0017	.0016	.0025	.0019	.0032	.0023
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0014	.0016	.0021	.0018	.0027	.0020	.0041	.0023	.0052	.0027	.0076	.0033	.0097	.0040
		75 - 98 HRB	250	.0011	.0015	.0017	.0016	.0023	.0019	.0034	.0021	.0044	.0025	.0064	.0030	.0081	.0036
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0007	.0011	.0011	.0013	.0014	.0015	.0021	.0017	.0027	.0020	.0039	.0023	.0049	.0028
		21 - 36 HRC	75	.0007	.0011	.0010	.0012	.0013	.0014	.0020	.0016	.0025	.0019	.0037	.0023	.0047	.0028
		36 - 50 HRC	70	.0006	.0010	.0008	.0011	.0011	.0013	.0017	.0015	.0022	.0018	.0032	.0021	.0040	.0026
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0019	.0019	.0028	.0021	.0037	.0024	.0056	.0028	.0072	.0032	.0105	.0039	.0134	.0047
		75 - 98 HRB	275	.0016	.0017	.0024	.0019	.0031	.0022	.0047	.0025	.0060	.0030	.0088	.0035	.0112	.0043
		21 - 36 HRC	250	.0012	.0015	.0018	.0017	.0023	.0019	.0035	.0022	.0045	.0026	.0066	.0031	.0084	.0037
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0009	.0013	.0014	.0015	.0018	.0017	.0028	.0020	.0036	.0023	.0052	.0027	.0066	.0033
		36 - 50 HRC	160	.0009	.0013	.0013	.0014	.0017	.0016	.0025	.0019	.0033	.0022	.0047	.0026	.0060	.0031
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0008	.0012	.0012	.0014	.0016	.0016	.0023	.0018	.0030	.0021	.0044	.0025	.0056	.0030
		21 - 36 HRC	170	.0008	.0012	.0012	.0013	.0015	.0015	.0023	.0017	.0029	.0020	.0042	.0024	.0054	.0030
		36 - 50 HRC	65	.0005	.0010	.0008	.0011	.0010	.0013	.0015	.0014	.0020	.0017	.0029	.0020	.0037	.0024

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	10%-15% Diameter
	≥ 35 HRC	Up to Max LOC	10%-15% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:

Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. Values shown are for non-reached tools. For tools with reaches greater than 3xD, IPT should be reduced. For more accurate running parameters, please refer to Machining Advisor Pro.

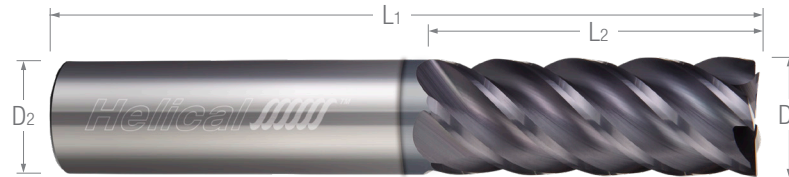
5 FLUTE - SQUARE

Finisher



HEF-5

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed with 5 flutes for excellent performance in roughing, High Efficiency Milling (HEM), and finishing (including thin wall applications)
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter D2 (h6)	Length of Cut L2 $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	1/4	1-1/2	5	05007	HEF-S-50125
	1/8	3/8	2	5	81802	HEF-SR-50125
	1/8	1/2	2-1/2	5	05022	HEF-R-50125
	1/8	5/8	2-1/2	5	81803	HEF-M-50125
	1/8	3/4	2-1/2	5	05037	HEF-L-50125
3/16	3/16	5/16	2	5	05067	HEF-S-50187
	3/16	7/16	2	5	81804	HEF-SR-50187
	3/16	9/16	2-1/2	5	05082	HEF-R-50187
	3/16	3/4	2-1/2	5	05097	HEF-M-50187
	3/16	1	2-1/2	5	81805	HEF-ML-50187
1/4	1/4	3/8	2	5	05127	HEF-S-50250
	1/4	1/2	2-1/2	5	05132	HEF-SR-50250
	1/4	3/4	2-1/2	5	05142	HEF-R-50250
	1/4	1	3	5	05157	HEF-M-50250
	1/4	1-1/4	3	5	05172	HEF-L-50250
	1/4	1-3/4	4	5	05182	HEF-X-50250
5/16	5/16	7/16	2	5	05202	HEF-S-50312
	5/16	13/16	2-1/2	5	05217	HEF-R-50312
	5/16	1	3	5	05232	HEF-M-50312
	5/16	1-1/4	3	5	05247	HEF-L-50312
	5/16	2-1/8	4	5	05262	HEF-X-50312
3/8	3/8	1/2	2	5	05292	HEF-S-50375
	3/8	3/4	2-1/2	5	81806	HEF-SR-50375
	3/8	1	3	5	05307	HEF-R-50375
	3/8	1-1/4	3	5	05322	HEF-M-50375
	3/8	1-1/2	3-1/2	5	05337	HEF-L-50375
	3/8	2	4	5	05352	HEF-LX-50375
	3/8	2-1/2	5	5	05367	HEF-X-50375
7/16	7/16	9/16	2-3/4	5	05397	HEF-S-50437
	7/16	1	2-3/4	5	05412	HEF-R-50437
	7/16	2	4	5	05427	HEF-L-50437

* .0005 max TIR

continued on next page

Finishers

HEF-5



5 FLUTE - SQUARE

Finisher (cont.)

continued from previous page

Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Aplus Coated	Tool Description
1/2	1/2	5/8	2-1/2	5	05457	HEF-S-50500
	1/2	1	3	5	05472	HEF-SR-50500
	1/2	1-1/4	3	5	05487	HEF-R-50500
	1/2	1-5/8	4	5	05502	HEF-M-50500
	1/2	2	4	5	05517	HEF-L-50500
	1/2	2-1/2	5	5	05532	HEF-LX-50500
	1/2	3-1/8	6	5	05547	HEF-X-50500
5/8	5/8	3/4	3	5	05607	HEF-S-50625
	5/8	1-5/8	3-1/2	5	05622	HEF-R-50625
	5/8	2-1/8	4	5	05637	HEF-M-50625
	5/8	2-1/2	5	5	05652	HEF-L-50625
	5/8	3-1/4	6	5	05662	HEF-LX-50625
	5/8	4	6	5	05667	HEF-X-50625
3/4	3/4	1	3	5	05697	HEF-S-50750
	3/4	1-5/8	4	5	05712	HEF-R-50750
	3/4	2-1/4	5	5	05727	HEF-M-50750
	3/4	2-3/4	5	5	05742	HEF-ML-50750
	3/4	3-1/2	6	5	05757	HEF-L-50750
	3/4	4	6	5	05772	HEF-X-50750
1	1	1-1/4	4	5	05862	HEF-S-51000
	1	2	4-1/2	5	05877	HEF-R-51000
	1	2-5/8	5	5	05892	HEF-M-51000
	1	3-1/4	6	5	05907	HEF-L-51000
	1	4-1/8	7	5	05922	HEF-X-51000

*.0005 max TIR

SPEEDS & FEEDS

5 Flute - Finisher



HEF-5

HEF-5																	
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0016	.0019	.0023	.0022	.0031	.0024	.0046	.0028	.0061	.0033	.0087	.0039	.0111	.0047
		75 - 98 HRB	445	.0012	.0016	.0017	.0018	.0023	.0021	.0034	.0024	.0044	.0028	.0064	.0033	.0081	.0040
		21 - 36 HRC	400	.0008	.0013	.0011	.0015	.0015	.0017	.0022	.0019	.0029	.0022	.0041	.0027	.0053	.0033
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0010	.0015	.0015	.0017	.0020	.0019	.0029	.0022	.0038	.0026	.0055	.0031	.0070	.0038
		21 - 36 HRC	340	.0008	.0013	.0011	.0014	.0015	.0017	.0022	.0019	.0029	.0023	.0041	.0027	.0052	.0033
		36 - 50 HRC	260	.0007	.0012	.0009	.0014	.0013	.0016	.0019	.0018	.0025	.0021	.0036	.0025	.0046	.0030
		> 50 HRC	155	.0005	.0011	.0007	.0012	.0010	.0014	.0015	.0016	.0020	.0019	.0028	.0022	.0036	.0027
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0010	.0015	.0015	.0017	.0020	.0019	.0029	.0022	.0038	.0026	.0055	.0031	.0070	.0038
		21 - 36 HRC	250	.0008	.0014	.0012	.0015	.0016	.0017	.0023	.0020	.0031	.0023	.0044	.0028	.0056	.0034
		36 - 50 HRC	145	.0006	.0012	.0009	.0013	.0012	.0015	.0018	.0017	.0024	.0020	.0034	.0024	.0044	.0029
		> 50 HRC	85	.0005	.0011	.0008	.0012	.0010	.0014	.0015	.0016	.0020	.0019	.0028	.0022	.0036	.0027
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0013	.0017	.0019	.0020	.0026	.0022	.0038	.0026	.0050	.0030	.0072	.0035	.0092	.0043
		75 - 98 HRB	255	.0009	.0014	.0013	.0016	.0018	.0018	.0026	.0021	.0035	.0025	.0050	.0029	.0063	.0036
		21 - 36 HRC	175	.0008	.0014	.0012	.0015	.0016	.0018	.0024	.0020	.0031	.0023	.0044	.0028	.0057	.0034
		36 - 50 HRC	150	.0007	.0013	.0011	.0014	.0014	.0017	.0021	.0019	.0028	.0022	.0040	.0026	.0051	.0032
		> 50 HRC	55	.0004	.0010	.0006	.0011	.0009	.0013	.0013	.0015	.0017	.0017	.0024	.0021	.0031	.0025
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0010	.0015	.0014	.0017	.0019	.0019	.0029	.0022	.0037	.0026	.0054	.0031	.0069	.0037
		21 - 36 HRC	225	.0009	.0014	.0013	.0016	.0017	.0018	.0026	.0021	.0034	.0024	.0048	.0029	.0062	.0035
		36 - 50 HRC	180	.0007	.0013	.0010	.0014	.0014	.0016	.0021	.0019	.0027	.0022	.0039	.0026	.0050	.0032
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0010	.0015	.0015	.0017	.0020	.0019	.0030	.0022	.0039	.0026	.0055	.0031	.0071	.0038
		21 - 36 HRC	280	.0009	.0014	.0013	.0016	.0017	.0018	.0026	.0021	.0034	.0024	.0048	.0029	.0062	.0035
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0007	.0013	.0011	.0014	.0015	.0017	.0022	.0019	.0028	.0022	.0041	.0026	.0052	.0032
		36 - 50 HRC	145	.0006	.0012	.0009	.0014	.0013	.0016	.0019	.0018	.0024	.0021	.0035	.0025	.0045	.0030
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0016	.0019	.0024	.0022	.0032	.0024	.0048	.0028	.0062	.0033	.0089	.0039	.0114	.0048
		21 - 36 HRC	370	.0009	.0014	.0013	.0016	.0017	.0018	.0026	.0021	.0034	.0025	.0048	.0029	.0062	.0035
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0010	.0015	.0015	.0017	.0020	.0020	.0030	.0023	.0040	.0026	.0057	.0031	.0073	.0038
		21 - 36 HRC	335	.0009	.0014	.0013	.0016	.0017	.0018	.0026	.0021	.0034	.0025	.0049	.0029	.0062	.0035
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0011	.0016	.0016	.0017	.0021	.0020	.0031	.0023	.0041	.0027	.0059	.0032	.0075	.0039
		21 - 36 HRC	260	.0007	.0013	.0010	.0014	.0014	.0016	.0021	.0019	.0027	.0022	.0039	.0026	.0050	.0032
		36 - 50 HRC	135	.0005	.0010	.0007	.0011	.0009	.0013	.0013	.0015	.0017	.0017	.0025	.0021	.0032	.0025
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0014	.0018	.0020	.0020	.0027	.0023	.0040	.0026	.0053	.0030	.0076	.0036	.0097	.0044
		75 - 98 HRB	250	.0012	.0016	.0017	.0018	.0023	.0021	.0034	.0024	.0044	.0028	.0063	.0033	.0081	.0040
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0007	.0013	.0010	.0014	.0014	.0016	.0021	.0019	.0027	.0022	.0039	.0026	.0049	.0031
		21 - 36 HRC	75	.0007	.0012	.0010	.0014	.0013	.0016	.0020	.0018	.0026	.0021	.0037	.0025	.0047	.0031
		36 - 50 HRC	70	.0006	.0011	.0008	.0013	.0011	.0015	.0017	.0017	.0022	.0020	.0032	.0023	.0041	.0028
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0019	.0021	.0028	.0024	.0037	.0027	.0056	.0031	.0073	.0036	.0104	.0043	.0134	.0052
		75 - 98 HRB	275	.0016	.0019	.0023	.0022	.0032	.0024	.0047	.0028	.0061	.0033	.0087	.0039	.0112	.0048
		21 - 36 HRC	250	.0012	.0017	.0017	.0019	.0024	.0021	.0035	.0024	.0046	.0028	.0066	.0034	.0084	.0041
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0009	.0015	.0014	.0017	.0019	.0019	.0028	.0022	.0036	.0025	.0052	.0030	.0066	.0037
		36 - 50 HRC	160	.0009	.0014	.0012	.0016	.0017	.0018	.0025	.0021	.0033	.0024	.0047	.0029	.0060	.0035
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0008	.0013	.0012	.0015	.0016	.0017	.0023	.0020	.0031	.0023	.0044	.0028	.0056	.0034
		21 - 36 HRC	170	.0008	.0013	.0011	.0015	.0015	.0017	.0023	.0019	.0029	.0023	.0042	.0027	.0054	.0033
		36 - 50 HRC	65	.0005	.0011	.0008	.0012	.0010	.0014	.0015	.0016	.0020	.0019	.0029	.0023	.0037	.0027

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	15%-25% Diameter
	≥ 35 HRC	Up to Max LOC	10%-20% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:

Hardness Scales: HRB = Rockwell B
HRC = Rockwell C

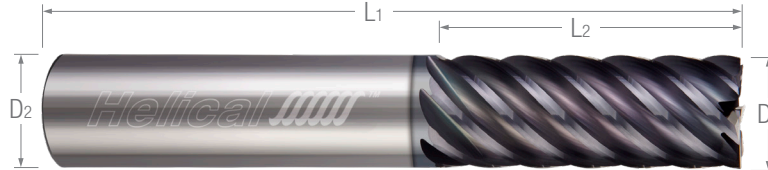
IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

HSF-7



7 FLUTE - SQUARE Finisher

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1^{+0.000}_{-0.002}$	D_2 (h6)	$L_2^{+0.032}_{-0.000}$	$L_1^{+0.062}_{-0.062}$			
1/4	1/4	3/8	2	7	24017	HSF-S-70250
	1/4	1/2	2-1/2	7	24022	HSF-SR-70250
	1/4	3/4	2-1/2	7	24032	HSF-R-70250
	1/4	1-1/4	3	7	24047	HSF-L-70250
	1/4	1-3/4	4	7	24062	HSF-X-70250
5/16	5/16	7/16	2	7	24092	HSF-S-70312
	5/16	13/16	2-1/2	7	24107	HSF-R-70312
	5/16	1-3/8	3-1/2	7	24122	HSF-L-70312
	5/16	2	4	7	24137	HSF-X-70312
3/8	3/8	1/2	2	7	24167	HSF-S-70375
	3/8	7/8	2-1/2	7	24182	HSF-SR-70375
	3/8	1	3	7	24187	HSF-R-70375
	3/8	1-1/2	3-1/2	7	24197	HSF-L-70375
	3/8	2-1/2	5	7	24212	HSF-X-70375
7/16	7/16	9/16	2-3/4	7	24242	HSF-S-70437
	7/16	1	2-3/4	7	24257	HSF-R-70437
	7/16	1-1/2	3-1/2	7	24272	HSF-M-70437
1/2	1/2	3/4	2-1/2	7	24317	HSF-S-70500
	1/2	1	2-1/2	7	81829	HSF-SR-70500
	1/2	1-1/4	3	7	24332	HSF-R-70500
	1/2	1-5/8	3-1/2	7	81830	HSF-M-70500
	1/2	2	4	7	24347	HSF-L-70500
	1/2	2-1/2	5	7	81831	HSF-LX-70500
5/8	5/8	3-1/4	6	7	24362	HSF-X-70500
	5/8	3/4	3	7	24392	HSF-S-70625
	5/8	1-5/8	4	7	24407	HSF-R-70625
3/4	5/8	2	4	7	24422	HSF-M-70625
	3/4	1	3	7	24467	HSF-S-70750
	3/4	1-5/8	4	7	24482	HSF-R-70750
	3/4	2-1/4	5	7	24497	HSF-M-70750
1	3/4	3-1/4	6	7	24512	HSF-L-70750
	1	1-1/4	4	7	24542	HSF-S-71000
	1	2	4-1/2	7	24557	HSF-R-71000
	1	3-1/4	6	7	24572	HSF-ML-71000
1-1/4	1	4-1/8	7	7	24587	HSF-X-71000
	1-1/4	2	4-1/2	7	24617	HSF-R-71250
	1-1/4	2-5/8	5-1/2	7	24632	HSF-M-71250
	1-1/4	3-1/4	6	7	24647	HSF-L-71250
	1-1/4	5	7-1/2	7	24662	HSF-X-71250

*.0005 max TIR

SPEEDS & FEEDS

7 Flute - Finisher



HSF-7

Material Guide		Hardness	SFM	Inches Per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0017	.0019	.0026	.0022	.0034	.0024	.0052	.0028	.0067	.0033	.0097	.0039	.0123	.0047
		75 - 98 HRB	445	.0013	.0016	.0019	.0018	.0025	.0021	.0038	.0024	.0049	.0028	.0071	.0033	.0090	.0040
		21 - 36 HRC	400	.0008	.0013	.0013	.0015	.0016	.0017	.0024	.0019	.0031	.0022	.0046	.0027	.0058	.0033
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0011	.0015	.0017	.0017	.0022	.0019	.0033	.0022	.0042	.0026	.0061	.0031	.0078	.0038
		21 - 36 HRC	340	.0008	.0013	.0012	.0014	.0016	.0017	.0024	.0019	.0031	.0023	.0046	.0027	.0058	.0033
		36 - 50 HRC	260	.0007	.0012	.0011	.0014	.0014	.0016	.0021	.0018	.0027	.0021	.0040	.0025	.0051	.0030
		> 50 HRC	155	.0006	.0011	.0009	.0012	.0011	.0014	.0017	.0016	.0022	.0019	.0032	.0022	.0040	.0027
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0011	.0015	.0017	.0017	.0022	.0019	.0033	.0022	.0042	.0026	.0061	.0031	.0078	.0038
		21 - 36 HRC	250	.0009	.0014	.0013	.0015	.0017	.0017	.0026	.0020	.0033	.0023	.0049	.0028	.0062	.0034
		36 - 50 HRC	145	.0007	.0012	.0010	.0013	.0014	.0015	.0020	.0017	.0026	.0020	.0038	.0024	.0049	.0029
		> 50 HRC	85	.0006	.0011	.0008	.0012	.0011	.0014	.0017	.0016	.0022	.0019	.0031	.0022	.0040	.0027
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0014	.0017	.0022	.0020	.0028	.0022	.0043	.0026	.0055	.0030	.0080	.0035	.0102	.0043
		75 - 98 HRB	255	.0010	.0014	.0015	.0016	.0019	.0018	.0029	.0021	.0038	.0025	.0055	.0029	.0070	.0036
		21 - 36 HRC	175	.0009	.0014	.0013	.0015	.0018	.0018	.0026	.0020	.0034	.0023	.0049	.0028	.0063	.0034
		36 - 50 HRC	150	.0008	.0013	.0012	.0014	.0016	.0017	.0024	.0019	.0031	.0022	.0044	.0026	.0056	.0032
		> 50 HRC	55	.0005	.0010	.0007	.0011	.0010	.0013	.0015	.0015	.0019	.0017	.0027	.0021	.0035	.0025
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0011	.0015	.0016	.0017	.0021	.0019	.0032	.0022	.0041	.0026	.0060	.0031	.0076	.0037
		21 - 36 HRC	225	.0010	.0014	.0015	.0016	.0019	.0018	.0029	.0021	.0037	.0024	.0054	.0029	.0069	.0035
		36 - 50 HRC	180	.0008	.0013	.0012	.0014	.0015	.0016	.0023	.0019	.0030	.0022	.0043	.0026	.0055	.0032
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0011	.0015	.0017	.0017	.0022	.0019	.0033	.0022	.0042	.0026	.0061	.0031	.0078	.0038
		21 - 36 HRC	280	.0010	.0014	.0015	.0016	.0019	.0018	.0029	.0021	.0037	.0024	.0053	.0029	.0068	.0035
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0008	.0013	.0012	.0014	.0016	.0017	.0024	.0019	.0031	.0022	.0045	.0026	.0057	.0032
		36 - 50 HRC	145	.0007	.0012	.0011	.0014	.0014	.0016	.0021	.0018	.0027	.0021	.0039	.0025	.0050	.0030
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0018	.0019	.0027	.0022	.0035	.0024	.0053	.0028	.0068	.0033	.0099	.0039	.0127	.0048
		21 - 36 HRC	370	.0010	.0014	.0015	.0016	.0019	.0018	.0029	.0021	.0037	.0025	.0054	.0029	.0069	.0035
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0011	.0015	.0017	.0017	.0022	.0020	.0034	.0023	.0043	.0026	.0063	.0031	.0080	.0038
		21 - 36 HRC	335	.0010	.0014	.0015	.0016	.0019	.0018	.0029	.0021	.0037	.0025	.0054	.0029	.0069	.0035
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0012	.0016	.0018	.0017	.0023	.0020	.0035	.0023	.0045	.0027	.0065	.0032	.0083	.0039
		21 - 36 HRC	260	.0008	.0013	.0012	.0014	.0015	.0016	.0023	.0019	.0030	.0022	.0043	.0026	.0055	.0032
		36 - 50 HRC	135	.0005	.0010	.0008	.0011	.0010	.0013	.0015	.0015	.0019	.0017	.0028	.0021	.0035	.0025
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0015	.0018	.0023	.0020	.0030	.0023	.0045	.0026	.0058	.0030	.0084	.0036	.0107	.0044
		75 - 98 HRB	250	.0013	.0016	.0019	.0018	.0025	.0021	.0038	.0024	.0048	.0028	.0071	.0033	.0090	.0040
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0008	.0013	.0012	.0014	.0015	.0016	.0023	.0019	.0029	.0022	.0043	.0026	.0055	.0031
		21 - 36 HRC	75	.0007	.0012	.0011	.0014	.0015	.0016	.0022	.0018	.0028	.0021	.0041	.0025	.0052	.0031
		36 - 50 HRC	70	.0006	.0011	.0009	.0013	.0013	.0015	.0019	.0017	.0024	.0020	.0035	.0023	.0045	.0028
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0021	.0021	.0032	.0024	.0041	.0027	.0062	.0031	.0080	.0036	.0116	.0043	.0148	.0052
		75 - 98 HRB	275	.0018	.0019	.0027	.0022	.0035	.0024	.0052	.0028	.0067	.0033	.0097	.0039	.0124	.0048
		21 - 36 HRC	250	.0013	.0017	.0020	.0019	.0026	.0021	.0039	.0024	.0050	.0028	.0073	.0034	.0093	.0041
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0010	.0015	.0016	.0017	.0020	.0019	.0031	.0022	.0040	.0025	.0058	.0030	.0073	.0037
		36 - 50 HRC	160	.0010	.0014	.0014	.0016	.0019	.0018	.0028	.0021	.0036	.0024	.0053	.0029	.0067	.0035
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0009	.0013	.0013	.0015	.0017	.0017	.0026	.0020	.0033	.0023	.0049	.0028	.0062	.0034
		21 - 36 HRC	170	.0009	.0013	.0013	.0015	.0017	.0017	.0025	.0019	.0033	.0023	.0047	.0027	.0060	.0033
		36 - 50 HRC	65	.0006	.0011	.0009	.0012	.0011	.0014	.0017	.0016	.0022	.0019	.0032	.0023	.0041	.0027

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	10%-15% Diameter
	≥ 35 HRC	Up to Max LOC	10%-15% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:
 Hardness Scales: HRB = Rockwell B
 HRC = Rockwell C
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

HXF

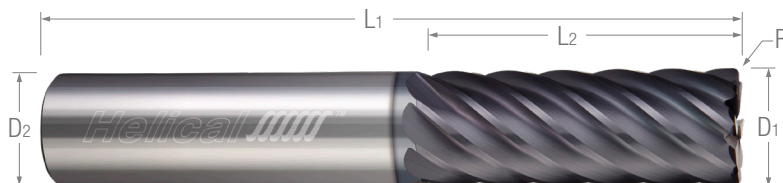


MULTI-FLUTE - CORNER RADIUS

Finisher

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed with high flute count for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

For increased wear resistance, see page 227 for *Tplus* coating



Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter D_2 (h6)	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.020	3/8	2	7	36016	HXF-S-070250-R.020
	1/4	.020	1/2	2	7	81832	HXF-SR-070250-R.020
	1/4	.020	3/4	2-1/2	7	36031	HXF-R-070250-R.020
3/8	3/8	.020	1/2	2	7	36046	HXF-S-070375-R.020
	3/8	.020	3/4	2-1/2	7	81833	HXF-SR-070375-R.020
	3/8	.020	1	3	7	36061	HXF-R-070375-R.020
	3/8	.020	1-1/4	3	7	81834	HXF-M-070375-R.020
1/2	1/2	.030	5/8	2-1/2	8	36076	HXF-S-080500-R.030
	1/2	.030	1	3	8	36091	HXF-SR-080500-R.030
	1/2	.030	1-1/4	3	8	36106	HXF-R-080500-R.030
	1/2	.030	1-5/8	3-1/2	8	81835	HXF-M-080500-R.030
	1/2	.030	2	3-1/2	8	81836	HXF-L-080500-R.030
5/8	5/8	.060	3/4	3	10	36121	HXF-S-100625-R.060
	5/8	.060	1-5/8	3-1/2	10	36136	HXF-R-100625-R.060
3/4	3/4	.060	1	3	12	36151	HXF-S-120750-R.060
	3/4	.060	1-5/8	4	12	36166	HXF-R-120750-R.060
	3/4	.060	2	4	12	81837	HXF-M-120750-R.060
1	1	.060	1-1/4	4	14	36181	HXF-S-141000-R.060
	1	.060	2	4-1/2	14	36196	HXF-R-141000-R.060

* .0005 max TIR



Speeds & Feeds on Page 170

SPEEDS & FEEDS

Multi-Flute - Corner Radius - Finisher



HXF

HXF																	
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0017	.0018	.0026	.0020	.0034	.0022	.0051	.0026	.0066	.0030	.0097	.0036	.0123	.0044
		75 - 98 HRB	445	.0012	.0015	.0019	.0017	.0025	.0019	.0038	.0022	.0048	.0026	.0071	.0031	.0090	.0037
		21 - 36 HRC	400	.0008	.0012	.0012	.0014	.0016	.0015	.0024	.0018	.0031	.0021	.0046	.0025	.0058	.0030
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0011	.0014	.0017	.0016	.0021	.0018	.0033	.0021	.0041	.0024	.0061	.0029	.0078	.0035
		21 - 36 HRC	340	.0008	.0012	.0012	.0013	.0016	.0015	.0024	.0018	.0031	.0021	.0045	.0025	.0058	.0030
		36 - 50 HRC	260	.0007	.0011	.0011	.0013	.0014	.0014	.0021	.0017	.0027	.0019	.0040	.0023	.0050	.0028
		> 50 HRC	155	.0006	.0010	.0009	.0011	.0011	.0013	.0013	.0017	.0015	.0021	.0017	.0031	.0020	.0040
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0011	.0014	.0017	.0016	.0021	.0018	.0033	.0021	.0041	.0024	.0061	.0029	.0078	.0035
		21 - 36 HRC	250	.0009	.0012	.0013	.0014	.0017	.0016	.0026	.0018	.0033	.0021	.0049	.0025	.0062	.0031
		36 - 50 HRC	145	.0007	.0011	.0010	.0012	.0013	.0014	.0020	.0016	.0026	.0019	.0038	.0023	.0048	.0027
		> 50 HRC	85	.0006	.0010	.0008	.0011	.0011	.0013	.0013	.0017	.0015	.0021	.0017	.0031	.0020	.0039
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0014	.0016	.0022	.0018	.0028	.0020	.0043	.0024	.0054	.0028	.0080	.0033	.0102	.0040
		75 - 98 HRB	255	.0010	.0013	.0015	.0015	.0019	.0017	.0029	.0019	.0037	.0023	.0055	.0027	.0070	.0033
		21 - 36 HRC	175	.0009	.0013	.0013	.0014	.0017	.0016	.0026	.0019	.0034	.0021	.0049	.0026	.0063	.0031
		36 - 50 HRC	150	.0008	.0012	.0012	.0013	.0015	.0015	.0023	.0017	.0030	.0020	.0044	.0024	.0056	.0030
		> 50 HRC	55	.0005	.0009	.0007	.0010	.0009	.0012	.0012	.0014	.0014	.0018	.0016	.0027	.0019	.0034
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0011	.0014	.0016	.0016	.0021	.0018	.0032	.0020	.0040	.0024	.0060	.0028	.0076	.0034
		21 - 36 HRC	225	.0010	.0013	.0015	.0015	.0019	.0017	.0029	.0019	.0036	.0023	.0054	.0027	.0068	.0033
		36 - 50 HRC	180	.0008	.0012	.0012	.0013	.0015	.0015	.0023	.0017	.0029	.0020	.0043	.0024	.0055	.0029
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0011	.0014	.0017	.0016	.0021	.0018	.0033	.0021	.0042	.0024	.0061	.0029	.0078	.0035
		21 - 36 HRC	280	.0010	.0013	.0014	.0015	.0019	.0017	.0029	.0019	.0036	.0022	.0053	.0027	.0068	.0033
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0008	.0012	.0012	.0013	.0016	.0015	.0024	.0018	.0031	.0021	.0045	.0025	.0057	.0030
		36 - 50 HRC	145	.0007	.0011	.0011	.0013	.0014	.0014	.0021	.0016	.0027	.0019	.0039	.0023	.0049	.0028
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0018	.0018	.0027	.0020	.0035	.0023	.0053	.0026	.0067	.0030	.0099	.0037	.0126	.0044
		21 - 36 HRC	370	.0009	.0013	.0015	.0015	.0019	.0017	.0029	.0019	.0037	.0022	.0054	.0027	.0068	.0033
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0011	.0014	.0017	.0016	.0022	.0018	.0034	.0021	.0043	.0024	.0063	.0029	.0080	.0035
		21 - 36 HRC	335	.0010	.0013	.0015	.0015	.0019	.0017	.0029	.0019	.0037	.0022	.0054	.0027	.0069	.0033
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0012	.0015	.0018	.0016	.0023	.0018	.0035	.0021	.0044	.0025	.0065	.0029	.0083	.0036
		21 - 36 HRC	260	.0008	.0012	.0012	.0013	.0015	.0015	.0023	.0017	.0029	.0020	.0043	.0024	.0055	.0029
		36 - 50 HRC	135	.0005	.0009	.0008	.0010	.0010	.0012	.0015	.0014	.0019	.0016	.0027	.0019	.0035	.0023
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0015	.0017	.0023	.0019	.0029	.0021	.0045	.0024	.0057	.0028	.0084	.0034	.0107	.0041
		75 - 98 HRB	250	.0013	.0015	.0019	.0017	.0025	.0019	.0037	.0022	.0048	.0026	.0070	.0031	.0089	.0037
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0008	.0012	.0012	.0013	.0015	.0015	.0023	.0017	.0029	.0020	.0043	.0024	.0054	.0029
		21 - 36 HRC	75	.0007	.0012	.0011	.0013	.0014	.0015	.0022	.0017	.0028	.0020	.0041	.0023	.0052	.0028
		36 - 50 HRC	70	.0006	.0010	.0010	.0012	.0012	.0014	.0019	.0015	.0024	.0018	.0035	.0022	.0044	.0026
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0020	.0019	.0031	.0022	.0041	.0025	.0062	.0028	.0079	.0033	.0116	.0039	.0147	.0048
		75 - 98 HRB	275	.0017	.0018	.0026	.0020	.0034	.0023	.0052	.0026	.0066	.0030	.0097	.0036	.0123	.0044
		21 - 36 HRC	250	.0013	.0015	.0020	.0017	.0025	.0020	.0039	.0022	.0050	.0026	.0073	.0031	.0093	.0038
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0010	.0014	.0016	.0015	.0020	.0017	.0031	.0020	.0039	.0023	.0057	.0028	.0073	.0034
		36 - 50 HRC	160	.0009	.0013	.0014	.0015	.0018	.0017	.0028	.0019	.0036	.0022	.0052	.0027	.0067	.0032
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0009	.0012	.0013	.0014	.0017	.0016	.0026	.0018	.0033	.0022	.0049	.0026	.0062	.0031
		21 - 36 HRC	170	.0008	.0012	.0013	.0014	.0017	.0016	.0025	.0018	.0032	.0021	.0047	.0025	.0060	.0030
		36 - 50 HRC	65	.0006	.0010	.0009	.0011	.0011	.0013	.0017	.0015	.0022	.0017	.0032	.0021	.0040	.0025

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	8%-10% Diameter
	≥ 35 HRC	Up to Max LOC	8%-10% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:
 Hardness Scales: HRB = Rockwell B
 HRC = Rockwell C
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

HEVC-C-4

4 FLUTE - CORNER RADIUS

Coolant Through - Chipbreaker Rougher - Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- 4 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D2 (h6)$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/4	1/4	.020	1/2	2-1/2	4	84328	HEVC-C-020-40250-R.020
	1/4	.020	3/4	2-1/2	4	84329	HEVC-C-030-40250-R.020
	1/4	.030	1/2	2-1/2	4	84330	HEVC-C-020-40250-R.030
	1/4	.030	3/4	2-1/2	4	84331	HEVC-C-030-40250-R.030
3/8	3/8	.020	1/2	2	4	84332	HEVC-C-013-40375-R.020
	3/8	.020	1	3	4	84333	HEVC-C-026-40375-R.020
	3/8	.030	1/2	2	4	84334	HEVC-C-013-40375-R.030
	3/8	.030	1	3	4	84335	HEVC-C-026-40375-R.030
1/2	1/2	.030	1	3	4	84336	HEVC-C-020-40500-R.030
	1/2	.030	1-1/4	3	4	84337	HEVC-C-025-40500-R.030
	1/2	.030	1-5/8	4	4	84338	HEVC-C-032-40500-R.030
	1/2	.060	1	3	4	84339	HEVC-C-020-40500-R.060
	1/2	.060	1-1/4	3	4	84340	HEVC-C-025-40500-R.060
	1/2	.060	1-5/8	4	4	84341	HEVC-C-032-40500-R.060
3/4	3/4	.030	1-5/8	4	4	84342	HEVC-C-021-40750-R.030
	3/4	.030	2-1/4	5	4	84343	HEVC-C-030-40750-R.030

*.0005 max TIR

SPEEDS & FEEDS

HEVC-C-4

4 Flute - Corner Radius Coolant Through - Chipbreaker Rougher - Variable Pitch

Roughers

HEVC-C-4																	
Material Guide		Hardness	SFM	Inches per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0007	.0013	.0011	.0019	.0014	.0025	.0021	.0037	.0028	.0049	.0040	.0070	.0050	.0089
		75 - 98 HRB	445	.0005	.0009	.0008	.0014	.0010	.0018	.0016	.0027	.0020	.0036	.0029	.0051	.0037	.0065
		21 - 36 HRC	400	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0018	.0013	.0023	.0019	.0033	.0024	.0042
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0005	.0008	.0007	.0012	.0009	.0016	.0013	.0024	.0017	.0031	.0025	.0044	.0032	.0056
		21 - 36 HRC	340	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0018	.0013	.0023	.0019	.0033	.0024	.0042
		36 - 50 HRC	260	.0003	.0005	.0005	.0008	.0006	.0010	.0009	.0015	.0011	.0020	.0016	.0029	.0021	.0036
> 50 HRC	155	.0002	.0004	.0004	.0006	.0005	.0008	.0007	.0012	.0009	.0016	.0013	.0023	.0019	.0033	.0024	
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0005	.0008	.0007	.0012	.0009	.0016	.0013	.0024	.0017	.0031	.0025	.0044	.0032	.0056
		21 - 36 HRC	250	.0004	.0006	.0005	.0009	.0007	.0013	.0011	.0019	.0014	.0025	.0020	.0035	.0025	.0045
		36 - 50 HRC	145	.0003	.0005	.0004	.0007	.0006	.0010	.0008	.0015	.0011	.0019	.0016	.0028	.0020	.0035
> 50 HRC	85	.0002	.0004	.0003	.0006	.0005	.0008	.0007	.0012	.0009	.0016	.0013	.0023	.0019	.0033	.0024	
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0006	.0011	.0009	.0015	.0012	.0021	.0018	.0031	.0023	.0040	.0033	.0058	.0042	.0074
		75 - 98 HRB	255	.0004	.0007	.0006	.0011	.0008	.0014	.0012	.0021	.0016	.0028	.0023	.0040	.0029	.0051
		21 - 36 HRC	175	.0004	.0007	.0006	.0010	.0007	.0013	.0011	.0019	.0014	.0025	.0020	.0036	.0026	.0046
36 - 50 HRC	150	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0017	.0013	.0022	.0018	.0032	.0023	.0041		
> 50 HRC	55	.0002	.0004	.0003	.0005	.0004	.0007	.0006	.0010	.0008	.0014	.0011	.0020	.0014	.0025		
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0004	.0008	.0007	.0012	.0009	.0016	.0013	.0023	.0017	.0030	.0024	.0043	.0031	.0055
		21 - 36 HRC	225	.0004	.0007	.0006	.0010	.0008	.0014	.0012	.0021	.0015	.0027	.0022	.0039	.0028	.0049
		36 - 50 HRC	180	.0003	.0006	.0005	.0008	.0006	.0011	.0009	.0017	.0012	.0022	.0018	.0031	.0023	.0040
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0005	.0008	.0007	.0012	.0009	.0016	.0013	.0024	.0018	.0031	.0025	.0044	.0032	.0057
		21 - 36 HRC	280	.0004	.0007	.0006	.0010	.0008	.0014	.0012	.0021	.0015	.0027	.0022	.0039	.0028	.0049
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0003	.0006	.0005	.0009	.0007	.0012	.0010	.0017	.0013	.0023	.0018	.0033	.0024	.0041
		36 - 50 HRC	145	.0003	.0005	.0004	.0008	.0006	.0010	.0009	.0015	.0011	.0020	.0016	.0028	.0020	.0036
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0007	.0013	.0011	.0019	.0015	.0026	.0022	.0038	.0028	.0050	.0041	.0072	.0052	.0091
		21 - 36 HRC	370	.0004	.0007	.0006	.0010	.0008	.0014	.0012	.0021	.0015	.0027	.0022	.0039	.0028	.0050
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0005	.0008	.0007	.0012	.0009	.0016	.0014	.0024	.0018	.0032	.0026	.0045	.0033	.0058
		21 - 36 HRC	335	.0004	.0007	.0006	.0010	.0008	.0014	.0012	.0021	.0016	.0027	.0022	.0039	.0028	.0050
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0005	.0009	.0007	.0013	.0010	.0017	.0014	.0025	.0019	.0033	.0027	.0047	.0034	.0060
		21 - 36 HRC	260	.0003	.0006	.0005	.0008	.0006	.0011	.0010	.0017	.0012	.0022	.0018	.0031	.0023	.0040
		36 - 50 HRC	135	.0002	.0004	.0003	.0005	.0004	.0007	.0006	.0011	.0008	.0014	.0011	.0020	.0014	.0025
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0006	.0011	.0009	.0016	.0012	.0022	.0018	.0032	.0024	.0042	.0035	.0061	.0044	.0077
		75 - 98 HRB	250	.0005	.0009	.0008	.0014	.0010	.0018	.0015	.0027	.0020	.0036	.0029	.0051	.0037	.0065
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0003	.0006	.0005	.0008	.0006	.0011	.0009	.0017	.0012	.0022	.0018	.0031	.0022	.0039
		21 - 36 HRC	75	.0003	.0005	.0005	.0008	.0006	.0011	.0009	.0016	.0012	.0021	.0017	.0030	.0021	.0038
		36 - 50 HRC	70	.0003	.0005	.0004	.0007	.0005	.0009	.0008	.0014	.0010	.0018	.0014	.0025	.0018	.0032
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0009	.0015	.0013	.0022	.0017	.0030	.0025	.0045	.0033	.0059	.0048	.0084	.0061	.0107
		75 - 98 HRB	275	.0007	.0013	.0011	.0019	.0014	.0025	.0021	.0038	.0028	.0049	.0040	.0070	.0051	.0090
		21 - 36 HRC	250	.0006	.0010	.0008	.0014	.0011	.0019	.0016	.0028	.0021	.0037	.0030	.0053	.0038	.0067
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0004	.0008	.0006	.0011	.0009	.0015	.0013	.0022	.0016	.0029	.0024	.0042	.0030	.0053
		36 - 50 HRC	160	.0004	.0007	.0006	.0010	.0008	.0014	.0011	.0020	.0015	.0026	.0022	.0038	.0027	.0048
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0004	.0006	.0006	.0009	.0007	.0013	.0011	.0019	.0014	.0025	.0020	.0035	.0025	.0045
		21 - 36 HRC	170	.0004	.0006	.0005	.0009	.0007	.0012	.0010	.0018	.0013	.0024	.0019	.0034	.0025	.0043
		36 - 50 HRC	65	.0002	.0004	.0004	.0006	.0005	.0008	.0007	.0012	.0009	.0016	.0013	.0023	.0017	.0029

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	75%-125% Diameter	100% Diameter
	≥ 35 HRC	60%-100% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	25%-35% Diameter

NOTES:
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

HEV-C-5

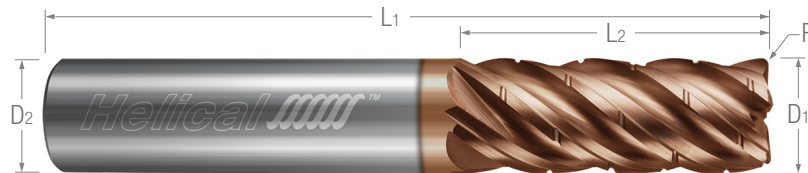


New Items!

5 FLUTE - CORNER RADIUS Chipbreaker Rougher - Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 5 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- Center cutting
- h6 shank tolerance for high precision tool holders
- T_{plus} coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 79 for Aplus coating



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	T _{plus} Coated	Tool Description
$D_1^{+.000^*}_{-.002^*}$	D ₂ (h6)	R $^{+.002^*}_{-.002^*}$	L ₂ $^{+.032^*}_{-.000^*}$	L ₁ $^{+.062^*}_{-.062^*}$			
1/8	1/8	.010	1/4	1-1/2	5	83090	HEV-C-S-50125-R.010
	1/8	.010	3/8	2	5	86146	HEV-C-SR-50125-R.010
	1/8	.010	1/2	2-1/2	5	83091	HEV-C-R-50125-R.010
	1/8	.010	5/8	2-1/2	5	86147	HEV-C-A-50125-R.010
3/16	3/16	.010	5/16	2	5	83092	HEV-C-S-50187-R.010
	3/16	.010	7/16	2	5	83093	HEV-C-SR-50187-R.010
	3/16	.010	9/16	2-1/2	5	83094	HEV-C-R-50187-R.010
	3/16	.010	3/4	2-1/2	5	83095	HEV-C-M-50187-R.010
	3/16	.010	1	2-1/2	5	86148	HEV-C-ML-50187-R.010
1/4	1/4	.020	3/8	2	5	83096	HEV-C-S-50250-R.020
	1/4	.020	1/2	2-1/2	5	83097	HEV-C-SR-50250-R.020
	1/4	.020	3/4	2-1/2	5	83098	HEV-C-R-50250-R.020
	1/4	.020	1	3	5	83099	HEV-C-M-50250-R.020
	1/4	.020	1-1/4	3	5	86149	HEV-C-L-50250-R.020
	1/4	.030	3/8	2	5	87375	HEV-C-S-50250-R.030
	1/4	.030	1/2	2-1/2	5	87376	HEV-C-SR-50250-R.030
	1/4	.030	3/4	2-1/2	5	87377	HEV-C-R-50250-R.030
5/16	5/16	.020	7/16	2	5	86150	HEV-C-S-50312-R.020
	5/16	.020	13/16	2-1/2	5	86151	HEV-C-R-50312-R.020
	5/16	.020	1-1/4	3	5	86152	HEV-C-L-50312-R.020
3/8	3/8	.020	1/2	2	5	83100	HEV-C-S-50375-R.020
	3/8	.020	3/4	2-1/2	5	83101	HEV-C-SR-50375-R.020
	3/8	.020	1	3	5	83102	HEV-C-R-50375-R.020
	3/8	.020	1-1/4	3	5	83103	HEV-C-M-50375-R.020
	3/8	.020	1-1/2	3-1/2	5	86153	HEV-C-L-50375-R.020
	3/8	.030	1/2	2	5	87379	HEV-C-S-50375-R.030
	3/8	.030	3/4	2-1/2	5	87380	HEV-C-SR-50375-R.030
	3/8	.030	1	3	5	87381	HEV-C-R-50375-R.030
3/8	.030	1-1/4	3	5	87382	HEV-C-M-50375-R.030	

* .0005 max TIR

continued on next page

5 FLUTE - CORNER RADIUS

New Items!



HEV-C-5

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.001"} -0.002"	Shank Diameter D2 (H6)	Corner Radius R ^{+0.002"} -0.002"	Length of Cut L2 ^{+0.032"} -0.000"	Overall Length L1 ^{+0.062"} -0.062"	Flutes	Tplus Coated	Tool Description	
1/2	1/2	.030	5/8	2-1/2	5	83104	HEV-C-S-50500-R.030	
	1/2	.030	1	3	5	83105	HEV-C-SR-50500-R.030	
	1/2	.030	1-1/4	3	5	83106	HEV-C-R-50500-R.030	
	1/2	.030	1-5/8	4	5	83107	HEV-C-M-50500-R.030	
	1/2	.030	2	4	5	83108	HEV-C-L-50500-R.030	
	1/2	.030	2-1/2	5	5	83109	HEV-C-LX-50500-R.030	
	1/2	.030	3-1/8	6	5	86154	HEV-C-X-50500-R.030	
	1/2	.060	5/8	2-1/2	5	83110	HEV-C-S-50500-R.060	
	1/2	.060	1	3	5	83111	HEV-C-SR-50500-R.060	
	1/2	.060	1-1/4	3	5	83112	HEV-C-R-50500-R.060	
	1/2	.060	1-5/8	4	5	83113	HEV-C-M-50500-R.060	
	1/2	.060	2	4	5	83114	HEV-C-L-50500-R.060	
	1/2	.060	2-1/2	5	5	83115	HEV-C-LX-50500-R.060	
	1/2	.125	5/8	2-1/2	5	87383	HEV-C-S-50500-R.125	new
	1/2	.125	1	3	5	87384	HEV-C-SR-50500-R.125	new
	1/2	.125	1-1/4	3	5	87385	HEV-C-R-50500-R.125	new
1/2	.125	1-5/8	4	5	87386	HEV-C-M-50500-R.125	new	
1/2	.125	2	4	5	87387	HEV-C-L-50500-R.125	new	
5/8	5/8	.030	3/4	3	5	83116	HEV-C-S-50625-R.030	
	5/8	.030	1-1/4	3-1/2	5	83117	HEV-C-SR-50625-R.030	
	5/8	.030	1-5/8	3-1/2	5	83118	HEV-C-R-50625-R.030	
	5/8	.030	2-1/8	4	5	83119	HEV-C-M-50625-R.030	
	5/8	.030	2-1/2	5	5	86155	HEV-C-L-50625-R.030	
	5/8	.060	1-1/4	3-1/2	5	87388	HEV-C-SR-50625-R.060	new
	5/8	.060	1-5/8	3-1/2	5	87389	HEV-C-R-50625-R.060	new
5/8	.060	2-1/8	4	5	87390	HEV-C-M-50625-R.060	new	
3/4	3/4	.030	1	3	5	83120	HEV-C-S-50750-R.030	
	3/4	.030	1-5/8	4	5	83121	HEV-C-R-50750-R.030	
	3/4	.030	2-1/4	5	5	83122	HEV-C-M-50750-R.030	
	3/4	.030	2-3/4	5	5	83123	HEV-C-L-50750-R.030	
	3/4	.030	3-1/4	6	5	83124	HEV-C-LX-50750-R.030	
	3/4	.030	4	6-1/2	5	86156	HEV-C-X-50750-R.030	
	3/4	.060	1	3	5	87391	HEV-C-S-50750-R.060	new
	3/4	.060	1-5/8	4	5	87392	HEV-C-R-50750-R.060	new
	3/4	.060	2-1/4	5	5	87393	HEV-C-M-50750-R.060	new
3/4	.060	2-3/4	5	5	87394	HEV-C-L-50750-R.060	new	

* .0005 max TIR

HEV-C-6



New Items!

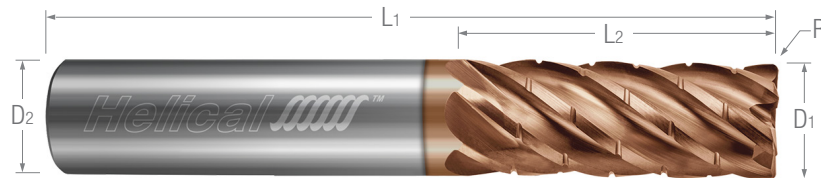
6 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 6 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure

- Center cutting
- h6 shank tolerance for high precision tool holders
- Tplus coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 84 for Aplus coating



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Tplus Coated	Tool Description
$D1^{+.000}_{-.002}$	$D2(h6)$	$R^{+.002}_{-.002}$	$L2^{+.032}_{-.000}$	$L1^{+.062}_{-.062}$			
new new new new	1/8	.010	1/4	1-1/2	6	87426	HEV-C-S-60125-R.010
			3/8	2	6	87427	HEV-C-SR-60125-R.010
			1/2	2-1/2	6	87428	HEV-C-R-60125-R.010
			5/8	2-1/2	6	87429	HEV-C-A-60125-R.010
new new new new	3/16	.010	5/16	2	6	87430	HEV-C-S-60187-R.010
			7/16	2	6	87431	HEV-C-SR-60187-R.010
			9/16	2-1/2	6	87432	HEV-C-R-60187-R.010
			3/4	2-1/2	6	87433	HEV-C-M-60187-R.010
new new new new new new new new new new new new new new new new	1/4	.010	3/8	2	6	87434	HEV-C-S-60250-R.010
			1/2	2-1/2	6	87435	HEV-C-SR-60250-R.010
			3/4	2-1/2	6	87436	HEV-C-R-60250-R.010
			1	3	6	87437	HEV-C-M-60250-R.010
			3/8	2	6	83145	HEV-C-S-60250-R.020
			1/2	2-1/2	6	83146	HEV-C-SR-60250-R.020
			3/4	2-1/2	6	83147	HEV-C-R-60250-R.020
			1	3	6	83148	HEV-C-M-60250-R.020
			3/8	2	6	87438	HEV-C-S-60250-R.030
			1/2	2-1/2	6	87439	HEV-C-SR-60250-R.030
			3/4	2-1/2	6	87440	HEV-C-R-60250-R.030
			1	3	6	87441	HEV-C-M-60250-R.030
			3/8	2	6	87442	HEV-C-S-60250-R.060
			1/2	2-1/2	6	87443	HEV-C-SR-60250-R.060
			3/4	2-1/2	6	87444	HEV-C-R-60250-R.060
			1	3	6	87445	HEV-C-M-60250-R.060
new new new new new new new new new new	3/8	.010	1/2	2	6	87446	HEV-C-S-60375-R.010
			3/4	2-1/2	6	87447	HEV-C-SR-60375-R.010
			1	3	6	87448	HEV-C-R-60375-R.010
			1-1/4	3	6	87449	HEV-C-M-60375-R.010
			1-1/2	3-1/2	6	87450	HEV-C-L-60375-R.010
			1/2	2	6	87451	HEV-C-S-60375-R.020
			3/4	2-1/2	6	87452	HEV-C-SR-60375-R.020
			1	3	6	87453	HEV-C-R-60375-R.020
			1-1/4	3	6	87454	HEV-C-M-60375-R.020
			1-1/2	3-1/2	6	87455	HEV-C-L-60375-R.020

*.0005 max TIR



Speeds & Feeds on Page 86

continued on next page

6 FLUTE - CORNER RADIUS

New Items!



HEV-C-6

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D ₁ ^{+0.000"} _{-.002"}	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002"} _{-.002"}	Length of Cut L ₂ ^{+0.032"} _{-.000"}	Overall Length L ₁ ^{+0.062"} _{-.062"}	Flutes	T _{plus} Coated	Tool Description
3/8	3/8	.030	1/2	2	6	83149	HEV-C-S-60375-R.030
	3/8	.030	3/4	2-1/2	6	83150	HEV-C-SR-60375-R.030
	3/8	.030	1	3	6	83151	HEV-C-R-60375-R.030
	3/8	.030	1-1/4	3	6	83152	HEV-C-M-60375-R.030
	3/8	.030	1-1/2	3-1/2	6	86157	HEV-C-L-60375-R.030
	3/8	.060	1/2	2	6	87456	HEV-C-S-60375-R.060 new
	3/8	.060	3/4	2-1/2	6	87457	HEV-C-SR-60375-R.060 new
	3/8	.060	1	3	6	87458	HEV-C-R-60375-R.060 new
	3/8	.060	1-1/4	3	6	87459	HEV-C-M-60375-R.060 new
3/8	.060	1-1/2	3-1/2	6	87460	HEV-C-L-60375-R.060 new	
1/2	1/2	.030	5/8	2-1/2	6	83153	HEV-C-S-60500-R.030
	1/2	.030	1	3	6	83154	HEV-C-SR-60500-R.030
	1/2	.030	1-1/4	3	6	83155	HEV-C-R-60500-R.030
	1/2	.030	1-5/8	4	6	83156	HEV-C-M-60500-R.030
	1/2	.030	2	4	6	83157	HEV-C-L-60500-R.030
	1/2	.060	5/8	2-1/2	6	83158	HEV-C-S-60500-R.060
	1/2	.060	1	3	6	83159	HEV-C-SR-60500-R.060
	1/2	.060	1-1/4	3	6	83160	HEV-C-R-60500-R.060
	1/2	.060	1-5/8	4	6	83161	HEV-C-M-60500-R.060
	1/2	.060	2	4	6	83162	HEV-C-L-60500-R.060
	1/2	.125	5/8	2-1/2	6	87461	HEV-C-S-60500-R.125 new
	1/2	.125	1	3	6	87462	HEV-C-SR-60500-R.125 new
	1/2	.125	1-1/4	3	6	87463	HEV-C-R-60500-R.125 new
	1/2	.125	1-5/8	4	6	87464	HEV-C-M-60500-R.125 new
1/2	.125	2	4	6	87465	HEV-C-L-60500-R.125 new	
5/8	5/8	.060	1-1/4	3-1/2	6	86162	HEV-C-SR-60625-R.060
	5/8	.060	1-5/8	3-1/2	6	86163	HEV-C-R-60625-R.060
	5/8	.060	2	4	6	86164	HEV-C-M-60625-R.060
3/4	3/4	.030	1-5/8	4	6	87466	HEV-C-R-60750-R.030 new
	3/4	.030	2-1/4	5	6	87467	HEV-C-M-60750-R.030 new
	3/4	.030	2-3/4	5	6	87468	HEV-C-L-60750-R.030 new
	3/4	.060	1-5/8	4	6	86165	HEV-C-R-60750-R.060
	3/4	.060	2-1/4	5	6	86166	HEV-C-M-60750-R.060
	3/4	.060	2-3/4	5	6	86167	HEV-C-L-60750-R.060
	3/4	.250	1-5/8	4	6	87469	HEV-C-R-60750-R.250 new
	3/4	.250	2-1/4	5	6	87470	HEV-C-M-60750-R.250 new
3/4	.250	2-3/4	5	6	87471	HEV-C-L-60750-R.250 new	

* .0005 max TIR

Roughers

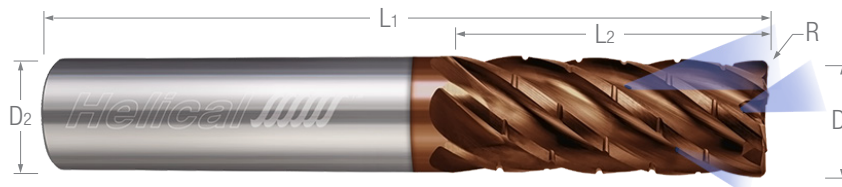
HEVC-C-6



6 FLUTE - CORNER RADIUS

Coolant Through - Chipbreaker Rougher - Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 6 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D1^{+.000^*}_{-.002^*}$	$D2(h6)$	$R^{+.002^*}_{-.002^*}$	$L2^{+.032^*}_{-.000^*}$	$L1^{+.062^*}_{-.062^*}$			
1/4	1/4	.020	3/8	2	6	84344	HEVC-C-015-60250-R.020
	1/4	.020	1/2	2-1/2	6	84345	HEVC-C-020-60250-R.020
3/8	3/8	.020	1/2	2	6	84346	HEVC-C-013-60375-R.020
	3/8	.020	1	3	6	84347	HEVC-C-026-60375-R.020
	3/8	.030	1/2	2	6	84348	HEVC-C-013-60375-R.030
	3/8	.030	1	3	6	84349	HEVC-C-026-60375-R.030
1/2	1/2	.030	1	3	6	84350	HEVC-C-020-60500-R.030
	1/2	.030	1-1/4	3	6	84351	HEVC-C-025-60500-R.030
	1/2	.030	1-5/8	4	6	84352	HEVC-C-032-60500-R.030
	1/2	.060	1	3	6	84353	HEVC-C-020-60500-R.060
	1/2	.060	1-1/4	3	6	84354	HEVC-C-025-60500-R.060
	1/2	.060	1-5/8	4	6	84355	HEVC-C-032-60500-R.060
3/4	3/4	.060	1-5/8	4	6	84356	HEVC-C-021-60750-R.060
	3/4	.060	2-1/4	5	6	84357	HEVC-C-030-60750-R.060

* .0005 max TIR

7 FLUTE - CORNER RADIUS

New Items!



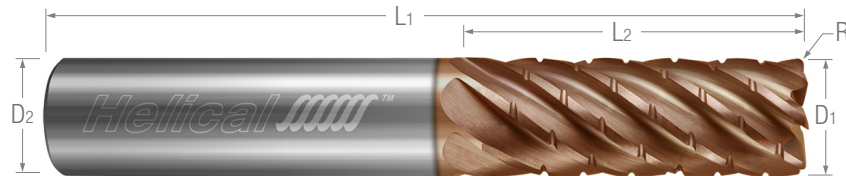
HEV-C-7

Chipbreaker Rougher - Variable Pitch

Roughers

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 87 for *Aplus* coating



Cutter Diameter* D1 ^{+0.002"} / _{-0.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	Length of Cut L2 ^{+0.032"} / _{-0.000"}	Overall Length L1 ^{+0.062"} / _{-0.062"}	Flutes	<i>Tplus</i> Coated	Tool Description
1/4	1/4	.020	3/8	2	7	86168	HEV-C-S-70250-R.020
	1/4	.020	1/2	2	7	82911	HEV-C-SR-70250-R.020
	1/4	.020	3/4	2-1/2	7	82912	HEV-C-R-70250-R.020
	1/4	.020	1	3	7	86169	HEV-C-M-70250-R.020
	1/4	.030	3/8	2	7	87191	HEV-C-S-70250-R.030
	1/4	.030	1/2	2	7	87192	HEV-C-SR-70250-R.030
	1/4	.030	3/4	2-1/2	7	87193	HEV-C-R-70250-R.030
5/16	5/16	.020	7/16	2	7	86170	HEV-C-S-70312-R.020
	5/16	.020	3/4	2-1/2	7	86171	HEV-C-R-70312-R.020
	5/16	.020	1	3	7	86172	HEV-C-M-70312-R.020
3/8	3/8	.020	1/2	2	7	82913	HEV-C-S-70375-R.020
	3/8	.020	3/4	2-1/2	7	82914	HEV-C-SR-70375-R.020
	3/8	.020	1	2-1/2	7	82915	HEV-C-R-70375-R.020
	3/8	.020	1-1/2	3-1/2	7	86173	HEV-C-L-70375-R.020
	3/8	.030	1/2	2	7	87194	HEV-C-S-70375-R.030
	3/8	.030	3/4	2-1/2	7	87195	HEV-C-SR-70375-R.030
	3/8	.030	1	2-1/2	7	87196	HEV-C-R-70375-R.030
1/2	1/2	.010	5/8	2-1/2	7	87197	HEV-C-S-70500-R.010
	1/2	.010	1	3	7	87198	HEV-C-SR-70500-R.010
	1/2	.010	1-1/4	3	7	87199	HEV-C-R-70500-R.010
	1/2	.010	1-5/8	4	7	87200	HEV-C-M-70500-R.010
	1/2	.010	2	4	7	87201	HEV-C-L-70500-R.010
	1/2	.030	5/8	2-1/2	7	82916	HEV-C-S-70500-R.030
	1/2	.030	1	3	7	82917	HEV-C-SR-70500-R.030
	1/2	.030	1-1/4	3	7	82918	HEV-C-R-70500-R.030
	1/2	.030	1-5/8	4	7	82919	HEV-C-M-70500-R.030
	1/2	.030	2	4	7	82920	HEV-C-L-70500-R.030
	1/2	.030	2-1/2	5	7	86174	HEV-C-LX-70500-R.030
	1/2	.060	5/8	2-1/2	7	83177	HEV-C-S-70500-R.060
	1/2	.060	1	3	7	83178	HEV-C-SR-70500-R.060
	1/2	.060	1-1/4	3	7	83179	HEV-C-R-70500-R.060
	1/2	.060	1-5/8	4	7	83180	HEV-C-M-70500-R.060
1/2	.060	2	4	7	83181	HEV-C-L-70500-R.060	

new
new
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continued on next page



HEV-C-7



New Items!

7 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Tplus Coated	Tool Description
5/8	5/8	.030	1-1/4	3-1/2	7	82921	HEV-C-SR-70625-R.030
	5/8	.030	1-5/8	4	7	82922	HEV-C-R-70625-R.030
	5/8	.030	2-1/8	4	7	86175	HEV-C-M-70625-R.030
3/4	3/4	.030	1-5/8	4	7	82923	HEV-C-R-70750-R.030
	3/4	.030	2-1/4	5	7	82924	HEV-C-M-70750-R.030
	3/4	.030	2-3/4	5	7	86176	HEV-C-L-70750-R.030
	3/4	.030	3-1/4	6	7	87202	HEV-C-LX-70750-R.030
	3/4	.030	4	6-1/2	7	87203	HEV-C-X-70750-R.030
	3/4	.060	1-5/8	4	7	82925	HEV-C-R-70750-R.060
	3/4	.060	2-1/4	5	7	82926	HEV-C-M-70750-R.060
	3/4	.060	2-3/4	5	7	86177	HEV-C-L-70750-R.060
	3/4	.060	3-1/4	6	7	87204	HEV-C-LX-70750-R.060
1	1	.030	2-5/8	5	7	87205	HEV-C-X-70750-R.060
	1	.030	3-1/4	6	7	87206	HEV-C-M-71000-R.030
	1	.030	4-1/8	7	7	87207	HEV-C-L-71000-R.030
		.030				87208	HEV-C-X-71000-R.030

*.0005 max TIR

MULTI-FLUTE - CORNER RADIUS

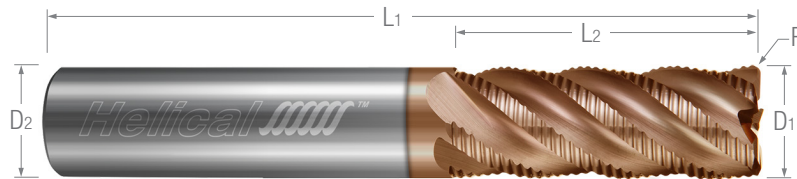
HXVR

Knuckle Rougher - Variable Pitch

Roughers

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with staggered "low profile" edge geometry for chip control and minimized cutting forces
- Available in 4 flute and 5 flute options
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 91 for *Aplus* coating



Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Tplus</i> Coated	Tool Description
1/4	1/4	.030	3/8	2	4	83482	HXVR-S-40250-R.030
	1/4	.030	3/4	2-1/2	4	83483	HXVR-R-40250-R.030
3/8	3/8	.040	1/2	2	4	83484	HXVR-S-40375-R.040
	3/8	.040	1/2	2	5	83485	HXVR-S-50375-R.040
	3/8	.040	1	3	4	83486	HXVR-R-40375-R.040
	3/8	.040	1	3	5	83487	HXVR-R-50375-R.040
1/2	1/2	.040	5/8	2-1/2	4	83488	HXVR-S-40500-R.040
	1/2	.040	5/8	2-1/2	5	83489	HXVR-S-50500-R.040
	1/2	.040	1-1/4	3	4	83490	HXVR-R-40500-R.040
	1/2	.040	1-1/4	3	5	83491	HXVR-R-50500-R.040
3/4	3/4	.060	1	3	4	83492	HXVR-S-40750-R.060
	3/4	.060	1	3	5	83493	HXVR-S-50750-R.060
	3/4	.060	1-5/8	4	4	83494	HXVR-R-40750-R.060
	3/4	.060	1-5/8	4	5	83495	HXVR-R-50750-R.060

*.0005 max TIR

HSV-4 / HSM-4

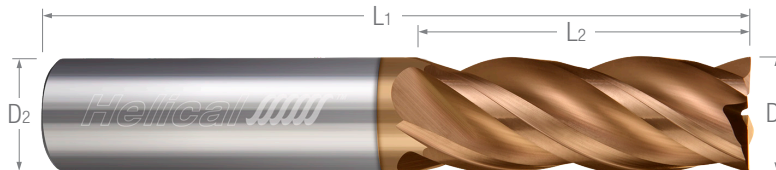
New Items!

4 FLUTE - SQUARE

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- CNC ground in the USA

For steel applications, see page 103 for *Aplus* coating



4 Flute

Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	<i>Tplus</i> Coated + Weldon Flat	Tool Description
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	D_2 (h6)	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$				
1/32	1/4	3/32	2-1/2	4	84040		HSM-030-40031
	1/4	5/32	2-1/2	4	84041		HSM-050-40031
3/64	1/4	5/32	2-1/2	4	84042		HSM-033-40047
	1/4	1/4	2-1/2	4	84043		HSM-053-40047
1/16	1/4	3/16	2-1/2	4	84044		HSM-030-40062
	1/4	5/16	2-1/2	4	84045		HSM-050-40062
5/64	1/4	1/4	2-1/2	4	84046		HSM-032-40078
	1/4	3/8	2-1/2	4	84047		HSM-048-40078
3/32	1/4	9/32	2-1/2	4	84048		HSM-030-40093
	1/4	1/2	2-1/2	4	84049		HSM-053-40093

new

Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	<i>Tplus</i> Coated + Weldon Flat	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	D_2 (h6)	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$				
1/8	1/8	1/4	1-1/2	4	83183		HSV-S-40125
	1/4	1/4	2-1/2	4	84050		HSM-020-40125
	1/8	3/8	2	4	83184		HSV-SR-40125
	1/4	3/8	2-1/2	4	84051		HSM-030-40125
	1/8	1/2	2-1/2	4	83185		HSV-R-40125
	1/4	1/2	2-1/2	4	84052		HSM-040-40125
	1/8	5/8	2-1/2	4	83186		HSV-A-40125
	1/8	3/4	2-1/2	4	83187		HSV-M-40125
	1/8	7/8	2-1/2	4	84693		HSV-L-40125
1/8	1	2-1/2	4	87472		HSV-LX-40125	
5/32	3/16	3/16	2	4	83188		HSV-S-40156
	3/16	5/16	2	4	84694		HSV-SR-40156
	3/16	7/16	2-1/2	4	83189		HSV-R-40156
	3/16	9/16	2-1/2	4	83190		HSV-M-40156
	3/16	3/4	2-1/2	4	84695		HSV-ML-40156
3/16	3/16	5/16	2	4	83191		HSV-S-40187
	1/4	5/16	2-1/2	4	84053		HSM-016-40187
	3/16	7/16	2	4	83192		HSV-SR-40187
	1/4	7/16	2-1/2	4	84054		HSM-023-40187
	1/4	9/16	2-1/2	4	84055		HSM-029-40187

* .0005 max TIR

continued on next page



Speeds & Feeds on Page 122

4 FLUTE - SQUARE **New Items!**

HSV-4 / HSM-4

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* $D_1 \begin{smallmatrix} +.000 \\ -.002 \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Length of Cut $L_2 \begin{smallmatrix} +.032 \\ -.000 \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062 \\ -.062 \end{smallmatrix}$	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description	
3/16	3/16	5/8	2-1/2	4	83193		HSV-R-40187	
	3/16	3/4	2-1/2	4	87473		HSV-A-40187	new
	1/4	3/4	2-1/2	4	84056		HSM-040-40187	
	3/16	1	2-1/2	4	83194		HSV-M-40187	
	3/16	1-3/16	3	4	87474		HSV-L-40187	new
7/32	1/4	1/4	2	4	87475		HSV-S-40218	new
	1/4	7/16	2-1/2	4	87476		HSV-R-40218	new
	1/4	5/8	2-1/2	4	87477		HSV-A-40218	new
1/4	1/4	3/8	2	4	82262	82262W	HSV-S-40250	
	1/4	1/2	2-1/2	4	82263	82263W	HSV-SR-40250	
	1/4	3/4	2-1/2	4	82264	82264W	HSV-R-40250	
	1/4	1	3	4	82265	82265W	HSV-M-40250	
	1/4	1-1/4	3	4	83195		HSV-L-40250	
	1/4	1-1/2	3	4	83196		HSV-LX-40250	
	1/4	1-3/4	4	4	87478		HSV-X-40250	new
5/16	5/16	1/2	2	4	83197		HSV-S-40312	
	5/16	3/4	2-1/2	4	83198		HSV-R-40312	
	5/16	1	2-1/2	4	83199		HSV-A-40312	
	5/16	1-1/4	3	4	83200		HSV-M-40312	
	5/16	1-9/16	4	4	87479		HSV-L-40312	new
3/8	3/8	1/2	2	4	82266	82266W	HSV-S-40375	
	3/8	7/8	3	4	82267	82267W	HSV-SR-40375	
	3/8	1	3	4	82268	82268W	HSV-R-40375	
	3/8	1-1/4	3	4	82269	82269W	HSV-M-40375	
	3/8	1-1/2	3	4	83201		HSV-L-40375	
	3/8	2	4	4	87480		HSV-LX-40375	new
1/2	1/2	5/8	2-1/2	4	82270	82270W	HSV-S-40500	
	1/2	1	3	4	82271	82271W	HSV-SR-40500	
	1/2	1-1/4	3	4	82272	82272W	HSV-R-40500	
	1/2	1-5/8	4	4	82273	82273W	HSV-M-40500	
	1/2	2	4	4	83202		HSV-L-40500	
	1/2	2-1/2	5	4	83203		HSV-LX-40500	
	1/2	3-1/8	6	4	84696		HSV-X-40500	
5/8	5/8	3/4	3	4	83204		HSV-S-40625	
	5/8	1-1/4	3-1/2	4	83205		HSV-SR-40625	
	5/8	1-5/8	3-1/2	4	83206		HSV-R-40625	
	5/8	2	4	4	83207		HSV-M-40625	
	5/8	2-1/2	5	4	87481		HSV-ML-40625	new
	5/8	3-1/4	6	4	87482		HSV-L-40625	new
3/4	3/4	7/8	3	4	83208		HSV-S-40750	
	3/4	1-1/4	4	4	83209		HSV-SR-40750	
	3/4	1-5/8	4	4	82274		HSV-R-40750	
	3/4	2-1/4	5	4	82275		HSV-M-40750	
	3/4	2-3/4	5	4	83210		HSV-ML-40750	
	3/4	3-1/4	6	4	83211		HSV-L-40750	
	3/4	4	6-1/2	4	87483		HSV-LX-40750	new

*.0005 max TIR

4 Flute

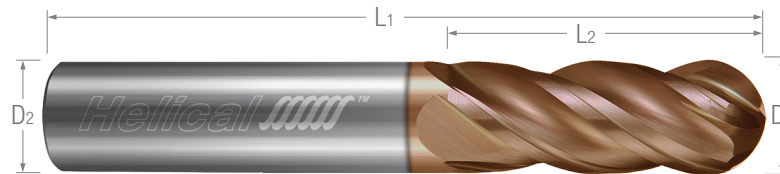
HSV-4

New Items! 4 FLUTE - BALL

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 106 for *Aplus* coating



new

new

new

new

new

Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	D_2 (h6)	$L_2 \begin{smallmatrix} +.032'' \\ -.006'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/8	1/8	1/4	1-1/2	4	83275	HSV-S-40125-BN
	1/8	3/8	2	4	83276	HSV-SR-40125-BN
	1/8	1/2	2-1/2	4	83277	HSV-R-40125-BN
	1/8	5/8	2-1/2	4	83278	HSV-A-40125-BN
	1/8	3/4	2-1/2	4	84750	HSV-M-40125-BN
	1/8	7/8	2-1/2	4	84751	HSV-L-40125-BN
	1/8	1	2-1/2	4	87484	HSV-LX-40125-BN
5/32	3/16	3/16	2	4	84752	HSV-S-40156-BN
	3/16	7/16	2-1/2	4	84753	HSV-R-40156-BN
	3/16	9/16	2-1/2	4	84754	HSV-M-40156-BN
	3/16	3/4	2-1/2	4	84755	HSV-ML-40156-BN
3/16	3/16	5/16	2	4	83279	HSV-S-40187-BN
	3/16	7/16	2	4	84756	HSV-SR-40187-BN
	3/16	5/8	2-1/2	4	83280	HSV-R-40187-BN
	3/16	1	2-1/2	4	83281	HSV-M-40187-BN
	3/16	1-3/16	3	4	84757	HSV-L-40187-BN
	3/16	1-3/8	3	4	87485	HSV-LX-40187-BN
7/32	1/4	1/4	2	4	87486	HSV-S-40218-BN
	1/4	7/16	2-1/2	4	87487	HSV-R-40218-BN
	1/4	5/8	2-1/2	4	87488	HSV-A-40218-BN
1/4	1/4	3/8	2	4	83282	HSV-S-40250-BN
	1/4	1/2	2-1/2	4	83283	HSV-SR-40250-BN
	1/4	3/4	2-1/2	4	83284	HSV-R-40250-BN
	1/4	1	3	4	83285	HSV-M-40250-BN
	1/4	1-1/4	3	4	83286	HSV-L-40250-BN
	1/4	1-1/2	3	4	84758	HSV-LX-40250-BN
	1/4	1-3/4	4	4	84759	HSV-X-40250-BN
5/16	5/16	1/2	2	4	83287	HSV-S-40312-BN
	5/16	3/4	2-1/2	4	83288	HSV-R-40312-BN
	5/16	1	2-1/2	4	83289	HSV-A-40312-BN
	5/16	1-1/4	3	4	83290	HSV-M-40312-BN
	5/16	1-9/16	4	4	84760	HSV-L-40312-BN

*.0005 max TIR

continued on next page



4 FLUTE - BALL

New Items!

HSV-4

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.000"} -0.002"	Shank Diameter D2 (h6)	Length of Cut L2 ^{+0.032"} -0.000"	Overall Length L1 ^{+0.062"} -0.062"	Flutes	Tplus Coated	Tool Description
3/8	3/8	1/2	2	4	83291	HSV-S-40375-BN
	3/8	7/8	3	4	83292	HSV-SR-40375-BN
	3/8	1	3	4	83293	HSV-R-40375-BN
	3/8	1-1/4	3	4	83294	HSV-M-40375-BN
	3/8	1-1/2	3	4	84761	HSV-L-40375-BN
	3/8	2	4	4	84762	HSV-LX-40375-BN
	3/8	2-1/2	5	4	87489	HSV-X-40375-BN new
7/16	7/16	5/8	2-3/4	4	84763	HSV-S-40437-BN
	7/16	7/8	2-3/4	4	84764	HSV-R-40437-BN
	7/16	1-1/8	3-1/2	4	84765	HSV-M-40437-BN
1/2	1/2	5/8	2-1/2	4	83295	HSV-S-40500-BN
	1/2	1	3	4	83296	HSV-SR-40500-BN
	1/2	1-1/4	3	4	83297	HSV-R-40500-BN
	1/2	1-5/8	4	4	83298	HSV-M-40500-BN
	1/2	2	4	4	83299	HSV-L-40500-BN
	1/2	2-1/2	5	4	84766	HSV-LX-40500-BN
	1/2	3-1/8	6	4	87490	HSV-X-40500-BN new
5/8	5/8	1-1/4	3-1/2	4	84767	HSV-SR-40625-BN
	5/8	1-5/8	3-1/2	4	84768	HSV-R-40625-BN
	5/8	2	4	4	84769	HSV-M-40625-BN
	5/8	2-1/2	5	4	87491	HSV-ML-40625-BN new
	5/8	3-1/4	6	4	87492	HSV-L-40625-BN new
3/4	3/4	7/8	3	4	83300	HSV-S-40750-BN
	3/4	1-1/4	4	4	83301	HSV-SR-40750-BN
	3/4	1-5/8	4	4	83302	HSV-R-40750-BN
	3/4	2-1/4	5	4	87493	HSV-M-40750-BN new
	3/4	2-3/4	5	4	87494	HSV-ML-40750-BN new
1	1	1-1/2	4	4	84770	HSV-S-41000-BN
	1	2	4-1/2	4	84771	HSV-R-41000-BN
	1	2-5/8	5	4	87495	HSV-M-41000-BN new

*.0005 max TIR

4 Flute

HSV-4 / HSM-4

New Items!

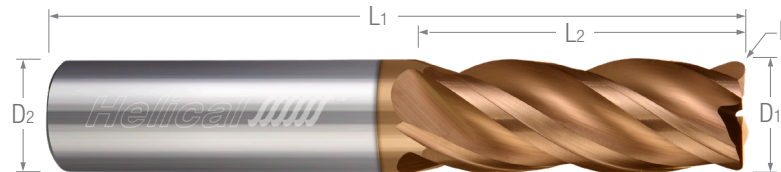
4 FLUTE - CORNER RADIUS

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics

- Center cutting
- h6 shank tolerance for high precision tool holders
- Tplus coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 109 for Aplus coating



4 Flute

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
$D_1^{+.0005"}$ $_{-.0005"}$	D_2 (h6)	$R^{+.001"}$ $_{-.001"}$	$L_2^{+.010"}$ $_{-.000"}$	$L_1^{+.062"}$ $_{-.062"}$				
1/32	1/4	.005	3/32	2-1/2	4	84016		HSM-030-40031-R.005
	1/4	.005	5/32	2-1/2	4	84017		HSM-050-40031-R.005
3/64	1/4	.010	5/32	2-1/2	4	84018		HSM-033-40047-R.010
	1/4	.010	1/4	2-1/2	4	84019		HSM-053-40047-R.010
1/16	1/4	.010	3/16	2-1/2	4	84020		HSM-030-40062-R.010
	1/4	.010	5/16	2-1/2	4	84021		HSM-050-40062-R.010
5/64	1/4	.010	1/4	2-1/2	4	84022		HSM-032-40078-R.010
	1/4	.010	3/8	2-1/2	4	84023		HSM-048-40078-R.010
3/32	1/4	.010	9/32	2-1/2	4	84024		HSM-030-40093-R.010
	1/4	.010	1/2	2-1/2	4	84025		HSM-053-40093-R.010

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
$D_1^{+.000"}$ $_{-.002"}$	D_2 (h6)	$R^{+.002"}$ $_{-.002"}$	$L_2^{+.032"}$ $_{-.000"}$	$L_1^{+.062"}$ $_{-.062"}$				
1/8	1/8	.010	1/4	1-1/2	4	83238		HSV-S-40125-R.010
	1/4	.010	1/4	2-1/2	4	84026		HSM-020-40125-R.010
	1/8	.010	3/8	2	4	84718		HSV-SR-40125-R.010
	1/4	.010	3/8	2-1/2	4	84027		HSM-030-40125-R.010
	1/8	.010	1/2	2-1/2	4	83239		HSV-R-40125-R.010
	1/4	.010	1/2	2-1/2	4	84028		HSM-040-40125-R.010
	1/8	.010	5/8	2-1/2	4	84719		HSV-A-40125-R.010
	1/8	.015	1/4	1-1/2	4	84720		HSV-S-40125-R.015
	1/8	.015	3/8	2	4	87683		HSV-SR-40125-R.015
	1/8	.015	1/2	2-1/2	4	84721		HSV-R-40125-R.015
	1/8	.020	1/4	1-1/2	4	87684		HSV-S-40125-R.020
	1/8	.020	3/8	2	4	87685		HSV-SR-40125-R.020
	1/8	.020	1/2	2-1/2	4	87686		HSV-R-40125-R.020
	1/8	.030	1/4	1-1/2	4	83240		HSV-S-40125-R.030
	1/4	.030	1/4	2-1/2	4	84033		HSM-020-40125-R.030
	1/8	.030	3/8	2	4	84722		HSV-SR-40125-R.030
	1/4	.030	3/8	2-1/2	4	84034		HSM-030-40125-R.030
	1/8	.030	1/2	2-1/2	4	83241		HSV-R-40125-R.030
	1/4	.030	1/2	2-1/2	4	84035		HSM-040-40125-R.030
	1/8	.030	5/8	2-1/2	4	84723		HSV-A-40125-R.030

new
new
new
new

*.0005 max TIR

continued on next page



Speeds & Feeds on Page 122

4 FLUTE - CORNER RADIUS

New Items!

HSV-4 / HSM-4

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D ₁ ^{+0.001"} _{-.002"}	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002"} _{-.002"}	Length of Cut L ₂ ^{+0.032"} _{-.000"}	Overall Length L ₁ ^{+0.062"} _{-.062"}	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description	
5/32	3/16	.010	3/16	2	4	87687		HSV-S-40156-R.010	new
	3/16	.010	5/16	2	4	87688		HSV-SR-40156-R.010	new
	3/16	.010	7/16	2-1/2	4	87689		HSV-R-40156-R.010	new
	3/16	.010	9/16	2-1/2	4	87690		HSV-M-40156-R.010	new
	3/16	.030	3/16	2	4	87691		HSV-S-40156-R.030	new
	3/16	.030	5/16	2	4	87692		HSV-SR-40156-R.030	new
	3/16	.030	7/16	2-1/2	4	87693		HSV-R-40156-R.030	new
	3/16	.030	9/16	2-1/2	4	87694		HSV-M-40156-R.030	new
3/16	3/16	.010	5/16	2	4	83242		HSV-S-40187-R.010	
	1/4	.010	5/16	2-1/2	4	84029		HSM-016-40187-R.010	
	1/4	.010	7/16	2-1/2	4	84030		HSM-023-40187-R.010	
	1/4	.010	9/16	2-1/2	4	84031		HSM-029-40187-R.010	
	3/16	.010	5/8	2-1/2	4	83243		HSV-R-40187-R.010	
	1/4	.010	3/4	2-1/2	4	84032		HSM-040-40187-R.010	
	3/16	.015	5/16	2	4	87695		HSV-S-40187-R.015	new
	3/16	.015	7/16	2	4	87696		HSV-SR-40187-R.015	new
	3/16	.015	5/8	2-1/2	4	87697		HSV-R-40187-R.015	new
	3/16	.020	5/16	2	4	87698		HSV-S-40187-R.020	new
	3/16	.020	7/16	2	4	87699		HSV-SR-40187-R.020	new
	3/16	.020	5/8	2-1/2	4	87700		HSV-R-40187-R.020	new
	3/16	.030	5/16	2	4	83244		HSV-S-40187-R.030	
	1/4	.030	5/16	2-1/2	4	84036		HSM-016-40187-R.030	
	1/4	.030	7/16	2-1/2	4	84037		HSM-023-40187-R.030	
	1/4	.030	9/16	2-1/2	4	84038		HSM-029-40187-R.030	
	3/16	.030	5/8	2-1/2	4	83245		HSV-R-40187-R.030	
	1/4	.030	3/4	2-1/2	4	84039		HSM-040-40187-R.030	
3/16	.030	1	2-1/2	4	84724		HSV-M-40187-R.030		
1/4	1/4	.010	3/8	2	4	83246		HSV-S-40250-R.010	
	1/4	.010	1/2	2-1/2	4	83247		HSV-SR-40250-R.010	
	1/4	.010	3/4	2-1/2	4	83248		HSV-R-40250-R.010	
	1/4	.010	1	3	4	84725		HSV-M-40250-R.010	
	1/4	.015	3/8	2	4	87701		HSV-S-40250-R.015	new
	1/4	.015	1/2	2-1/2	4	87702		HSV-SR-40250-R.015	new
	1/4	.015	3/4	2-1/2	4	87703		HSV-R-40250-R.015	new
	1/4	.015	1	3	4	87704		HSV-M-40250-R.015	new
	1/4	.020	3/8	2	4	82303	82303W	HSV-S-40250-R.020	
	1/4	.020	1/2	2-1/2	4	82304	82304W	HSV-SR-40250-R.020	
	1/4	.020	3/4	2-1/2	4	82305	82305W	HSV-R-40250-R.020	
	1/4	.020	1	3	4	82306		HSV-M-40250-R.020	
	1/4	.020	1-1/4	3	4	84726		HSV-L-40250-R.020	
	1/4	.030	3/8	2	4	83249		HSV-S-40250-R.030	
	1/4	.030	1/2	2-1/2	4	83250		HSV-SR-40250-R.030	
	1/4	.030	3/4	2-1/2	4	83251		HSV-R-40250-R.030	
	1/4	.030	1	3	4	83252		HSV-M-40250-R.030	
	1/4	.030	1-1/4	3	4	84727		HSV-L-40250-R.030	
	1/4	.060	3/8	2	4	83253		HSV-S-40250-R.060	
	1/4	.060	1/2	2-1/2	4	83254		HSV-SR-40250-R.060	
1/4	.060	3/4	2-1/2	4	83255		HSV-R-40250-R.060		
1/4	.060	1	3	4	83256		HSV-M-40250-R.060		
1/4	.060	1-1/4	3	4	84728		HSV-L-40250-R.060		

* .0005 max TIR

continued on next page

4 Flute

HSV-4 / HSM-4

New Items!

4 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

	Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	T plus Coated	T plus Coated + Weldon Flat	Tool Description	
	D ₁ ^{+0.000"} _{-0.002"}	D ₂ (h6)	R ^{+0.002"} _{-0.002"}	L ₂ ^{+0.032"} _{-0.000"}	L ₁ ^{+0.062"} _{-0.062"}					
new	5/16	5/16	.010	1/2	2	4	87705		HSV-S-40312-R.010	
new		5/16	.010	3/4	2-1/2	4	87706		HSV-R-40312-R.010	
new		5/16	.010	1	2-1/2	4	87707		HSV-A-40312-R.010	
new		5/16	.010	1-1/4	3	4	87708		HSV-M-40312-R.010	
		5/16	.020	1/2	2	4	84729		HSV-S-40312-R.020	
		5/16	.020	3/4	2-1/2	4	84730		HSV-R-40312-R.020	
		5/16	.020	1	2-1/2	4	84731		HSV-A-40312-R.020	
		5/16	.020	1-1/4	3	4	84732		HSV-M-40312-R.020	
new		5/16	.030	1/2	2	4	87709		HSV-S-40312-R.030	
new		5/16	.030	3/4	2-1/2	4	87710		HSV-R-40312-R.030	
new		5/16	.030	1	2-1/2	4	87711		HSV-A-40312-R.030	
new		5/16	.030	1-1/4	3	4	87712		HSV-M-40312-R.030	
new		3/8	3/8	.010	1/2	2	4	87713		HSV-S-40375-R.010
new			3/8	.010	7/8	3	4	87714		HSV-SR-40375-R.010
new			3/8	.010	1	3	4	87715		HSV-R-40375-R.010
new			3/8	.010	1-1/4	3	4	87716		HSV-M-40375-R.010
	3/8		.020	1/2	2	4	82307	82307W	HSV-S-40375-R.020	
	3/8		.020	7/8	3	4	82308	82308W	HSV-SR-40375-R.020	
	3/8		.020	1	3	4	82309		HSV-R-40375-R.020	
	3/8		.020	1-1/4	3	4	82310		HSV-M-40375-R.020	
	3/8		.030	1/2	2	4	82311		HSV-S-40375-R.030	
	3/8		.030	7/8	3	4	82312		HSV-SR-40375-R.030	
	3/8		.030	1	3	4	82313		HSV-R-40375-R.030	
	3/8		.030	1-1/4	3	4	82314		HSV-M-40375-R.030	
	3/8		.060	1/2	2	4	83257		HSV-S-40375-R.060	
	3/8		.060	7/8	3	4	83258		HSV-SR-40375-R.060	
new	3/8		.060	1	3	4	83259		HSV-R-40375-R.060	
	3/8		.060	1-1/4	3	4	87717		HSV-M-40375-R.060	
	1/2	1/2	.010	5/8	2-1/2	4	84733		HSV-S-40500-R.010	
		1/2	.010	1	3	4	84734		HSV-SR-40500-R.010	
		1/2	.010	1-1/4	3	4	84735		HSV-R-40500-R.010	
		1/2	.015	5/8	2-1/2	4	83260		HSV-S-40500-R.015	
		1/2	.015	1	3	4	83261		HSV-SR-40500-R.015	
		1/2	.015	1-1/4	3	4	83262		HSV-R-40500-R.015	
		1/2	.020	5/8	2-1/2	4	82315		HSV-S-40500-R.020	
		1/2	.020	1	3	4	82316		HSV-SR-40500-R.020	
		1/2	.020	1-1/4	3	4	82317		HSV-R-40500-R.020	
		1/2	.020	1-5/8	4	4	82318		HSV-M-40500-R.020	
		1/2	.030	5/8	2-1/2	4	82319	82319W	HSV-S-40500-R.030	
		1/2	.030	1	3	4	82320	82320W	HSV-SR-40500-R.030	
		1/2	.030	1-1/4	3	4	82321	82321W	HSV-R-40500-R.030	
		1/2	.030	1-5/8	4	4	82322	82322W	HSV-M-40500-R.030	
		1/2	.030	2	4	4	84736		HSV-L-40500-R.030	
		1/2	.060	5/8	2-1/2	4	82323		HSV-S-40500-R.060	
		1/2	.060	1	3	4	82324		HSV-SR-40500-R.060	
		1/2	.060	1-1/4	3	4	82325		HSV-R-40500-R.060	
		1/2	.060	1-5/8	4	4	82326		HSV-M-40500-R.060	
		1/2	.060	2	4	4	84737		HSV-L-40500-R.060	
	1/2	.090	5/8	2-1/2	4	84738		HSV-S-40500-R.090		
	1/2	.090	1	3	4	84739		HSV-SR-40500-R.090		
	1/2	.090	1-1/4	3	4	84740		HSV-R-40500-R.090		

*.0005 max TIR

continued on next page

4 FLUTE - CORNER RADIUS

New Items!

HSV-4 / HSM-4

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D ₁ ^{+0.001"} / _{-0.002"}	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	Length of Cut L ₂ ^{+0.032"} / _{-0.000"}	Overall Length L ₁ ^{+0.062"} / _{-0.062"}	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
1/2	1/2	.125	5/8	2-1/2	4	83263		HSV-S-40500-R.125
	1/2	.125	1	3	4	83264		HSV-SR-40500-R.125
	1/2	.125	1-1/4	3	4	83265		HSV-R-40500-R.125
	1/2	.125	1-5/8	4	4	83266		HSV-M-40500-R.125
	1/2	.125	2	4	4	84741		HSV-L-40500-R.125
5/8	5/8	.030	1-1/4	3-1/2	4	83267		HSV-SR-40625-R.030
	5/8	.030	1-5/8	3-1/2	4	83268		HSV-R-40625-R.030
	5/8	.030	2	4	4	83269		HSV-M-40625-R.030
3/4	3/4	.030	7/8	3	4	83270		HSV-S-40750-R.030
	3/4	.030	1-1/4	4	4	83271		HSV-SR-40750-R.030
	3/4	.030	1-5/8	4	4	82327		HSV-R-40750-R.030
	3/4	.030	2-1/4	5	4	82328		HSV-M-40750-R.030
	3/4	.030	3-1/4	6	4	83272		HSV-L-40750-R.030
	3/4	.060	7/8	3	4	87718		HSV-S-40750-R.060 new
	3/4	.060	1-1/4	4	4	87719		HSV-SR-40750-R.060 new
	3/4	.060	1-5/8	4	4	87720		HSV-R-40750-R.060 new
	3/4	.060	2-1/4	5	4	87721		HSV-M-40750-R.060 new
	3/4	.060	3-1/4	6	4	87722		HSV-L-40750-R.060 new
	3/4	.125	7/8	3	4	87723		HSV-S-40750-R.125 new
	3/4	.125	1-1/4	4	4	87724		HSV-SR-40750-R.125 new
	3/4	.125	1-5/8	4	4	87725		HSV-R-40750-R.125 new
	3/4	.125	2-1/4	5	4	87726		HSV-M-40750-R.125 new
3/4	.125	3-1/4	6	4	87727		HSV-L-40750-R.125 new	

*.0005 max TIR

4 Flute

HSV-RN-4

New! 4 FLUTE - SQUARE

Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 116 for *Aplus* coating



	Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Reach (LBS)	Neck Diameter	Flutes	<i>Tplus</i> Coated	Tool Description
	$D1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D2 \text{ (h6)}$	$L2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	$L3$				
new	1/8	1/8	5/32	3	3/8	.118	4	86935	HSV-RN-S-40125
new		1/8	5/32	3	1/2	.118	4	86936	HSV-RN-R-40125
new		1/8	5/32	3	5/8	.118	4	86937	HSV-RN-M-40125
new		1/8	5/32	3	3/4	.118	4	86938	HSV-RN-ML-40125
new		1/8	5/32	3	1	.118	4	86939	HSV-RN-LX-40125
new	3/16	3/16	7/32	3	1/2	.178	4	86940	HSV-RN-S-40187
new		3/16	7/32	3	3/4	.178	4	86941	HSV-RN-R-40187
new		3/16	7/32	3	1	.178	4	86942	HSV-RN-M-40187
new		3/16	7/32	3	1-5/16	.178	4	86943	HSV-RN-L-40187
new	1/4	1/4	3/8	3	3/4	.237	4	86944	HSV-RN-S-40250
new		1/4	3/8	4	1-1/8	.237	4	86945	HSV-RN-R-40250
new		1/4	3/8	4	1-5/8	.237	4	86946	HSV-RN-A-40250
new		1/4	3/8	4	2-1/8	.237	4	86947	HSV-RN-M-40250
new	3/8	3/8	1/2	4	1-1/8	.356	4	86948	HSV-RN-S-40375
new		3/8	1/2	4	1-5/8	.356	4	86949	HSV-RN-SR-40375
new		3/8	1/2	4	2-1/8	.356	4	86950	HSV-RN-R-40375
new		3/8	1/2	6	2-1/2	.356	4	86951	HSV-RN-A-40375
new	1/2	1/2	5/8	4	1-1/2	.475	4	86952	HSV-RN-S-40500
new		1/2	5/8	4	1-3/4	.475	4	86953	HSV-RN-SR-40500
new		1/2	5/8	4	2-1/4	.475	4	86954	HSV-RN-R-40500
new		1/2	5/8	5	2-3/4	.475	4	86955	HSV-RN-A-40500
new		1/2	5/8	6	3-3/8	.475	4	86956	HSV-RN-M-40500
new	3/4	3/4	1	6	2-1/2	.712	4	86957	HSV-RN-R-40750
new		3/4	1	6	3-3/8	.712	4	86958	HSV-RN-M-40750
new		3/4	1	6	4-1/8	.712	4	86959	HSV-RN-L-40750

* .0005 max TIR



4 FLUTE - BALL **New!**

HSV-RN-4

Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

4 Flute

For steel applications, see page 117 for *Aplus* coating



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Reach (LBS)	Neck Diameter	Flutes	Tplus Coated	Tool Description	
$D1^{+.000}_{-.002}$	$D2 (h6)$	$L2^{+.032}_{-.000}$	$L1^{+.062}_{-.062}$	$L3$					
1/8	1/8	5/32	3	3/8	.118	4	86875	HSV-RN-S-40125-BN	new
	1/8	5/32	3	1/2	.118	4	86876	HSV-RN-R-40125-BN	new
	1/8	5/32	3	5/8	.118	4	86877	HSV-RN-M-40125-BN	new
	1/8	5/32	3	3/4	.118	4	86878	HSV-RN-ML-40125-BN	new
	1/8	5/32	3	1	.118	4	86879	HSV-RN-LX-40125-BN	new
3/16	3/16	7/32	3	1/2	.178	4	86880	HSV-RN-S-40187-BN	new
	3/16	7/32	3	3/4	.178	4	86881	HSV-RN-R-40187-BN	new
	3/16	7/32	3	1	.178	4	86882	HSV-RN-M-40187-BN	new
	3/16	7/32	3	1-5/16	.178	4	86883	HSV-RN-L-40187-BN	new
1/4	1/4	3/8	3	3/4	.237	4	86884	HSV-RN-S-40250-BN	new
	1/4	3/8	4	1-1/8	.237	4	86885	HSV-RN-R-40250-BN	new
	1/4	3/8	4	1-5/8	.237	4	86886	HSV-RN-A-40250-BN	new
	1/4	3/8	4	2-1/8	.237	4	86887	HSV-RN-M-40250-BN	new
3/8	3/8	1/2	4	1-1/8	.356	4	86888	HSV-RN-S-40375-BN	new
	3/8	1/2	4	1-5/8	.356	4	86889	HSV-RN-SR-40375-BN	new
	3/8	1/2	4	2-1/8	.356	4	86890	HSV-RN-R-40375-BN	new
	3/8	1/2	6	2-1/2	.356	4	86891	HSV-RN-A-40375-BN	new
1/2	1/2	5/8	4	1-1/2	.475	4	86892	HSV-RN-S-40500-BN	new
	1/2	5/8	4	1-3/4	.475	4	86893	HSV-RN-SR-40500-BN	new
	1/2	5/8	4	2-1/4	.475	4	86894	HSV-RN-R-40500-BN	new
	1/2	5/8	5	2-3/4	.475	4	86895	HSV-RN-A-40500-BN	new
	1/2	5/8	6	3-3/8	.475	4	86896	HSV-RN-M-40500-BN	new
3/4	3/4	1	6	2-1/2	.712	4	86897	HSV-RN-R-40750-BN	new
	3/4	1	6	3-3/8	.712	4	86898	HSV-RN-M-40750-BN	new
	3/4	1	6	4-1/8	.712	4	86899	HSV-RN-L-40750-BN	new

* .0005 max TIR

HSV-RN-4

New!

4 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered with eccentric relief for maximum edge strength in both roughing and finishing applications
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics

- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- Tplus coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 119 for Aplus coating



	Cutter Dia. * D1 ^{+0.000} _{-0.002} "	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002} _{-0.002} "	Length of Cut L2 ^{+0.032} _{-0.000} "	Overall Length L1 ^{+0.062} _{-0.062} "	Reach (LBS) L3	Neck Diameter	Flutes	Tplus Coated	Tool Description
new	1/8	1/8	.010	5/32	3	3/8	.118	4	86900	HSV-RN-S-40125-R.010
new		1/8	.010	5/32	3	1/2	.118	4	86901	HSV-RN-R-40125-R.010
new		1/8	.010	5/32	3	5/8	.118	4	86902	HSV-RN-M-40125-R.010
new		1/8	.010	5/32	3	3/4	.118	4	86903	HSV-RN-ML-40125-R.010
new	3/16	3/16	.010	7/32	3	1/2	.178	4	86904	HSV-RN-S-40187-R.010
new		3/16	.010	7/32	3	3/4	.178	4	86905	HSV-RN-R-40187-R.010
new		3/16	.010	7/32	3	1	.178	4	86906	HSV-RN-M-40187-R.010
new		3/16	.010	7/32	3	1-5/16	.178	4	86907	HSV-RN-L-40187-R.010
new	1/4	1/4	.020	3/8	3	3/4	.237	4	86908	HSV-RN-S-40250-R.020
new		1/4	.020	3/8	4	1-1/8	.237	4	86909	HSV-RN-R-40250-R.020
new		1/4	.020	3/8	4	1-5/8	.237	4	86910	HSV-RN-A-40250-R.020
new		1/4	.020	3/8	4	2-1/8	.237	4	86911	HSV-RN-M-40250-R.020
new		1/4	.030	3/8	3	3/4	.237	4	86912	HSV-RN-S-40250-R.030
new		1/4	.030	3/8	4	1-1/8	.237	4	86913	HSV-RN-R-40250-R.030
new		1/4	.030	3/8	4	1-5/8	.237	4	86914	HSV-RN-A-40250-R.030
new		1/4	.030	3/8	4	2-1/8	.237	4	86915	HSV-RN-M-40250-R.030
new	3/8	3/8	.020	1/2	4	1-1/8	.356	4	86916	HSV-RN-S-40375-R.020
new		3/8	.020	1/2	4	2-1/8	.356	4	86917	HSV-RN-R-40375-R.020
new		3/8	.020	1/2	6	3-1/8	.356	4	86918	HSV-RN-M-40375-R.020
new		3/8	.020	1/2	6	4-1/8	.356	4	86919	HSV-RN-L-40375-R.020
new		3/8	.030	1/2	4	1-1/8	.356	4	86920	HSV-RN-S-40375-R.030
new		3/8	.030	1/2	4	2-1/8	.356	4	86921	HSV-RN-R-40375-R.030
new		3/8	.030	1/2	6	3-1/8	.356	4	86922	HSV-RN-M-40375-R.030
new		3/8	.030	1/2	6	4-1/8	.356	4	86923	HSV-RN-L-40375-R.030
new	1/2	1/2	.030	5/8	4	1-1/2	.475	4	86924	HSV-RN-S-40500-R.030
new		1/2	.030	5/8	4	2-1/4	.475	4	86925	HSV-RN-R-40500-R.030
new		1/2	.030	5/8	6	3-3/8	.475	4	86926	HSV-RN-M-40500-R.030
new		1/2	.030	5/8	6	4-1/8	.475	4	86927	HSV-RN-L-40500-R.030
new		1/2	.060	5/8	4	1-1/2	.475	4	86928	HSV-RN-S-40500-R.060
new		1/2	.060	5/8	4	2-1/4	.475	4	86929	HSV-RN-R-40500-R.060
new		1/2	.060	5/8	6	3-3/8	.475	4	86930	HSV-RN-M-40500-R.060
new		1/2	.060	5/8	6	4-1/8	.475	4	86931	HSV-RN-L-40500-R.060
new	3/4	3/4	.030	1	6	2-1/2	.712	4	86932	HSV-RN-R-40750-R.030
new		3/4	.030	1	6	3-3/8	.712	4	86933	HSV-RN-M-40750-R.030
new		3/4	.030	1	6	4-1/8	.712	4	86934	HSV-RN-L-40750-R.030

* .0005 max TIR



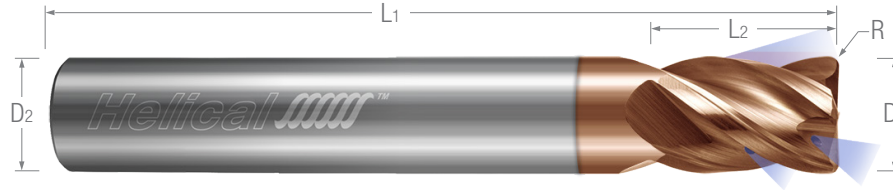
Speeds & Feeds on Page 122

4 FLUTE - CORNER RADIUS

HEVC-4

Coolant Through - Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- 4 flute variable pitch design for reduced harmonics and increased feed rates
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 ^{+0.001"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Tplus</i> Coated	Tool Description
1/4	1/4	.020	1/2	2-1/2	4	84289	HEVC-020-40250-R.020
	1/4	.020	3/4	2-1/2	4	84290	HEVC-030-40250-R.020
	1/4	.030	1/2	2-1/2	4	84291	HEVC-020-40250-R.030
	1/4	.030	3/4	2-1/2	4	84292	HEVC-030-40250-R.030
3/8	3/8	.020	1/2	2	4	84293	HEVC-013-40375-R.020
	3/8	.020	1	3	4	84294	HEVC-026-40375-R.020
	3/8	.030	1/2	2	4	84295	HEVC-013-40375-R.030
	3/8	.030	1	3	4	84296	HEVC-026-40375-R.030
1/2	1/2	.030	1	3	4	84297	HEVC-020-40500-R.030
	1/2	.030	1-1/4	3	4	84298	HEVC-025-40500-R.030
	1/2	.030	1-5/8	4	4	84299	HEVC-032-40500-R.030
	1/2	.060	1	3	4	84300	HEVC-020-40500-R.060
	1/2	.060	1-1/4	3	4	84301	HEVC-025-40500-R.060
	1/2	.060	1-5/8	4	4	84302	HEVC-032-40500-R.060
3/4	3/4	.030	1-5/8	4	4	84303	HEVC-021-40750-R.030
	3/4	.030	2-1/4	5	4	84304	HEVC-030-40750-R.030

*.0005 max TIR

HEVC-4

SPEEDS & FEEDS

4 Flute - Corner Radius - Coolant Through - Variable Pitch

HEVC-4

Material Guide		Hardness	SFM	Inches per Tooth (IPT)																							
				1/8			3/16			1/4			3/8			1/2			3/4			1					
				Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin	Slot	Rgh	Fin			
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0007	.0013	.0017	.0011	.0019	.0019	.0014	.0025	.0022	.0021	.0020	.0016	.0027	.0021	.0020	.0036	.0025	.0029	.0051	.0029	.0037	.0065	.0036	
		75 - 98 HRB	445	.0005	.0009	.0014	.0008	.0014	.0016	.0010	.0018	.0018	.0016	.0027	.0021	.0020	.0036	.0025	.0029	.0051	.0029	.0037	.0065	.0036	.0036	.0036	
		21 - 36 HRC	400	.0003	.0006	.0012	.0005	.0009	.0013	.0007	.0012	.0015	.0010	.0018	.0017	.0013	.0023	.0020	.0019	.0033	.0024	.0024	.0042	.0029	.0029	.0029	
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0005	.0008	.0014	.0007	.0012	.0015	.0009	.0016	.0017	.0013	.0024	.0020	.0017	.0031	.0023	.0025	.0044	.0027	.0032	.0056	.0033	.0033		
		21 - 36 HRC	340	.0003	.0006	.0012	.0005	.0009	.0013	.0007	.0012	.0015	.0010	.0018	.0017	.0013	.0023	.0020	.0019	.0033	.0024	.0024	.0042	.0029	.0029		
		36 - 50 HRC	260	.0003	.0005	.0011	.0005	.0008	.0012	.0006	.0010	.0014	.0009	.0015	.0016	.0011	.0020	.0019	.0016	.0029	.0022	.0021	.0036	.0027	.0027		
TOOL STEEL	A2, H13, L6, P20, S7	> 50 HRC	155	.0002	.0004	.0010	.0004	.0006	.0011	.0005	.0008	.0012	.0007	.0012	.0014	.0009	.0016	.0017	.0013	.0023	.0020	.0016	.0029	.0024	.0024		
		75 - 98 HRB	340	.0005	.0008	.0014	.0007	.0012	.0015	.0009	.0016	.0017	.0013	.0024	.0020	.0017	.0031	.0023	.0025	.0044	.0027	.0032	.0056	.0033	.0033		
		21 - 36 HRC	250	.0004	.0006	.0012	.0005	.0009	.0013	.0007	.0012	.0015	.0010	.0018	.0017	.0014	.0025	.0020	.0020	.0035	.0024	.0025	.0045	.0029	.0029		
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	75 - 98 HRB	290	.0006	.0011	.0015	.0009	.0015	.0017	.0012	.0021	.0020	.0018	.0031	.0023	.0023	.0040	.0026	.0033	.0058	.0032	.0042	.0074	.0038	.0038		
		21 - 36 HRC	255	.0004	.0007	.0013	.0006	.0011	.0014	.0008	.0014	.0016	.0012	.0021	.0019	.0016	.0028	.0022	.0023	.0040	.0026	.0029	.0051	.0031	.0031		
		36 - 50 HRC	175	.0004	.0007	.0012	.0006	.0010	.0013	.0007	.0013	.0015	.0011	.0019	.0018	.0014	.0025	.0021	.0020	.0036	.0025	.0026	.0046	.0030	.0030		
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	> 50 HRC	150	.0003	.0006	.0011	.0005	.0009	.0013	.0007	.0012	.0015	.0010	.0017	.0017	.0013	.0022	.0019	.0018	.0032	.0023	.0023	.0041	.0028	.0028		
		75 - 98 HRB	265	.0004	.0008	.0013	.0007	.0012	.0015	.0009	.0016	.0017	.0013	.0023	.0019	.0017	.0030	.0023	.0024	.0043	.0027	.0031	.0055	.0033	.0033		
		21 - 36 HRC	225	.0004	.0007	.0013	.0006	.0010	.0014	.0008	.0014	.0016	.0012	.0021	.0018	.0015	.0027	.0021	.0022	.0039	.0026	.0028	.0049	.0031	.0031		
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0005	.0008	.0013	.0007	.0012	.0015	.0009	.0016	.0017	.0013	.0024	.0020	.0018	.0031	.0023	.0025	.0044	.0027	.0032	.0057	.0033	.0033		
		21 - 36 HRC	280	.0004	.0007	.0013	.0006	.0010	.0014	.0008	.0014	.0016	.0012	.0021	.0018	.0015	.0027	.0021	.0022	.0039	.0025	.0028	.0049	.0031	.0031		
		36 - 50 HRC	180	.0003	.0006	.0011	.0005	.0008	.0012	.0006	.0011	.0014	.0009	.0017	.0017	.0012	.0022	.0019	.0018	.0031	.0023	.0023	.0040	.0028	.0028		
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0003	.0006	.0011	.0005	.0009	.0013	.0007	.0012	.0015	.0010	.0017	.0017	.0013	.0023	.0020	.0018	.0033	.0023	.0024	.0041	.0028	.0028		
		36 - 50 HRC	145	.0003	.0005	.0011	.0004	.0008	.0012	.0006	.0010	.0014	.0009	.0015	.0016	.0011	.0020	.0018	.0016	.0028	.0022	.0020	.0036	.0027	.0027		
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0007	.0013	.0017	.0011	.0019	.0019	.0015	.0026	.0022	.0022	.0038	.0025	.0028	.0050	.0029	.0041	.0072	.0035	.0052	.0091	.0043	.0043		
		21 - 36 HRC	370	.0004	.0007	.0013	.0006	.0010	.0014	.0008	.0014	.0016	.0012	.0021	.0018	.0015	.0027	.0022	.0022	.0039	.0026	.0028	.0050	.0031	.0031		
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0005	.0008	.0014	.0007	.0012	.0015	.0009	.0016	.0017	.0014	.0024	.0020	.0018	.0032	.0023	.0026	.0045	.0028	.0033	.0058	.0034	.0034		
		21 - 36 HRC	335	.0004	.0007	.0013	.0006	.0010	.0014	.0008	.0014	.0016	.0012	.0021	.0019	.0016	.0027	.0022	.0022	.0039	.0026	.0028	.0050	.0031	.0031		
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0005	.0009	.0014	.0007	.0013	.0015	.0010	.0017	.0018	.0014	.0025	.0020	.0019	.0033	.0024	.0027	.0047	.0028	.0034	.0060	.0034	.0034		
		21 - 36 HRC	260	.0003	.0006	.0011	.0005	.0008	.0013	.0006	.0011	.0014	.0010	.0017	.0017	.0012	.0022	.0019	.0018	.0031	.0023	.0023	.0040	.0028	.0028		
		36 - 50 HRC	135	.0002	.0004	.0009	.0003	.0005	.0010	.0004	.0007	.0011	.0006	.0011	.0013	.0008	.0014	.0015	.0011	.0020	.0018	.0014	.0025	.0022	.0022		
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0006	.0011	.0016	.0009	.0016	.0018	.0012	.0022	.0020	.0018	.0032	.0023	.0024	.0042	.0027	.0035	.0061	.0032	.0044	.0077	.0039	.0039		
		75 - 98 HRB	250	.0005	.0009	.0014	.0008	.0014	.0016	.0010	.0018	.0018	.0015	.0027	.0021	.0020	.0036	.0025	.0029	.0051	.0029	.0037	.0065	.0036	.0036		
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0003	.0006	.0011	.0005	.0008	.0013	.0006	.0011	.0014	.0009	.0017	.0017	.0012	.0022	.0019	.0018	.0031	.0023	.0022	.0039	.0028	.0028		
		21 - 36 HRC	75	.0003	.0005	.0011	.0005	.0008	.0012	.0006	.0011	.0014	.0009	.0016	.0016	.0012	.0021	.0019	.0017	.0030	.0023	.0021	.0038	.0027	.0027		
		36 - 50 HRC	70	.0003	.0005	.0010	.0004	.0007	.0011	.0005	.0009	.0013	.0008	.0014	.0015	.0010	.0018	.0017	.0014	.0025	.0021	.0018	.0032	.0025	.0025		
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0009	.0015	.0019	.0013	.0022	.0021	.0017	.0030	.0024	.0025	.0045	.0027	.0033	.0059	.0032	.0048	.0084	.0038	.0061	.0107	.0046	.0046		
		75 - 98 HRB	275	.0007	.0013	.0017	.0011	.0019	.0019	.0014	.0025	.0022	.0021	.0038	.0025	.0028	.0049	.0029	.0040	.0070	.0035	.0051	.0090	.0042	.0042		
		21 - 36 HRC	250	.0006	.0010	.0015	.0008	.0014	.0017	.0011	.0019	.0019	.0016	.0028	.0022	.0021	.0037	.0025	.0030	.0053	.0030	.0038	.0067	.0036	.0036		
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0004	.0008	.0013	.0006	.0011	.0015	.0009	.0015	.0017	.0013	.0022	.0019	.0016	.0029	.0022	.0024	.0042	.0027	.0030	.0053	.0032	.0032		
		36 - 50 HRC	160	.0004	.0007	.0012	.0006	.0010	.0014	.0008	.0014	.0016	.0011	.0020	.0018	.0015	.0026	.0021	.0022	.0038	.0025	.0027	.0048	.0031	.0031		
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0004	.0006	.0012	.0006	.0009	.0014	.0007	.0013	.0015	.0011	.0019	.0018	.0014	.0025	.0021	.0020	.0035	.0024	.0025	.0045	.0030	.0030		
		21 - 36 HRC	170	.0004	.0006	.0012	.0005	.0009	.0013	.0007	.0012	.0015	.0010	.0018	.0017	.0013	.0024	.0020	.0019	.0034	.0024	.0025	.0043	.0029	.0029		
		36 - 50 HRC	65	.0002	.0004	.0010	.0004	.0006	.0011	.0005	.0008	.0012	.0007	.0012	.0014	.0009	.0016	.0017	.0013	.0023	.0020	.0017	.0029	.0024	.0024		

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	75%-125% Diameter	100% Diameter
	≥ 35 HRC	60%-100% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	25%-35% Diameter
Fin (Finishing)	N/A	Up to Max LOC	4%-6% Diameter

NOTES:
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut.
 For more accurate running parameters, please refer to Machining Advisor Pro.

5 FLUTE - SQUARE

New Items!

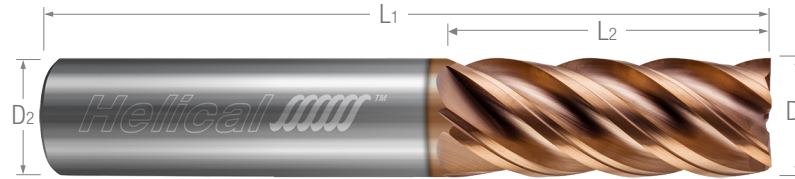


HEV-5 / HSM-5

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- Tplus coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 123 for Aplus coating



5 Flute

Cutter Diameter* D1 $^{+.0005}$ / $_{-.0005}$ "	Shank Diameter D2 (h6)	Length of Cut L2 $^{+.010}$ / $_{-.000}$ "	Overall Length L1 $^{+.062}$ / $_{-.062}$ "	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
1/32	1/4	3/32	2-1/2	5	84081		HSM-030-50031
	1/4	5/32	2-1/2	5	84082		HSM-050-50031
3/64	1/4	5/32	2-1/2	5	84083		HSM-033-50047
	1/4	1/4	2-1/2	5	84084		HSM-053-50047
1/16	1/4	3/16	2-1/2	5	84085		HSM-030-50062
	1/4	5/16	2-1/2	5	84086		HSM-050-50062
5/64	1/4	1/4	2-1/2	5	84087		HSM-032-50078
	1/4	3/8	2-1/2	5	84088		HSM-048-50078
3/32	1/4	9/32	2-1/2	5	84089		HSM-030-50093
	1/4	1/2	2-1/2	5	84090		HSM-053-50093

Cutter Diameter* D1 $^{+.000}$ / $_{-.002}$ "	Shank Diameter D2 (h6)	Length of Cut L2 $^{+.032}$ / $_{-.000}$ "	Overall Length L1 $^{+.062}$ / $_{-.062}$ "	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
1/8	1/8	1/4	1-1/2	5	59833		HEV-S-50125
	1/4	1/4	2-1/2	5	84091		HSM-020-50125
	1/8	3/8	2	5	82525		HEV-SR-50125
	1/4	3/8	2-1/2	5	84092		HSM-030-50125
	1/8	1/2	2-1/2	5	81840		HEV-R-50125
	1/4	1/2	2-1/2	5	84093		HSM-040-50125
	1/8	5/8	2-1/2	5	82526		HEV-A-50125
	1/8	3/4	2-1/2	5	82949		HEV-M-50125
5/32	1/8	1	2-1/2	5	87496		HEV-LX-50125 new
	3/16	3/16	2	5	82950		HEV-S-50156
	3/16	5/16	2	5	84633		HEV-SR-50156
	3/16	7/16	2-1/2	5	82951		HEV-R-50156
3/16	3/16	9/16	2-1/2	5	82952		HEV-M-50156
	3/16	5/16	2	5	59834		HEV-S-50187
	1/4	5/16	2-1/2	5	84094		HSM-016-50187
	3/16	7/16	2	5	82527		HEV-SR-50187
	1/4	7/16	2-1/2	5	84095		HSM-023-50187
	3/16	9/16	2-1/2	5	59835		HEV-R-50187
	1/4	9/16	2-1/2	5	84096		HSM-029-50187
	3/16	3/4	2-1/2	5	81841		HEV-M-50187
	1/4	3/4	2-1/2	5	84097		HSM-040-50187
	3/16	1	2-1/2	5	82953		HEV-ML-50187

* .0005 max TIR

continued on next page



HEV-5 / HSM-5



New Items!

5 FLUTE - SQUARE

Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 (h6)$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$				
7/32	1/4	5/16	2	5	82954		HEV-S-50218
	1/4	7/16	2-1/2	5	82955		HEV-R-50218
1/4	1/4	3/8	2	5	59836		HEV-S-50250
	1/4	1/2	2-1/2	5	59837		HEV-SR-50250
	1/4	3/4	2-1/2	5	59838		HEV-R-50250
	1/4	1	3	5	81842		HEV-M-50250
	1/4	1-1/4	3	5	82528		HEV-L-50250
	1/4	1-1/2	3	5	82956		HEV-LX-50250
	1/4	1-3/4	4	5	87497		HEV-X-50250
5/16	5/16	7/16	2	5	59839		HEV-S-50312
	5/16	13/16	2-1/2	5	59840		HEV-R-50312
	5/16	1	3	5	59841		HEV-M-50312
	5/16	1-1/4	3	5	87498		HEV-L-50312
3/8	3/8	1/2	2	5	59842	59842W	HEV-S-50375
	3/8	3/4	2-1/2	5	82529		HEV-SR-50375
	3/8	1	3	5	59843	59843W	HEV-R-50375
	3/8	1-1/4	3	5	59844		HEV-M-50375
	3/8	1-1/2	3-1/2	5	81843		HEV-L-50375
	3/8	2	4	5	87499		HEV-LX-50375
1/2	1/2	5/8	2-1/2	5	59845	59845W	HEV-S-50500
	1/2	1	3	5	59846	59846W	HEV-SR-50500
	1/2	1-1/4	3	5	59847	59847W	HEV-R-50500
	1/2	1-5/8	4	5	59848		HEV-M-50500
	1/2	2	4	5	81844		HEV-L-50500
	1/2	2-1/2	5	5	84634		HEV-LX-50500
	1/2	3-1/8	6	5	84635		HEV-X-50500
5/8	5/8	3/4	3	5	59849	59849W	HEV-S-50625
	5/8	1-1/4	3-1/2	5	59850		HEV-SR-50625
	5/8	1-5/8	3-1/2	5	59851	59851W	HEV-R-50625
	5/8	2-1/8	4	5	81845		HEV-M-50625
	5/8	2-1/2	5	5	81846		HEV-L-50625
3/4	3/4	1	3	5	59852		HEV-S-50750
	3/4	1-5/8	4	5	59853	59853W	HEV-R-50750
	3/4	2-1/4	5	5	59854	59854W	HEV-M-50750
	3/4	2-3/4	5	5	81847		HEV-L-50750
	3/4	3-1/4	6	5	82957		HEV-LX-50750
1	1	2	4-1/2	5	81848		HEV-R-51000
	1	2-5/8	5	5	81849		HEV-M-51000

*.0005 max TIR

5 FLUTE - CORNER RADIUS New Items!

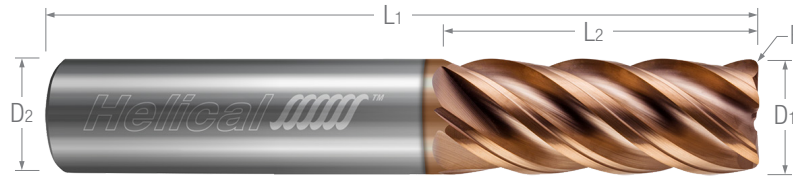


HEV-5 / HSM-5

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 126 for *Aplus* coating



5 Flute

Cutter Dia.* D1 ^{+0.005"} / _{-0.005"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.001"} / _{-0.001"}	LOC L2 ^{+0.010"} / _{-0.000"}	OAL L1 ^{+0.062"} / _{-0.062"}	Flutes	<i>Tplus</i> Coated	<i>Tplus</i> Coated + Weldon Flat	Tool Description
1/32	1/4	.005	3/32	2-1/2	5	84057		HSM-030-50031-R.005
	1/4	.005	5/32	2-1/2	5	84058		HSM-050-50031-R.005
3/64	1/4	.010	5/32	2-1/2	5	84059		HSM-033-50047-R.010
	1/4	.010	1/4	2-1/2	5	84060		HSM-053-50047-R.010
1/16	1/4	.010	3/16	2-1/2	5	84061		HSM-030-50062-R.010
	1/4	.010	5/16	2-1/2	5	84062		HSM-050-50062-R.010
5/64	1/4	.010	1/4	2-1/2	5	84063		HSM-032-50078-R.010
	1/4	.010	3/8	2-1/2	5	84064		HSM-048-50078-R.010
3/32	1/4	.010	9/32	2-1/2	5	84065		HSM-030-50093-R.010
	1/4	.010	1/2	2-1/2	5	84066		HSM-053-50093-R.010

Cutter Dia.* D1 ^{+0.000"} / _{-0.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	LOC L2 ^{+0.032"} / _{-0.000"}	OAL L1 ^{+0.062"} / _{-0.062"}	Flutes	<i>Tplus</i> Coated	<i>Tplus</i> Coated + Weldon Flat	Tool Description
1/8	1/8	.010	1/4	1-1/2	5	59855		HEV-S-50125-R.010
	1/4	.010	1/4	2-1/2	5	84067		HSM-020-50125-R.010
	1/8	.010	3/8	2	5	82970		HEV-SR-50125-R.010
	1/4	.010	3/8	2-1/2	5	84068		HSM-030-50125-R.010
	1/8	.010	1/2	2-1/2	5	81850		HEV-R-50125-R.010
	1/4	.010	1/2	2-1/2	5	84069		HSM-040-50125-R.010
	1/8	.010	5/8	2-1/2	5	84669		HEV-A-50125-R.010
	1/8	.010	3/4	2-1/2	5	82971		HEV-M-50125-R.010
	1/8	.015	1/4	1-1/2	5	82972		HEV-S-50125-R.015
	1/8	.015	3/8	2	5	84670		HEV-SR-50125-R.015
	1/8	.015	1/2	2-1/2	5	82973		HEV-R-50125-R.015
	1/8	.015	5/8	2-1/2	5	87500		HEV-A-50125-R.015 new
	1/8	.015	3/4	2-1/2	5	87501		HEV-M-50125-R.015 new
	1/8	.020	1/4	1-1/2	5	87502		HEV-S-50125-R.020 new
	1/8	.020	3/8	2	5	87503		HEV-SR-50125-R.020 new
1/8	.020	1/2	2-1/2	5	87504		HEV-R-50125-R.020 new	
1/8	.020	5/8	2-1/2	5	87505		HEV-A-50125-R.020 new	

*.0005 max TIR

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HEV-5 / HSM-5



New Items!

5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Dia.* D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Dia. D2 (h6)	Corner Radius R $\begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	LOC L2 $\begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	OAL L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
1/8	1/8	.030	1/4	1-1/2	5	81851		HEV-S-50125-R.030
	1/4	.030	1/4	2-1/2	5	84074		HSM-020-50125-R.030
	1/8	.030	3/8	2	5	84671		HEV-SR-50125-R.030
	1/4	.030	3/8	2-1/2	5	84075		HSM-030-50125-R.030
	1/8	.030	1/2	2-1/2	5	81852		HEV-R-50125-R.030
	1/4	.030	1/2	2-1/2	5	84076		HSM-040-50125-R.030
	1/8	.030	5/8	2-1/2	5	84672		HEV-A-50125-R.030
1/8	.030	3/4	2-1/2	5	82974		HEV-M-50125-R.030	
3/16	3/16	.010	5/16	2	5	59856		HEV-S-50187-R.010
	1/4	.010	5/16	2-1/2	5	84070		HSM-016-50187-R.010
	3/16	.010	7/16	2	5	82975		HEV-SR-50187-R.010
	1/4	.010	7/16	2-1/2	5	84071		HSM-023-50187-R.010
	3/16	.010	9/16	2-1/2	5	59857		HEV-R-50187-R.010
	1/4	.010	9/16	2-1/2	5	84072		HSM-029-50187-R.010
	3/16	.010	3/4	2-1/2	5	81853		HEV-M-50187-R.010
	1/4	.010	3/4	2-1/2	5	84073		HSM-040-50187-R.010
	3/16	.010	1	2-1/2	5	84673		HEV-ML-50187-R.010
	3/16	.015	5/16	2	5	82976		HEV-S-50187-R.015
	3/16	.015	9/16	2-1/2	5	82977		HEV-R-50187-R.015
	3/16	.030	5/16	2	5	81854		HEV-S-50187-R.030
	1/4	.030	5/16	2-1/2	5	84077		HSM-016-50187-R.030
	3/16	.030	7/16	2	5	84674		HEV-SR-50187-R.030
	1/4	.030	7/16	2-1/2	5	84078		HSM-023-50187-R.030
	3/16	.030	9/16	2-1/2	5	81855		HEV-R-50187-R.030
	1/4	.030	9/16	2-1/2	5	84079		HSM-029-50187-R.030
	3/16	.030	3/4	2-1/2	5	81856		HEV-M-50187-R.030
	1/4	.030	3/4	2-1/2	5	84080		HSM-040-50187-R.030
3/16	.030	1	2-1/2	5	84675		HEV-ML-50187-R.030	
1/4	1/4	.010	3/8	2	5	82978		HEV-S-50250-R.010
	1/4	.010	1/2	2-1/2	5	82979		HEV-SR-50250-R.010
	1/4	.010	3/4	2-1/2	5	82980		HEV-R-50250-R.010
	1/4	.010	1	3	5	87506		HEV-M-50250-R.010
	1/4	.010	1-1/4	3	5	87507		HEV-L-50250-R.010
	1/4	.015	3/8	2	5	82981		HEV-S-50250-R.015
	1/4	.015	1/2	2-1/2	5	82982		HEV-SR-50250-R.015
	1/4	.015	3/4	2-1/2	5	82983		HEV-R-50250-R.015
	1/4	.015	1	3	5	87508		HEV-M-50250-R.015
	1/4	.015	1-1/4	3	5	87509		HEV-L-50250-R.015
	1/4	.020	3/8	2	5	59858		HEV-S-50250-R.020
	1/4	.020	1/2	2-1/2	5	59859		HEV-SR-50250-R.020
	1/4	.020	3/4	2-1/2	5	59860		HEV-R-50250-R.020
	1/4	.020	1	3	5	81857		HEV-M-50250-R.020
	1/4	.020	1-1/4	3	5	82984		HEV-L-50250-R.020
	1/4	.030	3/8	2	5	59861		HEV-S-50250-R.030
	1/4	.030	1/2	2-1/2	5	59862		HEV-SR-50250-R.030
	1/4	.030	3/4	2-1/2	5	59863		HEV-R-50250-R.030
	1/4	.030	1	3	5	81858		HEV-M-50250-R.030
	1/4	.030	1-1/4	3	5	82985		HEV-L-50250-R.030
	1/4	.060	3/8	2	5	81859		HEV-S-50250-R.060
1/4	.060	1/2	2-1/2	5	81860		HEV-SR-50250-R.060	
1/4	.060	3/4	2-1/2	5	81861		HEV-R-50250-R.060	
1/4	.060	1	3	5	81862		HEV-M-50250-R.060	
1/4	.060	1-1/4	3	5	82986		HEV-L-50250-R.060	

new
newnew
new

*.0005 max TIR

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5 Flute

5 FLUTE - CORNER RADIUS New Items!



HEV-5 / HSM-5

Variable Pitch (cont.)

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Cutter Dia.* D1 ^{+0.000"} _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} _{-.002"}	LOC L2 ^{+0.032"} _{-.000"}	OAL L1 ^{+0.062"} _{-.062"}	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description	
5/16	5/16	.010	7/16	2	5	84676		HEV-S-50312-R.010	
	5/16	.010	13/16	2-1/2	5	84677		HEV-R-50312-R.010	
	5/16	.010	1-1/4	3	5	87510		HEV-M-50312-R.010	new
	5/16	.020	7/16	2	5	59864		HEV-S-50312-R.020	
	5/16	.020	13/16	2-1/2	5	59865		HEV-R-50312-R.020	
	5/16	.020	1	3	5	81863		HEV-M-50312-R.020	
	5/16	.030	7/16	2	5	82987		HEV-S-50312-R.030	
	5/16	.030	13/16	2-1/2	5	82988		HEV-R-50312-R.030	
5/16	.030	1	3	5	82989		HEV-M-50312-R.030		
3/8	3/8	.010	1/2	2	5	82990		HEV-S-50375-R.010	
	3/8	.010	3/4	2-1/2	5	84678		HEV-SR-50375-R.010	
	3/8	.010	1	3	5	82991		HEV-R-50375-R.010	
	3/8	.010	1-1/4	3	5	87511		HEV-M-50375-R.010	new
	3/8	.015	1	3	5	82992		HEV-R-50375-R.015	
	3/8	.015	1-1/4	3	5	87512		HEV-M-50375-R.015	new
	3/8	.020	1/2	2	5	59866	59866W	HEV-S-50375-R.020	
	3/8	.020	3/4	2-1/2	5	84679		HEV-SR-50375-R.020	
	3/8	.020	1	3	5	59867	59867W	HEV-R-50375-R.020	
	3/8	.020	1-1/4	3	5	59868		HEV-M-50375-R.020	
	3/8	.020	1-1/2	3-1/2	5	81864		HEV-L-50375-R.020	
	3/8	.030	1/2	2	5	59869	59869W	HEV-S-50375-R.030	
	3/8	.030	3/4	2-1/2	5	82993		HEV-SR-50375-R.030	
	3/8	.030	1	3	5	59870	59870W	HEV-R-50375-R.030	
	3/8	.030	1-1/4	3	5	59871		HEV-M-50375-R.030	
	3/8	.030	1-1/2	3-1/2	5	81865	81865W	HEV-L-50375-R.030	
	3/8	.030	2	4	5	84680		HEV-LX-50375-R.030	
	3/8	.060	1/2	2	5	59872		HEV-S-50375-R.060	
	3/8	.060	3/4	2-1/2	5	82994		HEV-SR-50375-R.060	
	3/8	.060	1	3	5	59873		HEV-R-50375-R.060	
3/8	.060	1-1/4	3	5	59874		HEV-M-50375-R.060		
3/8	.060	1-1/2	3-1/2	5	81866		HEV-L-50375-R.060		
3/8	.090	1/2	2	5	82995		HEV-S-50375-R.090		
3/8	.090	1	3	5	82996		HEV-R-50375-R.090		
3/8	.090	1-1/4	3	5	87513		HEV-M-50375-R.090	new	
1/2	1/2	.010	5/8	2-1/2	5	82997		HEV-S-50500-R.010	
	1/2	.010	1	3	5	82998		HEV-SR-50500-R.010	
	1/2	.010	1-1/4	3	5	82999		HEV-R-50500-R.010	
	1/2	.010	1-5/8	4	5	87514		HEV-M-50500-R.010	new
	1/2	.010	2	4	5	87515		HEV-L-50500-R.010	new
	1/2	.015	5/8	2-1/2	5	83000		HEV-S-50500-R.015	
	1/2	.015	1	3	5	83001		HEV-SR-50500-R.015	
	1/2	.015	1-1/4	3	5	83002		HEV-R-50500-R.015	
	1/2	.015	1-5/8	4	5	87516		HEV-M-50500-R.015	new
	1/2	.015	2	4	5	87517		HEV-L-50500-R.015	new
	1/2	.020	5/8	2-1/2	5	83003		HEV-S-50500-R.020	
	1/2	.020	1	3	5	83004		HEV-SR-50500-R.020	
	1/2	.020	1-1/4	3	5	83005		HEV-R-50500-R.020	
	1/2	.020	1-5/8	4	5	87518		HEV-M-50500-R.020	new
1/2	.020	2	4	5	87519		HEV-L-50500-R.020	new	

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HEV-5 / HSM-5



New Items!

5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

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Cutter Dia.* D1 ^{+0.00"} -0.02"	Shank Dia. D2 (h6)	Corner Radius R ^{+0.02"} -0.02"	LOC L2 ^{+0.32"} -0.00"	OAL L1 ^{+0.62"} -0.62"	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description	
1/2	1/2	.030	5/8	2-1/2	5	59875	59875W	HEV-S-50500-R.030	
	1/2	.030	1	3	5	59876	59876W	HEV-SR-50500-R.030	
	1/2	.030	1-1/4	3	5	59877	59877W	HEV-R-50500-R.030	
	1/2	.030	1-5/8	4	5	59878	59878W	HEV-M-50500-R.030	
	1/2	.030	2	4	5	81867		HEV-L-50500-R.030	
	1/2	.030	2-1/2	5	5	83006		HEV-LX-50500-R.030	
	1/2	.060	5/8	2-1/2	5	59879	59879W	HEV-S-50500-R.060	
	1/2	.060	1	3	5	59880	59880W	HEV-SR-50500-R.060	
	1/2	.060	1-1/4	3	5	59881	59881W	HEV-R-50500-R.060	
	1/2	.060	1-5/8	4	5	59882	59882W	HEV-M-50500-R.060	
	1/2	.060	2	4	5	81868		HEV-L-50500-R.060	
	1/2	.090	5/8	2-1/2	5	81869		HEV-S-50500-R.090	
	1/2	.090	1	3	5	81870		HEV-SR-50500-R.090	
	1/2	.090	1-1/4	3	5	81871		HEV-R-50500-R.090	
	1/2	.090	1-5/8	4	5	81872		HEV-M-50500-R.090	
	1/2	.090	2	4	5	81873		HEV-L-50500-R.090	
	1/2	.120	5/8	2-1/2	5	59883		HEV-S-50500-R.120	
	1/2	.120	1	3	5	59884		HEV-SR-50500-R.120	
	1/2	.120	1-1/4	3	5	59885		HEV-R-50500-R.120	
	1/2	.120	1-5/8	4	5	59886		HEV-M-50500-R.120	
1/2	.120	2	4	5	81874		HEV-L-50500-R.120		
1/2	.120	2-1/2	5	5	84681		HEV-LX-50500-R.120		
new	1/2	.125	5/8	2-1/2	5	87520		HEV-S-50500-R.125	
new	1/2	.125	1	3	5	87521		HEV-SR-50500-R.125	
new	1/2	.125	1-1/4	3	5	87522		HEV-R-50500-R.125	
new	1/2	.125	1-5/8	4	5	87523		HEV-M-50500-R.125	
new	1/2	.125	2	4	5	87524		HEV-L-50500-R.125	
new	5/8	5/8	.015	3/4	3	87525		HEV-S-50625-R.015	
new		5/8	.015	1-1/4	3-1/2	5	87526		HEV-SR-50625-R.015
new		5/8	.015	1-5/8	3-1/2	5	87527		HEV-R-50625-R.015
new		5/8	.015	2-1/8	4	5	87528		HEV-M-50625-R.015
		5/8	.030	3/4	3	5	59887	59887W	HEV-S-50625-R.030
		5/8	.030	1-1/4	3-1/2	5	59888		HEV-SR-50625-R.030
		5/8	.030	1-5/8	3-1/2	5	59889	59889W	HEV-R-50625-R.030
		5/8	.030	2-1/8	4	5	81875		HEV-M-50625-R.030
		5/8	.030	2-1/2	5	5	81876		HEV-L-50625-R.030
		5/8	.060	1-1/4	3-1/2	5	81877		HEV-SR-50625-R.060
		5/8	.060	1-5/8	3-1/2	5	81878		HEV-R-50625-R.060
		5/8	.060	2-1/8	4	5	81879		HEV-M-50625-R.060
		5/8	.120	1-5/8	3-1/2	5	83007		HEV-R-50625-R.120
	5/8	.120	2-1/8	4	5	83008		HEV-M-50625-R.120	
new	3/4	3/4	.015	1	3	87529		HEV-S-50750-R.015	
new		3/4	.015	1-1/4	4	87530		HEV-SR-50750-R.015	
new		3/4	.015	1-5/8	4	87531		HEV-R-50750-R.015	
new		3/4	.015	2-1/4	5	87532		HEV-M-50750-R.015	

*.0005 max TIR

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5 FLUTE - CORNER RADIUS New Items!



HEV-5 / HSM-5

Variable Pitch (cont.)

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Cutter Dia.* D1 ^{+0.000"} -0.002"	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} -0.002"	LOC L2 ^{+0.032"} -0.000"	OAL L1 ^{+0.062"} -0.062"	Flutes	Tplus Coated	Tplus Coated + Weldon Flat	Tool Description
3/4	3/4	.030	1	3	5	59890	59890W	HEV-S-50750-R.030
	3/4	.030	1-1/4	4	5	83009		HEV-SR-50750-R.030
	3/4	.030	1-5/8	4	5	59891	59891W	HEV-R-50750-R.030
	3/4	.030	2-1/4	5	5	59892	59892W	HEV-M-50750-R.030
	3/4	.030	2-3/4	5	5	81880		HEV-L-50750-R.030
	3/4	.030	3-1/4	6	5	83010		HEV-LX-50750-R.030
	3/4	.060	1	3	5	59893		HEV-S-50750-R.060
	3/4	.060	1-1/4	4	5	83011		HEV-SR-50750-R.060
	3/4	.060	1-5/8	4	5	59894		HEV-R-50750-R.060
	3/4	.060	2-1/4	5	5	59895		HEV-M-50750-R.060
	3/4	.060	2-3/4	5	5	83012		HEV-L-50750-R.060
	3/4	.060	3-1/4	6	5	83013		HEV-LX-50750-R.060
	3/4	.090	1-5/8	4	5	81881		HEV-R-50750-R.090
	3/4	.090	2-1/4	5	5	84682		HEV-M-50750-R.090
	3/4	.120	1	3	5	59896		HEV-S-50750-R.120
	3/4	.120	1-5/8	4	5	59897		HEV-R-50750-R.120
	3/4	.120	2-1/4	5	5	59898		HEV-M-50750-R.120
	3/4	.190	1-5/8	4	5	81882		HEV-R-50750-R.190
3/4	.190	2-1/4	5	5	84683		HEV-M-50750-R.190	
3/4	.250	1-5/8	4	5	81883		HEV-R-50750-R.250	
3/4	.250	2-1/4	5	5	84684		HEV-M-50750-R.250	
1	1	.030	1-1/4	4	5	59899		HEV-S-51000-R.030
	1	.030	2	4-1/2	5	59900		HEV-R-51000-R.030
	1	.030	2-5/8	5	5	59901		HEV-M-51000-R.030
	1	.030	3-1/4	6	5	81884		HEV-L-51000-R.030
	1	.060	1-1/4	4	5	81885		HEV-S-51000-R.060
	1	.060	2	4-1/2	5	81886		HEV-R-51000-R.060
	1	.060	2-5/8	5	5	81887		HEV-M-51000-R.060
	1	.120	1-1/4	4	5	81888		HEV-S-51000-R.120
	1	.120	2	4-1/2	5	81889		HEV-R-51000-R.120
	1	.120	2-5/8	5	5	81890		HEV-M-51000-R.120
	1	.250	1-1/4	4	5	81891		HEV-S-51000-R.250
	1	.250	2	4-1/2	5	81892		HEV-R-51000-R.250
1	.250	2-5/8	5	5	81893		HEV-M-51000-R.250	

*.0005 max TIR

5 Flute

HEV-RN-5



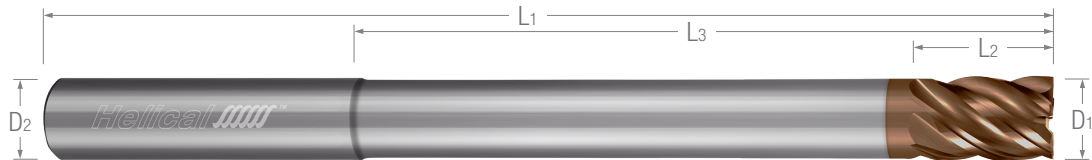
New!

5 FLUTE - SQUARE

Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- Tplus coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 133 for Aplus coating



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Reach (LBS)	Neck Diameter	Flutes	Tplus Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 \text{ (h6)}$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	L_3				
new 1/8	1/8	5/32	2	3/8	.118	5	86798	HEV-RN-S-50125
	1/8	5/32	2	1/2	.118	5	86799	HEV-RN-R-50125
	1/8	5/32	2-1/2	3/4	.118	5	86800	HEV-RN-M-50125
	1/8	5/32	2-1/2	1	.118	5	86801	HEV-RN-L-50125
new 3/16	3/16	7/32	2	1/2	.178	5	86802	HEV-RN-R-50187
	3/16	7/32	2-1/2	3/4	.178	5	86803	HEV-RN-M-50187
	3/16	7/32	2-1/2	1-1/8	.178	5	86804	HEV-RN-L-50187
new 1/4	1/4	3/8	4	3/4	.237	5	86805	HEV-RN-S-50250
	1/4	3/8	4	1-1/8	.237	5	86806	HEV-RN-R-50250
	1/4	3/8	4	1-5/8	.237	5	86807	HEV-RN-A-50250
	1/4	3/8	4	2-1/8	.237	5	86808	HEV-RN-M-50250
	1/4	3/8	4	2-1/2	.237	5	86809	HEV-RN-ML-50250
new 3/8	3/8	1/2	4	1-1/8	.356	5	86810	HEV-RN-S-50375
	3/8	1/2	4	1-5/8	.356	5	86811	HEV-RN-SR-50375
	3/8	1/2	4	2-1/8	.356	5	86812	HEV-RN-R-50375
	3/8	1/2	6	2-1/2	.356	5	86813	HEV-RN-A-50375
	3/8	1/2	6	3-1/8	.356	5	86814	HEV-RN-M-50375
new 1/2	1/2	5/8	4	1-1/2	.475	5	86815	HEV-RN-S-50500
	1/2	5/8	4	1-3/4	.475	5	86816	HEV-RN-SR-50500
	1/2	5/8	4	2-1/4	.475	5	86817	HEV-RN-R-50500
	1/2	5/8	5	2-3/4	.475	5	86818	HEV-RN-A-50500
	1/2	5/8	6	3-3/8	.475	5	86819	HEV-RN-M-50500
new 3/4	3/4	1	4	2	.712	5	86820	HEV-RN-S-50750
	3/4	1	6	2-1/2	.712	5	86821	HEV-RN-R-50750
	3/4	1	6	2-7/8	.712	5	86822	HEV-RN-A-50750
	3/4	1	6	3-3/8	.712	5	86823	HEV-RN-M-50750
	3/4	1	6	4-1/8	.712	5	86824	HEV-RN-L-50750

* .0005 max TIR



5 FLUTE - CORNER RADIUS New!

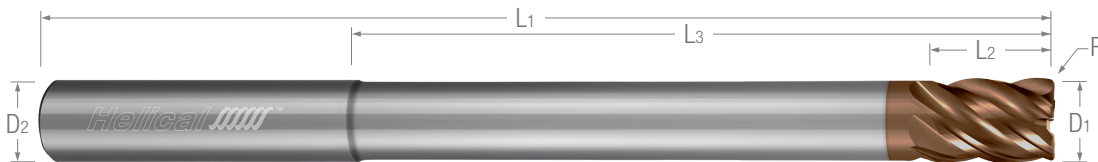


HEV-RN-5

Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- Tplus coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 135 for Aplus coating



5 Flute

Cutter Dia.* D ₁ ^{+0.000"} / _{-0.002"}	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	Length of Cut L ₂ ^{+0.032"} / _{-0.000"}	OAL L ₁ ^{+0.062"} / _{-0.062"}	Reach (LBS) L ₃	Neck Diameter	Flutes	Tplus Coated	Tool Description	
1/8	1/8	.010	5/32	2	3/8	.118	5	86748	HEV-RN-S-50125-R.010	new
	1/8	.010	5/32	2	1/2	.118	5	86749	HEV-RN-R-50125-R.010	new
	1/8	.010	5/32	2-1/2	3/4	.118	5	86750	HEV-RN-M-50125-R.010	new
	1/8	.010	5/32	2-1/2	1	.118	5	86751	HEV-RN-L-50125-R.010	new
3/16	3/16	.010	7/32	2	1/2	.178	5	86752	HEV-RN-R-50187-R.010	new
	3/16	.010	7/32	2-1/2	3/4	.178	5	86753	HEV-RN-M-50187-R.010	new
	3/16	.010	7/32	2-1/2	1-1/8	.178	5	86754	HEV-RN-L-50187-R.010	new
	3/16	.010	7/32	2-1/2	1-5/16	.178	5	86755	HEV-RN-LX-50187-R.010	new
	3/16	.030	7/32	2	1/2	.178	5	86756	HEV-RN-R-50187-R.030	new
	3/16	.030	7/32	2-1/2	3/4	.178	5	86757	HEV-RN-M-50187-R.030	new
	3/16	.030	7/32	2-1/2	1-1/8	.178	5	86758	HEV-RN-L-50187-R.030	new
	3/16	.030	7/32	2-1/2	1-5/16	.178	5	86759	HEV-RN-LX-50187-R.030	new
1/4	1/4	.020	3/8	4	3/4	.237	5	86760	HEV-RN-S-50250-R.020	new
	1/4	.020	3/8	4	1-1/8	.237	5	86761	HEV-RN-R-50250-R.020	new
	1/4	.020	3/8	4	1-5/8	.237	5	86762	HEV-RN-A-50250-R.020	new
	1/4	.020	3/8	4	2-1/8	.237	5	86763	HEV-RN-M-50250-R.020	new
	1/4	.030	3/8	4	3/4	.237	5	86764	HEV-RN-S-50250-R.030	new
	1/4	.030	3/8	4	1-1/8	.237	5	86765	HEV-RN-R-50250-R.030	new
	1/4	.030	3/8	4	1-5/8	.237	5	86766	HEV-RN-A-50250-R.030	new
	1/4	.030	3/8	4	2-1/8	.237	5	86767	HEV-RN-M-50250-R.030	new
3/8	3/8	.020	1/2	4	1-1/8	.356	5	86768	HEV-RN-S-50375-R.020	new
	3/8	.020	1/2	4	1-5/8	.356	5	86769	HEV-RN-SR-50375-R.020	new
	3/8	.020	1/2	4	2-1/8	.356	5	86770	HEV-RN-R-50375-R.020	new
	3/8	.030	1/2	4	1-1/8	.356	5	86771	HEV-RN-S-50375-R.030	new
	3/8	.030	1/2	4	1-5/8	.356	5	86772	HEV-RN-SR-50375-R.030	new
	3/8	.030	1/2	4	2-1/8	.356	5	86773	HEV-RN-R-50375-R.030	new

* .0005 max TIR

continued on next page



HEV-RN-5



New!

5 FLUTE - CORNER RADIUS

Variable Pitch - Reduced Neck (cont.)

continued from previous page

Cutter Dia.* D ₁ ^{+0.000"} / _{-0.002"}	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.002"} / _{-0.002"}	Length of Cut L ₂ ^{+0.032"} / _{-0.000"}	OAL L ₁ ^{+0.062"} / _{-0.062"}	Reach (LBS) L ₃	Neck Diameter	Flutes	Tplus Coated	Tool Description	
new	1/2	1/2	.030	5/8	4	1-1/2	.475	5	86774	HEV-RN-S-50500-R.030
new		1/2	.030	5/8	4	1-3/4	.475	5	86775	HEV-RN-SR-50500-R.030
new		1/2	.030	5/8	4	2-1/4	.475	5	86776	HEV-RN-R-50500-R.030
new		1/2	.030	5/8	5	2-3/4	.475	5	86777	HEV-RN-A-50500-R.030
new		1/2	.030	5/8	6	3-3/8	.475	5	86778	HEV-RN-M-50500-R.030
new		1/2	.060	5/8	4	1-1/2	.475	5	86779	HEV-RN-S-50500-R.060
new		1/2	.060	5/8	4	1-3/4	.475	5	86780	HEV-RN-SR-50500-R.060
new		1/2	.060	5/8	4	2-1/4	.475	5	86781	HEV-RN-R-50500-R.060
new		1/2	.060	5/8	5	2-3/4	.475	5	86782	HEV-RN-A-50500-R.060
new		1/2	.060	5/8	6	3-3/8	.475	5	86783	HEV-RN-M-50500-R.060
new		5/8	5/8	.030	3/4	4	1-5/8	.593	5	86784
new	5/8		.030	3/4	6	2-3/8	.593	5	86785	HEV-RN-R-50625-R.030
new	5/8		.030	3/4	6	3-3/8	.593	5	86786	HEV-RN-M-50625-R.030
new	5/8		.030	3/4	6	4-1/8	.593	5	86787	HEV-RN-L-50625-R.030
new	3/4	3/4	.030	1	4	2	.712	5	86788	HEV-RN-S-50750-R.030
new		3/4	.030	1	6	2-1/2	.712	5	86789	HEV-RN-R-50750-R.030
new		3/4	.030	1	6	2-7/8	.712	5	86790	HEV-RN-A-50750-R.030
new		3/4	.030	1	6	3-3/8	.712	5	86791	HEV-RN-M-50750-R.030
new		3/4	.030	1	6	4-1/8	.712	5	86792	HEV-RN-L-50750-R.030
new		3/4	.120	1	4	2	.712	5	86793	HEV-RN-S-50750-R.120
new		3/4	.120	1	6	2-1/2	.712	5	86794	HEV-RN-R-50750-R.120
new		3/4	.120	1	6	2-7/8	.712	5	86795	HEV-RN-A-50750-R.120
new		3/4	.120	1	6	3-3/8	.712	5	86796	HEV-RN-M-50750-R.120
new		3/4	.120	1	6	4-1/8	.712	5	86797	HEV-RN-L-50750-R.120

*.0005 max TIR

6 FLUTE - SQUARE

New Items!

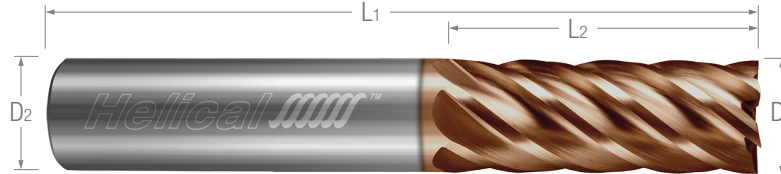


HEV-6

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 139 for *Aplus* coating



6 Flute

Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description	
$D1^{+.0002}_{-.002}$	D2 (h6)	$L2^{+.032}_{-.000}$	$L1^{+.062}_{-.062}$				
1/8	1/8	1/4	1-1/2	6	87538	HEV-S-60125	new
	1/8	3/8	2	6	87539	HEV-SR-60125	new
	1/8	1/2	2-1/2	6	87540	HEV-R-60125	new
	1/8	5/8	2-1/2	6	87541	HEV-A-60125	new
3/16	3/16	5/16	2	6	87542	HEV-S-60187	new
	3/16	7/16	2	6	87543	HEV-SR-60187	new
	3/16	9/16	2-1/2	6	87544	HEV-R-60187	new
	3/16	3/4	2-1/2	6	87545	HEV-M-60187	new
1/4	1/4	3/8	2	6	59902	HEV-S-60250	
	1/4	1/2	2-1/2	6	59903	HEV-SR-60250	
	1/4	3/4	2-1/2	6	59904	HEV-R-60250	
	1/4	1	3	6	81894	HEV-M-60250	
	1/4	1-1/4	3	6	83303	HEV-L-60250	
	1/4	1-1/2	3	6	83304	HEV-LX-60250	
5/16	5/16	7/16	2	6	83305	HEV-S-60312	
	5/16	3/4	2-1/2	6	83306	HEV-R-60312	
	5/16	1	3	6	83307	HEV-M-60312	
	5/16	1-1/4	3	6	84991	HEV-ML-60312	
3/8	3/8	1/2	2	6	59905	HEV-S-60375	
	3/8	3/4	2-1/2	6	83308	HEV-SR-60375	
	3/8	1	3	6	59906	HEV-R-60375	
	3/8	1-1/4	3	6	59907	HEV-M-60375	
	3/8	1-1/2	3-1/2	6	81895	HEV-L-60375	
	3/8	2	4	6	83309	HEV-LX-60375	
1/2	1/2	5/8	2-1/2	6	59908	HEV-S-60500	
	1/2	1	3	6	59909	HEV-SR-60500	
	1/2	1-1/4	3	6	59910	HEV-R-60500	
	1/2	1-5/8	4	6	59911	HEV-M-60500	
	1/2	2	4	6	81896	HEV-L-60500	
	1/2	2-1/2	5	6	83310	HEV-LX-60500	

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HEV-6



New Items!

6 FLUTE - SQUARE

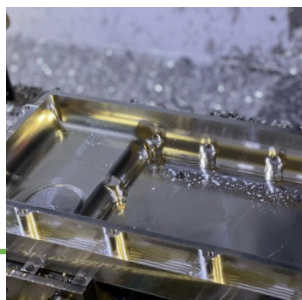
Variable Pitch (cont.)

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Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Tplus Coated	Tool Description
$D_1^{+.000"}_{-.002"}$	$D_2(h6)$	$L_2^{+.032"}_{-.000"}$	$L_1^{+.062"}_{-.062"}$			
5/8	5/8	3/4	3	6	83311	HEV-S-60625
	5/8	1-1/4	3-1/2	6	83312	HEV-SR-60625
	5/8	1-5/8	3-1/2	6	83313	HEV-R-60625
	5/8	2	4	6	83314	HEV-M-60625
	5/8	2-1/2	5	6	83315	HEV-L-60625
3/4	3/4	1	3	6	83316	HEV-S-60750
	3/4	1-5/8	4	6	81897	HEV-R-60750
	3/4	2-1/4	5	6	81898	HEV-M-60750
	3/4	2-3/4	5	6	81899	HEV-L-60750
	3/4	3-1/4	6	6	83317	HEV-LX-60750
1	1	2	4-1/2	6	84992	HEV-R-61000
	1	2-5/8	5	6	84993	HEV-M-61000
	1	3-1/4	6	6	84994	HEV-L-61000

*.0005 max TIR

@bondobird



Made with a
Custom Tool:
See more about
our Custom
Tools on pg 301

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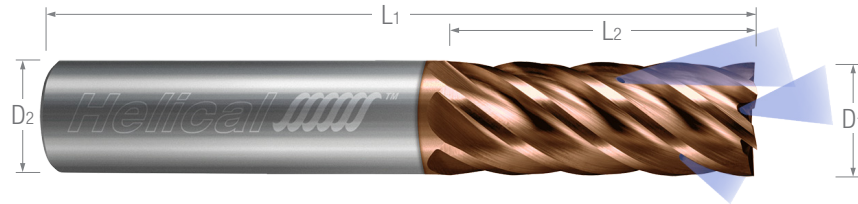
6 FLUTE - SQUARE

Coolant Through - Variable Pitch



HEVC-6

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 (h6)$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/4	1/4	3/8	2	6	84305	HEVC-015-60250
	1/4	1/2	2-1/2	6	84306	HEVC-020-60250
3/8	3/8	1/2	2	6	84307	HEVC-013-60375
	3/8	1	3	6	84308	HEVC-026-60375
1/2	1/2	1	3	6	84309	HEVC-020-60500
	1/2	1-1/4	3	6	84310	HEVC-025-60500
	1/2	1-5/8	4	6	84311	HEVC-032-60500
3/4	3/4	1-5/8	4	6	84312	HEVC-021-60750
	3/4	2-1/4	5	6	84313	HEVC-030-60750

*.0005 max TIR

6 Flute

HEV-6



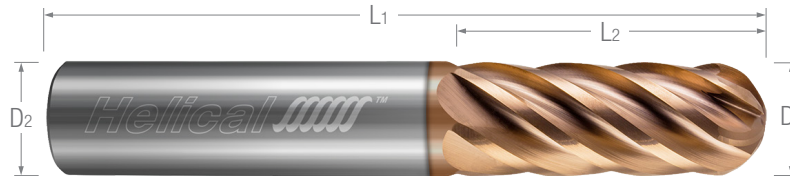
New Items!

6 FLUTE - BALL

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 142 for *Aplus* coating



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D_1^{+.000"}_{-.002"}$	D_2 (h6)	$L_2^{+.032"}_{-.000"}$	$L_1^{+.062"}_{-.062"}$			
1/4	1/4	3/8	2	6	81924	HEV-S-60250-BN
	1/4	1/2	2-1/2	6	81925	HEV-SR-60250-BN
	1/4	3/4	2-1/2	6	81926	HEV-R-60250-BN
	1/4	1	3	6	81927	HEV-M-60250-BN
	1/4	1-1/4	3	6	82595	HEV-L-60250-BN
	1/4	1-1/2	3	6	86024	HEV-LX-60250-BN
5/16	5/16	7/16	2	6	83364	HEV-S-60312-BN
	5/16	3/4	2-1/2	6	83365	HEV-R-60312-BN
	5/16	1	3	6	83366	HEV-M-60312-BN
	5/16	1-1/4	3	6	86025	HEV-ML-60312-BN
3/8	3/8	1/2	2	6	81928	HEV-S-60375-BN
	3/8	3/4	2-1/2	6	83367	HEV-SR-60375-BN
	3/8	1	3	6	81929	HEV-R-60375-BN
	3/8	1-1/4	3	6	81930	HEV-M-60375-BN
	3/8	1-1/2	3-1/2	6	82596	HEV-L-60375-BN
	3/8	2	4	6	86026	HEV-LX-60375-BN
1/2	1/2	5/8	2-1/2	6	81931	HEV-S-60500-BN
	1/2	1	3	6	81932	HEV-SR-60500-BN
	1/2	1-1/4	3	6	81933	HEV-R-60500-BN
	1/2	1-5/8	4	6	81934	HEV-M-60500-BN
	1/2	2	4	6	81935	HEV-L-60500-BN
	1/2	2-1/2	5	6	83368	HEV-LX-60500-BN
	1/2	3-1/8	6	6	86027	HEV-X-60500-BN
5/8	5/8	3/4	3	6	83369	HEV-S-60625-BN
	5/8	1-1/4	3-1/2	6	83370	HEV-SR-60625-BN
	5/8	1-5/8	3-1/2	6	83371	HEV-R-60625-BN
	5/8	2	4	6	87546	HEV-M-60625-BN
3/4	3/4	1	3	6	81936	HEV-S-60750-BN
	3/4	1-5/8	4	6	81937	HEV-R-60750-BN
	3/4	2-1/4	5	6	83372	HEV-M-60750-BN
	3/4	2-3/4	5	6	87547	HEV-L-60750-BN
	3/4	3-1/4	6	6	87548	HEV-LX-60750-BN
1	1	1-1/4	4	6	86028	HEV-S-61000-BN
	1	2	4-1/2	6	81938	HEV-R-61000-BN
	1	2-5/8	5	6	86029	HEV-M-61000-BN
	1	3-1/4	6	6	87549	HEV-L-61000-BN

new

new
new

new

*.0005 max TIR



Speeds & Feeds on Page 152

6 FLUTE - CORNER RADIUS New Items!

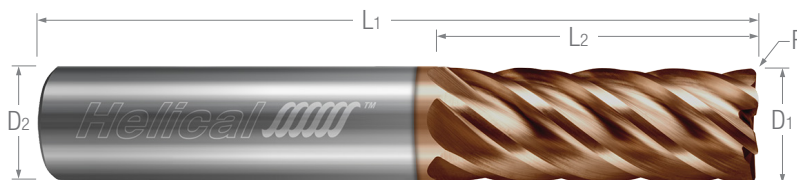


HEV-6

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 143 for *Aplus* coating



Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.02"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Tplus</i> Coated	Tool Description
1/4	1/4	.010	3/8	2	6	86007	HEV-S-60250-R.010
	1/4	.010	1/2	2-1/2	6	86008	HEV-SR-60250-R.010
	1/4	.010	3/4	2-1/2	6	86009	HEV-R-60250-R.010
	1/4	.010	1	3	6	87580	HEV-M-60250-R.010 new
	1/4	.010	1-1/4	3	6	87581	HEV-L-60250-R.010 new
	1/4	.020	3/8	2	6	59912	HEV-S-60250-R.020
	1/4	.020	1/2	2-1/2	6	59913	HEV-SR-60250-R.020
	1/4	.020	3/4	2-1/2	6	59914	HEV-R-60250-R.020
	1/4	.020	1	3	6	81900	HEV-M-60250-R.020
	1/4	.020	1-1/4	3	6	83324	HEV-L-60250-R.020
	1/4	.030	3/8	2	6	59915	HEV-S-60250-R.030
	1/4	.030	1/2	2-1/2	6	59916	HEV-SR-60250-R.030
	1/4	.030	3/4	2-1/2	6	59917	HEV-R-60250-R.030
	1/4	.030	1	3	6	81901	HEV-M-60250-R.030
	1/4	.030	1-1/4	3	6	83325	HEV-L-60250-R.030
	1/4	.060	3/8	2	6	81902	HEV-S-60250-R.060
	1/4	.060	1/2	2-1/2	6	81903	HEV-SR-60250-R.060
	1/4	.060	3/4	2-1/2	6	81904	HEV-R-60250-R.060
1/4	.060	1	3	6	81905	HEV-M-60250-R.060	
1/4	.060	1-1/4	3	6	83326	HEV-L-60250-R.060	
5/16	5/16	.020	7/16	2	6	82587	HEV-S-60312-R.020
	5/16	.020	3/4	2-1/2	6	83327	HEV-R-60312-R.020
	5/16	.020	1	3	6	86010	HEV-M-60312-R.020
	5/16	.030	7/16	2	6	82588	HEV-S-60312-R.030
	5/16	.030	3/4	2-1/2	6	83328	HEV-R-60312-R.030
	5/16	.030	1	3	6	87582	HEV-M-60312-R.030
	5/16	.060	7/16	2	6	83329	HEV-S-60312-R.060 new
	5/16	.060	3/4	2-1/2	6	83330	HEV-R-60312-R.060
	5/16	.060	1	3	6	87583	HEV-M-60312-R.060 new

* .0005 max TIR

continued on next page



HEV-6



New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Tplus Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 (h6)$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
new	3/8	.010	1/2	2	6	86011	HEV-S-60375-R.010
		.010	3/4	2-1/2	6	86012	HEV-SR-60375-R.010
		.010	1	3	6	86013	HEV-R-60375-R.010
		.010	1-1/4	3	6	86014	HEV-M-60375-R.010
		.010	1-1/2	3-1/2	6	87584	HEV-L-60375-R.010
		.020	1/2	2	6	59918	HEV-S-60375-R.020
		.020	3/4	2-1/2	6	86015	HEV-SR-60375-R.020
		.020	1	3	6	59919	HEV-R-60375-R.020
		.020	1-1/4	3	6	59920	HEV-M-60375-R.020
		.020	1-1/2	3-1/2	6	83331	HEV-L-60375-R.020
		.030	1/2	2	6	59921	HEV-S-60375-R.030
		.030	3/4	2-1/2	6	86016	HEV-SR-60375-R.030
		.030	1	3	6	59922	HEV-R-60375-R.030
		.030	1-1/4	3	6	59923	HEV-M-60375-R.030
		.030	1-1/2	3-1/2	6	83332	HEV-L-60375-R.030
		.060	1/2	2	6	59924	HEV-S-60375-R.060
		.060	3/4	2-1/2	6	86017	HEV-SR-60375-R.060
		.060	1	3	6	59925	HEV-R-60375-R.060
		.060	1-1/4	3	6	59926	HEV-M-60375-R.060
		.060	1-1/2	3-1/2	6	83333	HEV-L-60375-R.060
.090	2	4	6	86018	HEV-LX-60375-R.060		
.090	1/2	2	6	81906	HEV-S-60375-R.090		
.090	3/4	2-1/2	6	86019	HEV-SR-60375-R.090		
.090	1	3	6	81907	HEV-R-60375-R.090		
.090	1-1/4	3	6	83334	HEV-M-60375-R.090		
.090	1-1/2	3-1/2	6	83335	HEV-L-60375-R.090		
new new new new new new	1/2	.010	1	3	6	83336	HEV-SR-60500-R.010
		.010	1-1/4	3	6	83337	HEV-R-60500-R.010
		.010	1-5/8	4	6	86020	HEV-M-60500-R.010
		.010	2	4	6	87585	HEV-L-60500-R.010
		.010	2-1/2	5	6	87586	HEV-LX-60500-R.010
		.015	1	3	6	83338	HEV-SR-60500-R.015
		.015	1-1/4	3	6	83339	HEV-R-60500-R.015
		.015	1-5/8	4	6	86021	HEV-M-60500-R.015
		.015	2	4	6	87587	HEV-L-60500-R.015
		.015	2-1/2	5	6	87588	HEV-LX-60500-R.015
		.020	1	3	6	83340	HEV-SR-60500-R.020
		.020	1-1/4	3	6	83341	HEV-R-60500-R.020
		.020	1-5/8	4	6	86022	HEV-M-60500-R.020
		.020	2	4	6	87589	HEV-L-60500-R.020
		.020	2-1/2	5	6	87590	HEV-LX-60500-R.020
		.030	5/8	2-1/2	6	59927	HEV-S-60500-R.030
		.030	1	3	6	59928	HEV-SR-60500-R.030
		.030	1-1/4	3	6	59929	HEV-R-60500-R.030
		.030	1-5/8	4	6	59930	HEV-M-60500-R.030
		.030	2	4	6	81908	HEV-L-60500-R.030
.030	2-1/2	5	6	86023	HEV-LX-60500-R.030		

* .0005 max TIR

continued on next page

6 Flute

6 FLUTE - CORNER RADIUS New Items!



HEV-6

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Plus Coated	Tool Description
1/2	1/2	.060	5/8	2-1/2	6	59931	HEV-S-60500-R.060
	1/2	.060	1	3	6	59932	HEV-SR-60500-R.060
	1/2	.060	1-1/4	3	6	59933	HEV-R-60500-R.060
	1/2	.060	1-5/8	4	6	59934	HEV-M-60500-R.060
	1/2	.060	2	4	6	81909	HEV-L-60500-R.060
	1/2	.060	2-1/2	5	6	87591	HEV-LX-60500-R.060
	1/2	.090	5/8	2-1/2	6	83342	HEV-S-60500-R.090
	1/2	.090	1	3	6	83343	HEV-SR-60500-R.090
	1/2	.090	1-1/4	3	6	82589	HEV-R-60500-R.090
	1/2	.090	1-5/8	4	6	82590	HEV-M-60500-R.090
	1/2	.090	2	4	6	82591	HEV-L-60500-R.090
	1/2	.125	5/8	2-1/2	6	59935	HEV-S-60500-R.125
	1/2	.125	1	3	6	59936	HEV-SR-60500-R.125
	1/2	.125	1-1/4	3	6	59937	HEV-R-60500-R.125
	1/2	.125	1-5/8	4	6	59938	HEV-M-60500-R.125
1/2	.125	2	4	6	81910	HEV-L-60500-R.125	
1/2	.125	2-1/2	5	6	87592	HEV-LX-60500-R.125	
5/8	5/8	.030	1-1/4	3-1/2	6	83344	HEV-SR-60625-R.030
	5/8	.030	1-5/8	3-1/2	6	83345	HEV-R-60625-R.030
	5/8	.060	1-1/4	3-1/2	6	83346	HEV-SR-60625-R.060
	5/8	.060	1-5/8	3-1/2	6	83347	HEV-R-60625-R.060
	5/8	.090	1-1/4	3-1/2	6	83348	HEV-SR-60625-R.090
	5/8	.090	1-5/8	3-1/2	6	83349	HEV-R-60625-R.090
	5/8	.125	1-1/4	3-1/2	6	83350	HEV-SR-60625-R.125
	5/8	.125	1-5/8	3-1/2	6	83351	HEV-R-60625-R.125
3/4	3/4	.030	1	3	6	83352	HEV-S-60750-R.030
	3/4	.030	1-5/8	4	6	81911	HEV-R-60750-R.030
	3/4	.030	2-1/4	5	6	81912	HEV-M-60750-R.030
	3/4	.030	2-3/4	5	6	81913	HEV-L-60750-R.030
	3/4	.030	3-1/4	6	6	83353	HEV-LX-60750-R.030
	3/4	.060	1-5/8	4	6	81914	HEV-R-60750-R.060
	3/4	.060	2-1/4	5	6	81915	HEV-M-60750-R.060
	3/4	.060	2-3/4	5	6	81916	HEV-L-60750-R.060
	3/4	.090	1	3	6	81989	HEV-S-60750-R.090
	3/4	.090	1-5/8	4	6	81917	HEV-R-60750-R.090
	3/4	.090	2-1/4	5	6	81918	HEV-M-60750-R.090
	3/4	.090	2-3/4	5	6	81919	HEV-L-60750-R.090
	3/4	.120	1	3	6	87593	HEV-S-60750-R.120
	3/4	.120	1-5/8	4	6	87594	HEV-R-60750-R.120
	3/4	.120	2-1/4	5	6	87595	HEV-M-60750-R.120
	3/4	.125	1	3	6	83354	HEV-S-60750-R.125
	3/4	.125	1-5/8	4	6	83355	HEV-R-60750-R.125
	3/4	.125	2-1/4	5	6	83356	HEV-M-60750-R.125
	3/4	.190	1	3	6	81990	HEV-S-60750-R.190
	3/4	.250	1	3	6	83357	HEV-S-60750-R.250
3/4	.250	1-5/8	4	6	83358	HEV-R-60750-R.250	
3/4	.250	2-1/4	5	6	83359	HEV-M-60750-R.250	
3/4	.250	2-3/4	5	6	83360	HEV-L-60750-R.250	
1	1	.030	2	4-1/2	6	81920	HEV-R-61000-R.030
	1	.030	2-5/8	5	6	81921	HEV-M-61000-R.030
	1	.060	2	4-1/2	6	81922	HEV-R-61000-R.060
	1	.060	2-5/8	5	6	81923	HEV-M-61000-R.060

new

new

new

new

new

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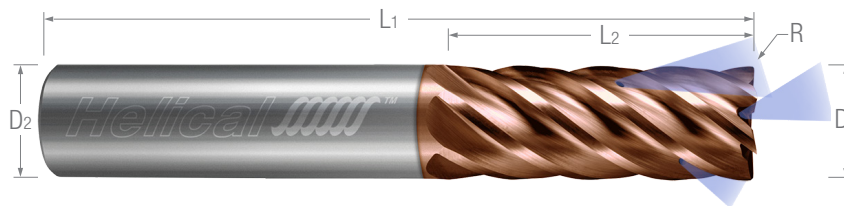
HEVC-6



6 FLUTE - CORNER RADIUS

Coolant Through - Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D_1^{+.000^*}_{-.002^*}$	D_2 (h6)	$R^{+.002^*}_{-.002^*}$	$L_2^{+.032^*}_{-.000^*}$	$L_1^{+.062^*}_{-.062^*}$			
1/4	1/4	.020	3/8	2	6	84314	HEVC-015-60250-R.020
	1/4	.020	1/2	2-1/2	6	84315	HEVC-020-60250-R.020
3/8	3/8	.020	1/2	2	6	84316	HEVC-013-60375-R.020
	3/8	.020	1	3	6	84317	HEVC-026-60375-R.020
	3/8	.030	1/2	2	6	84318	HEVC-013-60375-R.030
	3/8	.030	1	3	6	84319	HEVC-026-60375-R.030
1/2	1/2	.030	1	3	6	84320	HEVC-020-60500-R.030
	1/2	.030	1-1/4	3	6	84321	HEVC-025-60500-R.030
	1/2	.030	1-5/8	4	6	84322	HEVC-032-60500-R.030
	1/2	.060	1	3	6	84323	HEVC-020-60500-R.060
	1/2	.060	1-1/4	3	6	84324	HEVC-025-60500-R.060
	1/2	.060	1-5/8	4	6	84325	HEVC-032-60500-R.060
3/4	3/4	.060	1-5/8	4	6	84326	HEVC-021-60750-R.060
	3/4	.060	2-1/4	5	6	84327	HEVC-030-60750-R.060

*.0005 max TIR



6 FLUTE - SQUARE New!



HEV-RN-6

Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 149 for *Aplus* coating



Cutter Diameter D1 ^{+0.000} / _{-0.002} "	Shank Diameter* D2 (h6)	Length of Cut L2 ^{+0.032} / _{-0.000} "	Overall Length L1 ^{+0.062} / _{-0.062} "	Reach (LBS) L3	Neck Diameter	Flutes	<i>Tplus</i> Coated	Tool Description	
1/4	1/4	3/8	4	3/4	.237	6	86862	HEV-RN-S-60250	new
	1/4	3/8	4	1-1/8	.237	6	86863	HEV-RN-R-60250	new
	1/4	3/8	4-1/2	2-1/8	.237	6	86864	HEV-RN-M-60250	new
3/8	3/8	1/2	4	1-1/8	.356	6	86865	HEV-RN-S-60375	new
	3/8	1/2	4	2-1/8	.356	6	86866	HEV-RN-R-60375	new
	3/8	1/2	6	3-1/8	.356	6	86867	HEV-RN-M-60375	new
1/2	1/2	5/8	4	1-1/2	.475	6	86868	HEV-RN-S-60500	new
	1/2	5/8	4	2-1/4	.475	6	86869	HEV-RN-R-60500	new
	1/2	5/8	6	3-3/8	.475	6	86870	HEV-RN-M-60500	new
	1/2	5/8	6	4-1/8	.475	6	86871	HEV-RN-L-60500	new
3/4	3/4	1	4	2	.712	6	86872	HEV-RN-S-60750	new
	3/4	1	6	2-1/2	.712	6	86873	HEV-RN-R-60750	new
	3/4	1	6	3-3/8	.712	6	86874	HEV-RN-M-60750	new

* .0005 max TIR

8 Ways You're Killing Your End Mill

In The Loupe
MACHINISTS BLOG

Are you making these end mill killing mistakes? You could be getting much more use from your tooling! Learn these 8 common ways machinists break their end mills prematurely in our "In the Loupe" blog post *8 Ways You're Killing Your End Mill*.



SCAN TO READ

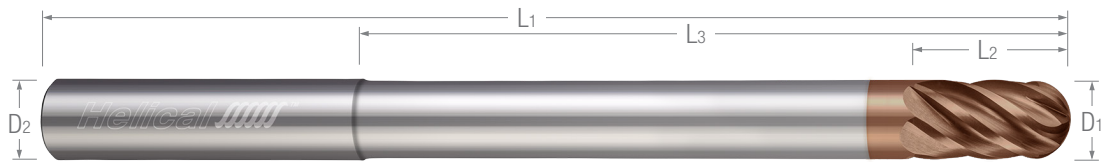
www.harveypformance.com/in-the-loupe/8-ways-youre-killing-your-end-mill/

HEV-RN-6


New! 6 FLUTE - BALL
Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 150 for *Aplus* coating



	Cutter Diameter $D_1 \begin{smallmatrix} +.000^* \\ -.002^* \end{smallmatrix}$	Shank Diameter* $D_2 \text{ (h6)}$	Length of Cut $L_2 \begin{smallmatrix} +.032^* \\ -.000^* \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062^* \\ -.062^* \end{smallmatrix}$	Reach (LBS) L_3	Neck Diameter	Flutes	<i>Tplus</i> Coated	Tool Description
new	1/4	1/4	3/8	4	3/4	.237	6	86825	HEV-RN-S-60250-BN
new		1/4	3/8	4	1-1/8	.237	6	86826	HEV-RN-R-60250-BN
new		1/4	3/8	4	2-1/8	.237	6	86827	HEV-RN-M-60250-BN
new	3/8	3/8	1/2	4	1-1/8	.356	6	86828	HEV-RN-S-60375-BN
new		3/8	1/2	4	2-1/8	.356	6	86829	HEV-RN-R-60375-BN
new		3/8	1/2	6	3-1/8	.356	6	86830	HEV-RN-M-60375-BN
new	1/2	1/2	5/8	4	1-1/2	.475	6	86831	HEV-RN-S-60500-BN
new		1/2	5/8	4	2-1/4	.475	6	86832	HEV-RN-R-60500-BN
new		1/2	5/8	6	3-3/8	.475	6	86833	HEV-RN-M-60500-BN
new		1/2	5/8	6	4-1/8	.475	6	86834	HEV-RN-L-60500-BN
new	3/4	3/4	1	4	2	.712	6	86835	HEV-RN-S-60750-BN
new		3/4	1	6	2-1/2	.712	6	86836	HEV-RN-R-60750-BN
new		3/4	1	6	3-3/8	.712	6	86837	HEV-RN-M-60750-BN

* .0005 max TIR



6 FLUTE - CORNER RADIUS New!



HEV-RN-6

Variable Pitch - Reduced Neck

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 151 for *Aplus* coating



Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	OAL L1 ^{+0.062"} / _{-.062"}	Reach (LBS) L3	Neck Diameter	Flutes	<i>Tplus</i> Coated	Tool Description	
1/4	1/4	.020	3/8	4	3/4	.237	6	86838	HEV-RN-S-60250-R.020	new
	1/4	.020	3/8	4	1-1/8	.237	6	86839	HEV-RN-R-60250-R.020	new
	1/4	.020	3/8	4	2-1/8	.237	6	86840	HEV-RN-M-60250-R.020	new
3/8	3/8	.020	1/2	4	1-1/8	.356	6	86841	HEV-RN-S-60375-R.020	new
	3/8	.020	1/2	4	2-1/8	.356	6	86842	HEV-RN-R-60375-R.020	new
	3/8	.020	1/2	6	3-1/8	.356	6	86843	HEV-RN-M-60375-R.020	new
1/2	1/2	.030	5/8	4	1-1/2	.475	6	86844	HEV-RN-S-60500-R.030	new
	1/2	.030	5/8	4	2-1/4	.475	6	86845	HEV-RN-R-60500-R.030	new
	1/2	.030	5/8	6	3-3/8	.475	6	86846	HEV-RN-M-60500-R.030	new
	1/2	.030	5/8	6	4-1/8	.475	6	86847	HEV-RN-L-60500-R.030	new
	1/2	.060	5/8	4	1-1/2	.475	6	86848	HEV-RN-S-60500-R.060	new
	1/2	.060	5/8	4	2-1/4	.475	6	86849	HEV-RN-R-60500-R.060	new
	1/2	.060	5/8	6	3-3/8	.475	6	86850	HEV-RN-M-60500-R.060	new
	1/2	.060	5/8	6	4-1/8	.475	6	86851	HEV-RN-L-60500-R.060	new
	1/2	.125	5/8	4	1-1/2	.475	6	86852	HEV-RN-S-60500-R.125	new
	1/2	.125	5/8	4	2-1/4	.475	6	86853	HEV-RN-R-60500-R.125	new
	1/2	.125	5/8	6	3-3/8	.475	6	86854	HEV-RN-M-60500-R.125	new
	1/2	.125	5/8	6	4-1/8	.475	6	86855	HEV-RN-L-60500-R.125	new
3/4	3/4	.030	1	4	2	.712	6	86856	HEV-RN-S-60750-R.030	new
	3/4	.030	1	6	2-1/2	.712	6	86857	HEV-RN-R-60750-R.030	new
	3/4	.030	1	6	3-3/8	.712	6	86858	HEV-RN-M-60750-R.030	new
	3/4	.060	1	4	2	.712	6	86859	HEV-RN-S-60750-R.060	new
	3/4	.060	1	6	2-1/2	.712	6	86860	HEV-RN-R-60750-R.060	new
	3/4	.060	1	6	3-3/8	.712	6	86861	HEV-RN-M-60750-R.060	new

6 Flute

HEV-7

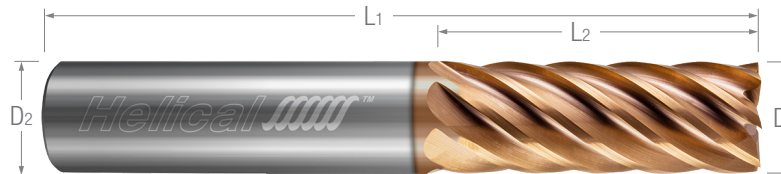


New Items!

7 FLUTE - SQUARE
Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 153 for *Aplus* coating



Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D2 \text{ (h6)}$	$L2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/4	1/4	3/8	2	7	59939	HEV-S-70250
	1/4	1/2	2	7	59940	HEV-SR-70250
	1/4	3/4	2-1/2	7	59941	HEV-R-70250
	1/4	1	3	7	83375	HEV-M-70250
	1/4	1-1/4	3	7	86030	HEV-L-70250
5/16	5/16	7/16	2	7	86031	HEV-S-70312
	5/16	3/4	2-1/2	7	86032	HEV-R-70312
	5/16	1	3	7	86033	HEV-M-70312
3/8	3/8	1/2	2	7	59942	HEV-S-70375
	3/8	3/4	2-1/2	7	59943	HEV-SR-70375
	3/8	1	2-1/2	7	59944	HEV-R-70375
	3/8	1-1/4	3	7	86034	HEV-M-70375
	3/8	1-1/2	3-1/2	7	81939	HEV-L-70375
	3/8	2	4	7	87102	HEV-LX-70375
1/2	1/2	5/8	2-1/2	7	59945	HEV-S-70500
	1/2	1	3	7	59946	HEV-SR-70500
	1/2	1-1/4	3	7	59947	HEV-R-70500
	1/2	1-5/8	4	7	59948	HEV-M-70500
	1/2	2	4	7	81940	HEV-L-70500
	1/2	2-1/2	5	7	86035	HEV-LX-70500
	1/2	3-1/8	6	7	86036	HEV-X-70500
5/8	5/8	3/4	3	7	81941	HEV-S-70625
	5/8	1-1/4	3-1/2	7	81942	HEV-SR-70625
	5/8	1-5/8	4	7	81943	HEV-R-70625
	5/8	2-1/8	4	7	87103	HEV-M-70625
3/4	3/4	1-1/4	3-1/2	7	87104	HEV-SR-70750
	3/4	1-5/8	4	7	81944	HEV-R-70750
	3/4	2-1/4	5	7	81945	HEV-M-70750
	3/4	2-3/4	5	7	86037	HEV-L-70750
	3/4	3-1/4	6	7	87105	HEV-LX-70750
1	1	1-1/4	4	7	86038	HEV-S-71000
	1	2	5	7	81946	HEV-R-71000
	1	2-5/8	5	7	86039	HEV-M-71000

new

new

new

new

*.0005 max TIR



Speeds & Feeds on Page 163

7 FLUTE - CORNER RADIUS

New Items!

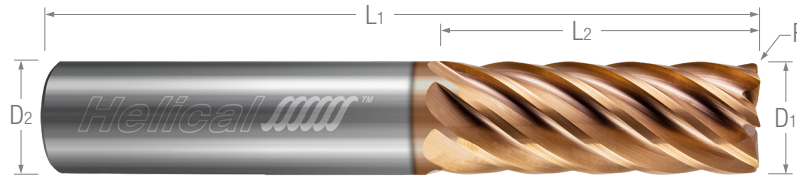


HEV-7

Variable Pitch

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- T_{plus} coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 156 for Aplus coating



Cutter Diameter* D1 ^{+0.000} / _{-.002} "	Shank Diameter D2 (h6)	Corner Radius R ^{+0.02} / _{-.002} "	Length of Cut L2 ^{+0.02} / _{-.000} "	Overall Length L1 ^{+0.062} / _{-.062} "	Flutes	T _{plus} Coated	Tool Description	
1/4	1/4	.010	3/8	2	7	87144	HEV-S-70250-R.010	new
	1/4	.010	1/2	2	7	87145	HEV-SR-70250-R.010	new
	1/4	.010	3/4	2-1/2	7	87146	HEV-R-70250-R.010	new
	1/4	.010	1	3	7	87147	HEV-M-70250-R.010	new
	1/4	.010	1-1/4	3	7	87148	HEV-L-70250-R.010	new
	1/4	.020	3/8	2	7	59949	HEV-S-70250-R.020	
	1/4	.020	1/2	2	7	59950	HEV-SR-70250-R.020	
	1/4	.020	3/4	2-1/2	7	59951	HEV-R-70250-R.020	
	1/4	.020	1	3	7	83389	HEV-M-70250-R.020	
	1/4	.020	1-1/4	3	7	86048	HEV-L-70250-R.020	
	1/4	.030	3/8	2	7	87149	HEV-S-70250-R.030	new
	1/4	.030	1/2	2	7	87150	HEV-SR-70250-R.030	new
	1/4	.030	3/4	2-1/2	7	87151	HEV-R-70250-R.030	new
	1/4	.030	1	3	7	87152	HEV-M-70250-R.030	new
1/4	.030	1-1/4	3	7	87153	HEV-L-70250-R.030	new	
3/8	3/8	.010	1/2	2	7	87154	HEV-S-70375-R.010	new
	3/8	.010	3/4	2-1/2	7	87155	HEV-SR-70375-R.010	new
	3/8	.010	1	2-1/2	7	87156	HEV-R-70375-R.010	new
	3/8	.020	1/2	2	7	59952	HEV-S-70375-R.020	
	3/8	.020	3/4	2-1/2	7	59953	HEV-SR-70375-R.020	
	3/8	.020	1	2-1/2	7	59954	HEV-R-70375-R.020	
	3/8	.020	1-1/4	3	7	86049	HEV-M-70375-R.020	
	3/8	.020	1-1/2	3-1/2	7	81947	HEV-L-70375-R.020	
	3/8	.020	2	4	7	86050	HEV-LX-70375-R.020	
	3/8	.030	1/2	2	7	87157	HEV-S-70375-R.030	new
	3/8	.030	3/4	2-1/2	7	87158	HEV-SR-70375-R.030	new
	3/8	.030	1	2-1/2	7	87159	HEV-R-70375-R.030	new
	3/8	.060	1/2	2	7	83390	HEV-S-70375-R.060	
	3/8	.060	3/4	2-1/2	7	83391	HEV-SR-70375-R.060	
	3/8	.060	1	2-1/2	7	83392	HEV-R-70375-R.060	
	3/8	.125	1/2	2	7	87160	HEV-S-70375-R.125	new
3/8	.125	3/4	2-1/2	7	87161	HEV-SR-70375-R.125	new	
3/8	.125	1	2-1/2	7	87162	HEV-R-70375-R.125	new	

* .0005 max TIR

continued on next page



HEV-7



New Items!

7 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Tplus Coated	Tool Description
$D_1^{+.000"}$ $-.002"$	D_2 (H6)	$R^{+.002"}$ $-.002"$	$L_2^{+.032"}$ $-.000"$	$L_1^{+.062"}$ $-.062"$			
new	1/2	.010	5/8	2-1/2	7	86051	HEV-S-70500-R.010
	1/2	.010	1	3	7	86052	HEV-SR-70500-R.010
	1/2	.010	1-1/4	3	7	86053	HEV-R-70500-R.010
	1/2	.010	1-5/8	4	7	86054	HEV-M-70500-R.010
	1/2	.010	2	4	7	87163	HEV-L-70500-R.010
	1/2	.020	5/8	2-1/2	7	83393	HEV-S-70500-R.020
	1/2	.020	1	3	7	83394	HEV-SR-70500-R.020
	1/2	.020	1-1/4	3	7	83395	HEV-R-70500-R.020
	1/2	.020	1-5/8	4	7	83396	HEV-M-70500-R.020
	1/2	.020	2	4	7	86055	HEV-L-70500-R.020
	1/2	.030	5/8	2-1/2	7	59955	HEV-S-70500-R.030
	1/2	.030	1	3	7	59956	HEV-SR-70500-R.030
	1/2	.030	1-1/4	3	7	59957	HEV-R-70500-R.030
	1/2	.030	1-5/8	4	7	59958	HEV-M-70500-R.030
	1/2	.030	2	4	7	81948	HEV-L-70500-R.030
	1/2	.030	2-1/2	5	7	86056	HEV-LX-70500-R.030
	1/2	.060	5/8	2-1/2	7	83397	HEV-S-70500-R.060
	1/2	.060	1	3	7	83398	HEV-SR-70500-R.060
	1/2	.060	1-1/4	3	7	83399	HEV-R-70500-R.060
	new	1/2	.060	1-5/8	4	7	87169
new	1/2	.060	2	4	7	87170	HEV-L-70500-R.060
new	1/2	.125	5/8	2-1/2	7	87164	HEV-S-70500-R.125
new	1/2	.125	1	3	7	87165	HEV-SR-70500-R.125
new	1/2	.125	1-1/4	3	7	87166	HEV-R-70500-R.125
new	1/2	.125	1-5/8	4	7	87167	HEV-M-70500-R.125
new	1/2	.125	2	4	7	87168	HEV-L-70500-R.125
5/8	5/8	.030	3/4	3	7	81949	HEV-S-70625-R.030
	5/8	.030	1-1/4	3-1/2	7	81950	HEV-SR-70625-R.030
	5/8	.030	1-5/8	4	7	81951	HEV-R-70625-R.030
	5/8	.030	2-1/8	4	7	86057	HEV-M-70625-R.030
	5/8	.060	1-1/4	3-1/2	7	83400	HEV-SR-70625-R.060
	5/8	.060	1-5/8	4	7	83401	HEV-R-70625-R.060
new new	3/4	.030	1	3	7	81952	HEV-S-70750-R.030
	3/4	.030	1-1/4	3-1/2	7	81953	HEV-SR-70750-R.030
	3/4	.030	1-5/8	4	7	81954	HEV-R-70750-R.030
	3/4	.030	2-1/4	5	7	81955	HEV-M-70750-R.030
	3/4	.030	2-3/4	5	7	87171	HEV-L-70750-R.030
	3/4	.030	3-1/4	6	7	87172	HEV-LX-70750-R.030
	3/4	.060	1	3	7	83402	HEV-S-70750-R.060
	3/4	.060	1-5/8	4	7	83403	HEV-R-70750-R.060
	3/4	.060	2-1/4	5	7	83404	HEV-M-70750-R.060
	3/4	.060	2-3/4	5	7	86058	HEV-L-70750-R.060
new	3/4	.060	3-1/4	6	7	87173	HEV-LX-70750-R.060
1	1	.030	1-1/4	4	7	86059	HEV-S-71000-R.030
	1	.030	2	5	7	86060	HEV-R-71000-R.030
	1	.030	2-5/8	5	7	86061	HEV-M-71000-R.030

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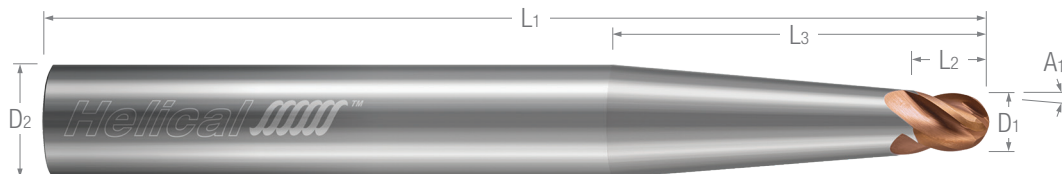
CONTOUR FINISHERS - 4 FLUTE - BALL

New!

HCF-TN-4

Tapered Neck

- Engineered for optimal performance in 3D contouring, profiling, and tapered wall applications
- Tapered length of cut and tapered neck for maximum rigidity and clearance in tight spaces
- Reach taper matches LOC taper and is relieved for clearance along entire reach length
- 4 flute variable pitch geometry designed for minimized harmonics and reduced tool pressure
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Angle Per Side $A_1 \begin{smallmatrix} +0^\circ30' \\ -0^\circ30' \end{smallmatrix}$	Cutter Dia $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Dia $D_2 \text{ (h6)}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Reach (LBS) L_3	Flutes	<i>Tplus</i> Coated	Tool Description	
2°	1/8	3/16	3/16	2-1/2	1.0329	4	86442	HCF020-TN-082-40125-BN	new
	1/8	1/4	3/16	4	1.9278	4	86443	HCF020-TN-154-40125-BN	new
	3/16	1/4	1/4	2-1/2	1.1007	4	86444	HCF020-TN-058-40187-BN	new
	3/16	5/16	1/4	4	1.9956	4	86445	HCF020-TN-106-40187-BN	new
	1/4	5/16	5/16	2-1/2	1.1685	4	86446	HCF020-TN-046-40250-BN	new
	1/4	3/8	5/16	4	2.0634	4	86447	HCF020-TN-082-40250-BN	new
	5/16	3/8	3/8	2-1/2	1.2362	4	86448	HCF020-TN-039-40312-BN	new
	5/16	7/16	3/8	4	2.1311	4	86449	HCF020-TN-068-40312-BN	new
	3/8	7/16	1/2	2-3/4	1.3065	4	86450	HCF020-TN-034-40375-BN	new
	3/8	1/2	1/2	4	2.2014	4	86451	HCF020-TN-058-40375-BN	new
3°	1/8	1/4	3/16	2-1/2	1.3062	4	86452	HCF030-TN-104-40125-BN	new
	1/8	3/8	3/16	4	2.4988	4	86453	HCF030-TN-199-40125-BN	new
	3/16	1/4	1/4	2	.7655	4	86454	HCF030-TN-040-40187-BN	new
	3/16	3/8	1/4	3-1/2	1.9581	4	86455	HCF030-TN-104-40187-BN	new
	1/4	3/8	5/16	3	1.4173	4	86456	HCF030-TN-056-40250-BN	new
	1/4	1/2	5/16	5	2.6099	4	86457	HCF030-TN-104-40250-BN	new
	5/16	3/8	3/8	2-1/2	.8766	4	86458	HCF030-TN-028-40312-BN	new
	5/16	1/2	3/8	4	2.0692	4	86459	HCF030-TN-066-40312-BN	new
	3/8	1/2	1/2	3	1.5310	4	86460	HCF030-TN-040-40375-BN	new
	3/8	5/8	1/2	5	2.7235	4	86461	HCF030-TN-072-40375-BN	new
5°	1/8	1/4	3/16	2	.8078	4	86462	HCF050-TN-064-40125-BN	new
	1/8	3/8	3/16	3-1/2	1.5222	4	86463	HCF050-TN-121-40125-BN	new
	3/16	5/16	1/4	2-1/2	.8533	4	86464	HCF050-TN-045-40187-BN	new
	3/16	1/2	1/4	4	1.9249	4	86465	HCF050-TN-102-40187-BN	new
	1/4	3/8	5/16	2-1/2	.8988	4	86466	HCF050-TN-035-40250-BN	new
	1/4	1/2	5/16	3-1/2	1.6132	4	86467	HCF050-TN-064-40250-BN	new
	5/16	1/2	3/8	3	1.3015	4	86468	HCF050-TN-041-40312-BN	new
	5/16	5/8	3/8	4	2.0158	4	86469	HCF050-TN-064-40312-BN	new
	3/8	1/2	1/2	2-1/2	.9922	4	86470	HCF050-TN-026-40375-BN	new
	3/8	5/8	1/2	3-1/2	1.7066	4	86471	HCF050-TN-045-40375-BN	new

Finishers

HCF-TN-4

SPEEDS & FEEDS

Contour Finishers - 4 Flute - Ball - Tapered Neck

HCF-TN-4								
Material Guide		Hardness	SFM	Inches per Tooth (IPT)				
				1/8	3/16	1/4	5/16	3/8
				Fin	Fin	Fin	Fin	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	800	.0014	.0017	.0019	.0020	.0022
		75 - 98 HRB	750	.0013	.0014	.0016	.0018	.0019
		21 - 36 HRC	700	.0010	.0012	.0013	.0014	.0015
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	600	.0012	.0014	.0015	.0016	.0017
		21 - 36 HRC	550	.0010	.0012	.0013	.0014	.0015
		36 - 50 HRC	400	.0010	.0011	.0012	.0013	.0014
		> 50 HRC	350	.0008	.0009	.0011	.0012	.0013
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	550	.0012	.0014	.0015	.0016	.0017
		21 - 36 HRC	500	.0011	.0012	.0014	.0014	.0015
		36 - 50 HRC	450	.0009	.0011	.0012	.0013	.0014
		> 50 HRC	400	.0008	.0009	.0011	.0012	.0013
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	450	.0014	.0015	.0017	.0018	.0020
		75 - 98 HRB	500	.0011	.0013	.0014	.0015	.0016
		21 - 36 HRC	450	.0011	.0012	.0014	.0014	.0015
		36 - 50 HRC	400	.0010	.0011	.0013	.0014	.0014
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	500	.0012	.0014	.0015	.0016	.0017
		21 - 36 HRC	450	.0011	.0013	.0014	.0015	.0016
		36 - 50 HRC	400	.0010	.0011	.0013	.0014	.0014
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	750	.0012	.0014	.0015	.0016	.0017
		21 - 36 HRC	650	.0011	.0013	.0014	.0015	.0016
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	450	.0010	.0011	.0013	.0014	.0014
		36 - 50 HRC	400	.0010	.0011	.0013	.0013	.0014
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	600	.0015	.0017	.0019	.0021	.0023
		21 - 36 HRC	550	.0011	.0013	.0014	.0015	.0016
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	550	.0012	.0014	.0015	.0016	.0017
		21 - 36 HRC	450	.0011	.0013	.0014	.0015	.0016
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	500	.0013	.0014	.0015	.0017	.0018
		21 - 36 HRC	450	.0010	.0011	.0013	.0014	.0014
		36 - 50 HRC	400	.0008	.0009	.0010	.0011	.0012
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	600	.0014	.0015	.0018	.0019	.0021
		75 - 98 HRB	550	.0013	.0014	.0016	.0018	.0019
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	200	.0010	.0011	.0013	.0014	.0014
		21 - 36 HRC	180	.0010	.0011	.0013	.0014	.0014
		36 - 50 HRC	150	.0009	.0010	.0012	.0013	.0014
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	350	.0016	.0018	.0021	.0023	.0024
		75 - 98 HRB	400	.0015	.0017	.0019	.0020	.0022
		21 - 36 HRC	325	.0013	.0014	.0016	.0018	.0019
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	300	.0012	.0013	.0014	.0016	.0017
		36 - 50 HRC	250	.0011	.0013	.0014	.0015	.0016
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	225	.0011	.0012	.0014	.0014	.0015
		21 - 36 HRC	150	.0010	.0012	.0014	.0014	.0015
		36 - 50 HRC	90	.0008	.0010	.0011	.0012	.0013

MILLING PROCESS	ADOC	RDOC
Fin (Finishing)	Up to Max LOC	4%-6% Diameter
	Up to Max LOC	4%-6% Diameter

NOTES:

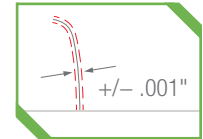
ADOC and RDOC are recommended starting values, and should be adjusted according to your finish requirements

MULTI-AXIS FINISHERS - 4 FLUTE

HMAF-FE-4

Lens Form

- Specially defined profile for massive reductions in cycle time and vastly improved surface finish
- Lens form with two tangential radii for finishing floors
- 4 flute geometry specifically designed for finishing in stainless steel, high temperature alloys, and other ferrous materials
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Major Radius R1	Corner Radius R3	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Benefit Multiple	<i>Tplus</i> Coated	Tool Description
3/8	3/8	3/4	.020	3/8	2-1/2	4	2x	86368	HMAF-FE-40375-02-LNS
1/2	1/2	1	.030	1/2	3	4	2x	86369	HMAF-FE-40500-02-LNS
5/8	5/8	1-1/4	.035	5/8	3-1/2	4	2x	86370	HMAF-FE-40625-02-LNS
3/4	3/4	1-1/2	.045	3/4	4	4	2x	86371	HMAF-FE-40750-02-LNS

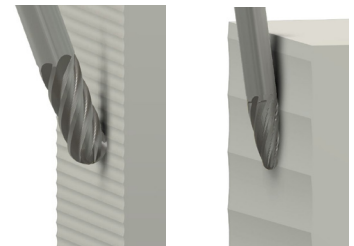
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 **Speeds & Feeds on Page 223**

Multi-Axis Finishers: Benefits & Stocked Profiles

Multi-Axis Finishers can significantly reduce cycle times and dramatically improve surface finish when used in place of a ball end mill, and are best used in wide open, flowing, and somewhat flat surfaces due to their large radii. Because of its larger radius, a far greater stepover can be used pass-to-pass while keeping the same cusp height as a ball end mill. This decreases the cycle time by a known value called the Benefit Multiple.

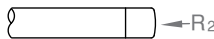
Pro Tip: Multi-Axis Finisher with a Benefit Multiple of 8 will reduce the cycle time to 1/8 of the cycle time for a ball end mill of the same shank diameter – an 87.5% time savings!



The images above show the comparison of a ball end mill to an oval shape Multi-Axis Finisher with a benefit multiple of 4.

3 Different Profiles of Multi-Axis Finishers

Lens



Geometry: 2 tangential radii on the end of the tool
Main Use: Primarily on the face of a part
Tip: Tilt angles of approximately 5 degrees are recommended for these tools to avoid working on-center

Taper

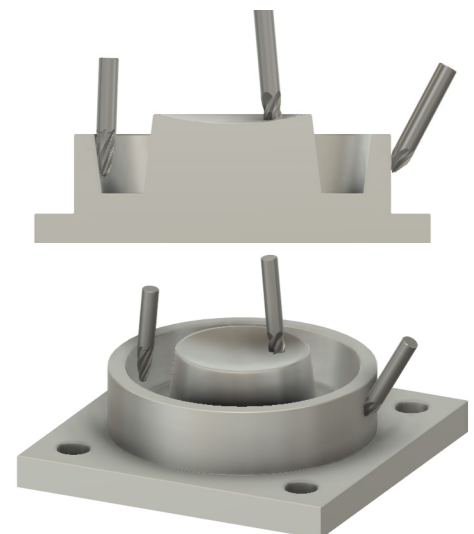


Geometry: 3 tangential radii and a taper angle
Main Use: When a specific approach angle is needed, and where maximum performance gain is desired
Tip: This form allows for the largest radius, and therefore the greatest potential improvement in finish and cycle time

Oval



Geometry: 2 tangential radii
Main Use: In smaller spaces where a slightly varied approach angle is required
Tip: This form offers the most versatility and is a common choice for machinists machining impellers or fan blades



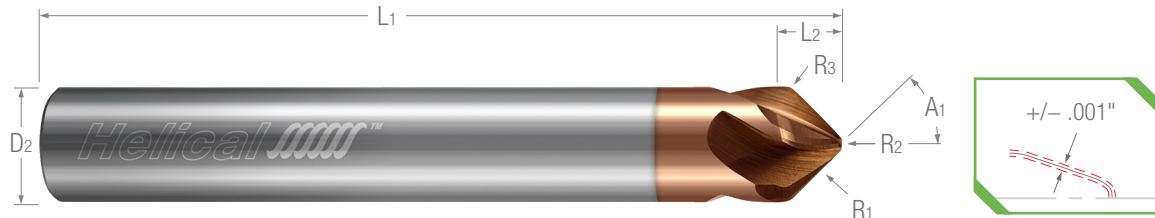
HMAF-FE-4

New!

MULTI-AXIS FINISHERS - 4 FLUTE

Taper Form

- Specially defined profile for massive reductions in cycle time and vastly improved surface finish
- Taper form with three tangential radii and offered in a variety of angles for maximum performance and optimal clearance angle for any workpiece
- 4 flute geometry specifically designed for semi-finishing and finishing in stainless steel, high temperature alloys, and other ferrous materials
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Ang. Per Side	Shank Dia.	Major Radius	Tip Radius	Corner Radius	Length of Cut	OAL	Flutes	Benefit Multiple	<i>Tplus</i> Coated	Tool Description
A1 ^{+0°30'} _{-0°30'}	D2 (h6)	R1	R2	R3	L2	L1 ^{+0.062"} _{-.062"}				
new new new new new new new new 15°	3/8	12	3/64	.1875	.5901	2-1/2	4	8x	86476	HMAF-FE-40375-08-T15
	3/8	27	3/64	.1875	.5902	2-1/2	4	12x	86479	HMAF-FE-40375-12-T15
	1/2	16	1/16	.2500	.7868	3	4	8x	86482	HMAF-FE-40500-08-T15
	1/2	36	1/16	.2500	.7869	3	4	12x	86485	HMAF-FE-40500-12-T15
	5/8	20	5/64	.3125	.9834	3	4	8x	86488	HMAF-FE-40625-08-T15
	5/8	45	5/64	.3125	.9836	3	4	12x	86491	HMAF-FE-40625-12-T15
	3/4	24	3/32	.3750	1.1801	4	4	8x	86494	HMAF-FE-40750-08-T15
	3/4	54	3/32	.3750	1.1803	4	4	12x	86497	HMAF-FE-40750-12-T15
new new new new new new new new 30°	3/8	12	3/64	.1875	.3281	2-1/2	4	8x	86477	HMAF-FE-40375-08-T30
	3/8	27	3/64	.1875	.3281	2-1/2	4	12x	86480	HMAF-FE-40375-12-T30
	1/2	16	1/16	.2500	.4375	3	4	8x	86483	HMAF-FE-40500-08-T30
	1/2	36	1/16	.2500	.4375	3	4	12x	86486	HMAF-FE-40500-12-T30
	5/8	20	5/64	.3125	.5469	3	4	8x	86489	HMAF-FE-40625-08-T30
	5/8	45	5/64	.3125	.5469	3	4	12x	86492	HMAF-FE-40625-12-T30
	3/4	24	3/32	.3750	.6562	4	4	8x	86495	HMAF-FE-40750-08-T30
	3/4	54	3/32	.3750	.6562	4	4	12x	86498	HMAF-FE-40750-12-T30
new new new new new new new new 45°	3/8	12	3/64	.0468	.1875	2-1/2	4	8x	86478	HMAF-FE-40375-08-T45
	3/8	27	3/64	.0468	.1875	2-1/2	4	12x	86481	HMAF-FE-40375-12-T45
	1/2	16	1/16	.0625	.2500	3	4	8x	86484	HMAF-FE-40500-08-T45
	1/2	36	1/16	.0625	.2500	3	4	12x	86487	HMAF-FE-40500-12-T45
	5/8	20	5/64	.0781	.3125	3	4	8x	86490	HMAF-FE-40625-08-T45
	5/8	45	5/64	.0781	.3125	3	4	12x	86493	HMAF-FE-40625-12-T45
	3/4	24	3/32	.0937	.3750	4	4	8x	86496	HMAF-FE-40750-08-T45
	3/4	54	3/32	.0937	.3750	4	4	12x	86499	HMAF-FE-40750-12-T45

* .0005 max TIR

Multi-Axis Finishers - Technical Information - pg 220

When switching from a traditional ball end mill, the unique geometries of Multi-Axis Finishers allow for dramatically improved surface finish, while significantly reducing cycle times. Learn more about the Benefit Multiple, profile options, and how these superior tools can pay dividends at the spindle.



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Speeds & Feeds on Page 223

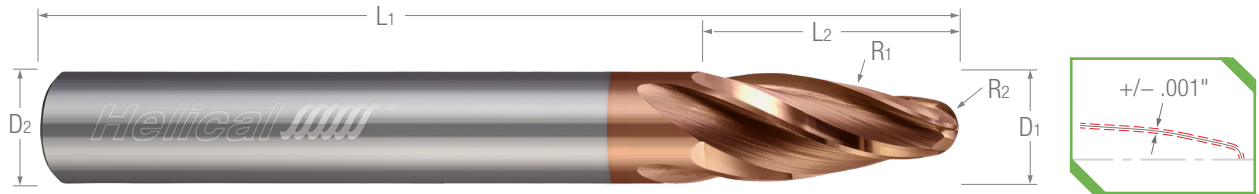
MULTI-AXIS FINISHERS - 4 FLUTE

New!

HMAF-FE-4

Oval Form

- Specially defined profile for massive reductions in cycle time and vastly improved surface finish
- Oval form with two tangential radii for versatility in angle of approach and clearance in tight spaces
- 4 flute geometry specifically designed for semi-finishing and finishing in stainless steel, high temperature alloys, and other ferrous materials
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000} / _{-.002} "	Shank Dia. D2 (h6)	Major Radius R1	Tip Radius R2	Length of Cut L2	Overall Length L1 ^{+0.062} / _{-.062} "	Flutes	Benefit Multiple	<i>Tplus</i> Coated	Tool Description
3/8	3/8	3	3/32	.8260	2-1/2	4	4x	86472	HMAF-FE-40375-04-OVL
1/2	1/2	4	1/8	1.1013	3	4	4x	86473	HMAF-FE-40500-04-OVL
5/8	5/8	5	5/32	1.3766	3-1/2	4	4x	86474	HMAF-FE-40625-04-OVL
3/4	3/4	6	3/16	1.6519	4	4	4x	86475	HMAF-FE-40750-04-OVL

new
new
new
new

* .0005 max TIR

Multi-Axis Finishers - Technical Information - pg 220

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HMAF-FE-4

SPEEDS & FEEDS
4 Flute - Multi-Axis Finishers

HMAF-FE-4										
Material Guide		Hardness	SFM	Inches per Tooth (IPT)						
				1/8	3/16	1/4	3/8	1/2	5/8	3/4
				Fin	Fin	Fin	Fin	Fin	Fin	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	800	.0017	.0019	.0022	.0025	.0029	.0034	.0042
		75 - 98 HRB	750	.0014	.0016	.0018	.0021	.0025	.0029	.0036
		21 - 36 HRC	700	.0012	.0013	.0015	.0017	.0020	.0024	.0029
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	600	.0013	.0015	.0017	.0020	.0023	.0027	.0033
		21 - 36 HRC	550	.0011	.0013	.0015	.0017	.0020	.0023	.0028
		36 - 50 HRC	400	.0011	.0012	.0014	.0016	.0018	.0022	.0027
		> 50 HRC	350	.0010	.0011	.0012	.0014	.0016	.0019	.0024
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	550	.0013	.0015	.0017	.0020	.0023	.0027	.0033
		21 - 36 HRC	500	.0012	.0013	.0015	.0017	.0020	.0024	.0029
		36 - 50 HRC	450	.0011	.0012	.0014	.0015	.0018	.0022	.0026
		> 50 HRC	400	.0010	.0011	.0012	.0014	.0016	.0019	.0023
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	450	.0015	.0017	.0020	.0022	.0026	.0031	.0038
		75 - 98 HRB	500	.0013	.0014	.0016	.0019	.0022	.0026	.0031
		21 - 36 HRC	450	.0012	.0013	.0015	.0018	.0020	.0025	.0030
		36 - 50 HRC	400	.0011	.0013	.0014	.0017	.0019	.0023	.0028
		> 50 HRC	350	.0009	.0010	.0011	.0013	.0015	.0018	.0022
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-TMO, 316, 316L, 321, 347	75 - 98 HRB	500	.0013	.0015	.0017	.0019	.0023	.0027	.0033
		21 - 36 HRC	450	.0013	.0014	.0016	.0018	.0021	.0026	.0031
		36 - 50 HRC	400	.0011	.0012	.0014	.0016	.0019	.0023	.0028
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	750	.0013	.0015	.0017	.0020	.0023	.0027	.0033
		21 - 36 HRC	650	.0013	.0014	.0016	.0018	.0021	.0025	.0031
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	450	.0011	.0013	.0015	.0017	.0020	.0023	.0028
		36 - 50 HRC	400	.0011	.0012	.0014	.0016	.0018	.0022	.0027
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	600	.0017	.0019	.0022	.0025	.0029	.0035	.0042
		21 - 36 HRC	550	.0013	.0014	.0016	.0018	.0021	.0025	.0031
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	550	.0014	.0015	.0017	.0020	.0023	.0028	.0034
		21 - 36 HRC	450	.0013	.0014	.0016	.0018	.0021	.0026	.0031
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	500	.0014	.0015	.0018	.0020	.0024	.0028	.0034
		21 - 36 HRC	450	.0011	.0013	.0014	.0017	.0019	.0023	.0028
		36 - 50 HRC	400	.0009	.0010	.0011	.0013	.0015	.0018	.0022
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	600	.0016	.0018	.0020	.0023	.0027	.0032	.0039
		75 - 98 HRB	550	.0014	.0016	.0018	.0021	.0025	.0029	.0036
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	200	.0011	.0013	.0014	.0016	.0019	.0023	.0028
		21 - 36 HRC	180	.0011	.0012	.0014	.0016	.0019	.0023	.0027
		36 - 50 HRC	150	.0010	.0011	.0013	.0015	.0017	.0021	.0025
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	350	.0019	.0021	.0024	.0027	.0032	.0038	.0046
		75 - 98 HRB	400	.0017	.0019	.0022	.0025	.0029	.0035	.0042
		21 - 36 HRC	325	.0015	.0017	.0019	.0022	.0025	.0030	.0036
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	300	.0013	.0015	.0017	.0019	.0022	.0027	.0032
		36 - 50 HRC	250	.0012	.0014	.0016	.0018	.0021	.0025	.0031
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	225	.0012	.0013	.0015	.0018	.0021	.0024	.0030
		21 - 36 HRC	150	.0012	.0013	.0015	.0017	.0020	.0024	.0029
		36 - 50 HRC	90	.0010	.0011	.0012	.0014	.0017	.0020	.0024

STYLE	TOOLPATH	ADOC (STOCK REMOVAL)	RDOC (STEPOVER PER PASS)
HMAF-FE-4	Finishing (Fin)	.005"-.010"	.025 x Dia x Benefit Multiple

NOTES:

ADOC and RDOC are recommended starting values, and should be adjusted according to your finish requirements

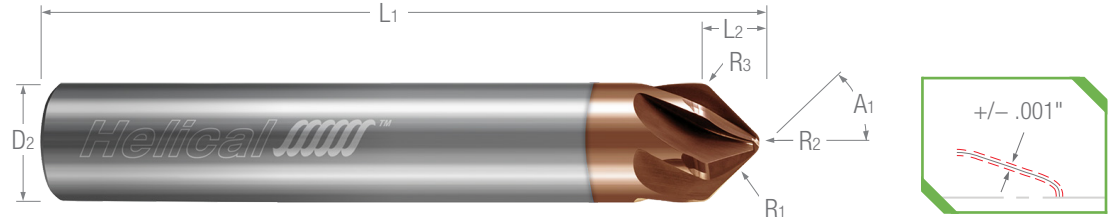
If converting from a ball end mill, the benefit multiple can be used to recalculate stepover pass-to-pass

MULTI-AXIS FINISHERS - 6 FLUTE

HMAF-FE-6

Taper Form

- Specially defined profile for massive reductions in cycle time and vastly improved surface finish
- Taper form with three tangential radii and offered in a variety of angles for maximum performance and optimal clearance angle for any workpiece
- 6 flute geometry specifically designed for finishing in stainless steel, high temperature alloys, and other ferrous materials
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Ang. Per Side	Shank Dia.	Major Radius	Tip Radius	Corner Radius	Length of Cut	OAL	Flutes	Benefit Multiple	<i>Tplus</i> Coated	Tool Description
A1 ^{+0°30'} _{-0°30'}	D2 (h6)	R1	R2	R3	L2	L1 ^{+0.062"} _{-.062"}				
15°	3/8	12	3/64	3/16	.5901	2-1/2	6	8x	86333	HMAF-FE-60375-08-T15
	3/8	27	3/64	3/16	.5902	2-1/2	6	12x	86338	HMAF-FE-60375-12-T15
	1/2	16	1/16	1/4	.7868	3	6	8x	86341	HMAF-FE-60500-08-T15
	1/2	36	1/16	1/4	.7869	3	6	12x	86346	HMAF-FE-60500-12-T15
	5/8	20	5/64	5/16	.9834	3	6	8x	86349	HMAF-FE-60625-08-T15
	5/8	45	5/64	5/16	.9836	3	6	12x	86354	HMAF-FE-60625-12-T15
	3/4	24	3/32	3/8	1.1801	4	6	8x	86357	HMAF-FE-60750-08-T15
	3/4	54	3/32	3/8	1.1803	4	6	12x	86362	HMAF-FE-60750-12-T15
30°	3/8	12	3/64	3/16	.3281	2-1/2	6	8x	86334	HMAF-FE-60375-08-T30
	3/8	27	3/64	3/16	.3281	2-1/2	6	12x	86339	HMAF-FE-60375-12-T30
	1/2	16	1/16	1/4	.4375	3	6	8x	86342	HMAF-FE-60500-08-T30
	1/2	36	1/16	1/4	.4375	3	6	12x	86347	HMAF-FE-60500-12-T30
	5/8	20	5/64	5/16	.5469	3	6	8x	86350	HMAF-FE-60625-08-T30
	5/8	45	5/64	5/16	.5469	3	6	12x	86355	HMAF-FE-60625-12-T30
	3/4	24	3/32	3/8	.6562	4	6	8x	86358	HMAF-FE-60750-08-T30
	3/4	54	3/32	3/8	.6562	4	6	12x	86363	HMAF-FE-60750-12-T30
45°	3/8	12	3/64	3/64	.1875	2-1/2	6	8x	86335	HMAF-FE-60375-08-T45
	3/8	27	3/64	3/64	.1875	2-1/2	6	12x	86340	HMAF-FE-60375-12-T45
	1/2	16	1/16	1/16	.2500	3	6	8x	86343	HMAF-FE-60500-08-T45
	1/2	36	1/16	1/16	.2500	3	6	12x	86348	HMAF-FE-60500-12-T45
	5/8	20	5/64	5/64	.3125	3	6	8x	86351	HMAF-FE-60625-08-T45
	5/8	45	5/64	5/64	.3125	3	6	12x	86356	HMAF-FE-60625-12-T45
	3/4	24	3/32	3/32	.3750	4	6	8x	86359	HMAF-FE-60750-08-T45
	3/4	54	3/32	3/32	.3750	4	6	12x	86364	HMAF-FE-60750-12-T45

* .0005 max TIR

Multi-Axis Finishers - Technical Information - pg 220

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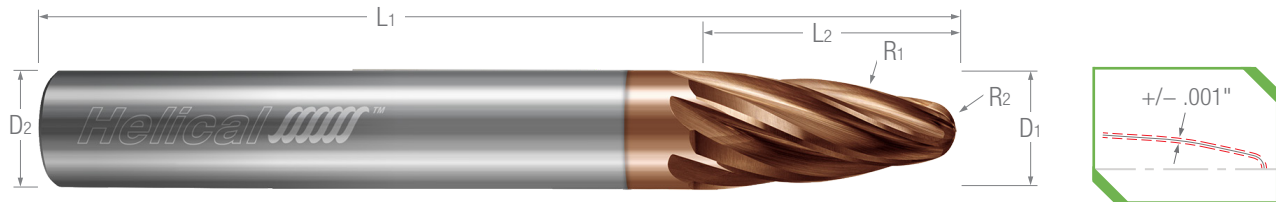
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HMAF-FE-6

MULTI-AXIS FINISHERS - 6 FLUTE

Oval Form

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- Oval form with two tangential radii for versatility in angle of approach and clearance in tight spaces
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- h6 shank tolerance for high precision tool holders
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- Solid carbide
- CNC ground in the USA



Cutter Dia.* D1 ^{+0.000"} _{-.002"}	Shank Dia. D2 (h6)	Major Radius R1	Tip Radius R2	Length of Cut L2	Overall Length L1 ^{+0.062"} _{-.062"}	Flutes	Benefit Multiple	<i>Tplus</i> Coated	Tool Description
3/8	3/8	3	3/32	.8260	2-1/2	6	4x	86321	HMAF-FE-60375-04-OVL
1/2	1/2	4	1/8	1.1013	3	6	4x	86322	HMAF-FE-60500-04-OVL
5/8	5/8	5	5/32	1.3766	3-1/2	6	4x	86323	HMAF-FE-60625-04-OVL
3/4	3/4	6	3/16	1.6519	4	6	4x	86324	HMAF-FE-60750-04-OVL

* .0005 max TIR

Multi-Axis Finishers - Technical Information - pg 220

When switching from a traditional ball end mill, the unique geometries of Multi-Axis Finishers allow for dramatically improved surface finish, while significantly reducing cycle times. Learn more about the Benefit Multiple, profile options, and how these superior tools can pay dividends at the spindle.



scan the QR code
to read online



SPEEDS & FEEDS

6 Flute - Multi-Axis Finishers

HMAF-FE-6

HMAF-FE-6										
Material Guide		Hardness	SFM	Inches per Tooth (IPT)						
				1/8	3/16	1/4	3/8	1/2	5/8	3/4
				Fin	Fin	Fin	Fin	Fin	Fin	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	800	.0030	.0034	.0039	.0044	.0051	.0060	.0074
		75 - 98 HRB	750	.0025	.0028	.0032	.0037	.0044	.0051	.0064
		21 - 36 HRC	700	.0021	.0023	.0026	.0030	.0035	.0042	.0051
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	600	.0023	.0026	.0030	.0035	.0041	.0048	.0058
		21 - 36 HRC	550	.0019	.0023	.0026	.0030	.0035	.0041	.0049
		36 - 50 HRC	400	.0019	.0021	.0025	.0028	.0032	.0039	.0048
		> 50 HRC	350	.0018	.0019	.0021	.0025	.0028	.0034	.0042
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	550	.0023	.0026	.0030	.0035	.0041	.0048	.0058
		21 - 36 HRC	500	.0021	.0023	.0026	.0030	.0035	.0042	.0051
		36 - 50 HRC	450	.0019	.0021	.0025	.0026	.0032	.0039	.0046
		> 50 HRC	400	.0018	.0019	.0021	.0025	.0028	.0034	.0041
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	450	.0026	.0030	.0035	.0039	.0046	.0055	.0067
		75 - 98 HRB	500	.0023	.0025	.0028	.0034	.0039	.0046	.0055
		21 - 36 HRC	450	.0021	.0023	.0026	.0032	.0035	.0044	.0053
		36 - 50 HRC	400	.0019	.0023	.0025	.0030	.0034	.0041	.0049
		> 50 HRC	350	.0016	.0018	.0019	.0023	.0026	.0032	.0039
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	500	.0023	.0026	.0030	.0034	.0041	.0048	.0058
		21 - 36 HRC	450	.0023	.0025	.0028	.0032	.0037	.0046	.0055
		36 - 50 HRC	400	.0019	.0021	.0025	.0028	.0034	.0041	.0049
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	750	.0023	.0026	.0030	.0035	.0041	.0048	.0058
		21 - 36 HRC	650	.0023	.0025	.0028	.0032	.0037	.0044	.0055
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	450	.0019	.0023	.0026	.0030	.0035	.0041	.0049
		36 - 50 HRC	400	.0019	.0021	.0025	.0028	.0032	.0039	.0048
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	600	.0030	.0034	.0039	.0044	.0051	.0062	.0074
		21 - 36 HRC	550	.0023	.0025	.0028	.0032	.0037	.0044	.0055
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	550	.0025	.0026	.0030	.0035	.0041	.0049	.0060
		21 - 36 HRC	450	.0023	.0025	.0028	.0032	.0037	.0046	.0055
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	500	.0025	.0026	.0032	.0035	.0042	.0049	.0060
		21 - 36 HRC	450	.0019	.0023	.0025	.0030	.0034	.0041	.0049
		36 - 50 HRC	400	.0016	.0018	.0019	.0023	.0026	.0032	.0039
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	600	.0028	.0032	.0035	.0041	.0048	.0056	.0069
		75 - 98 HRB	550	.0025	.0028	.0032	.0037	.0044	.0051	.0064
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	200	.0019	.0023	.0025	.0028	.0034	.0041	.0049
		21 - 36 HRC	180	.0019	.0021	.0025	.0028	.0034	.0041	.0048
		36 - 50 HRC	150	.0018	.0019	.0023	.0026	.0030	.0037	.0044
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	350	.0034	.0037	.0042	.0048	.0056	.0067	.0081
		75 - 98 HRB	400	.0030	.0034	.0039	.0044	.0051	.0062	.0074
		21 - 36 HRC	325	.0026	.0030	.0034	.0039	.0044	.0053	.0064
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	300	.0023	.0026	.0030	.0034	.0039	.0048	.0056
		36 - 50 HRC	250	.0021	.0025	.0028	.0032	.0037	.0044	.0055
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	225	.0021	.0023	.0026	.0032	.0037	.0042	.0053
		21 - 36 HRC	150	.0021	.0023	.0026	.0030	.0035	.0042	.0051
		36 - 50 HRC	90	.0018	.0019	.0021	.0025	.0030	.0035	.0042

Finishers

NOTES:

ADOC and RDOC are recommended starting values, and should be adjusted according to your finish requirements

If converting from a ball end mill, the benefit multiple can be used to recalculate stepover pass-to-pass

STYLE	TOOLPATH	ADOC (STOCK REMOVAL)	RDOC (STEPOVER PER PASS)
HMAF-FE-6	Finishing (Fin)	.005"-.010"	.025 x Dia x Benefit Multiple

HXF

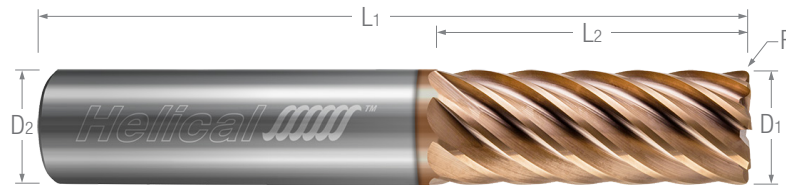


MULTI-FLUTE - CORNER RADIUS

Finisher

- Offers proven performance and extended tool life in stainless steels, high temp alloys, and hardened steels up to 65 Rc
- Well-suited for increased wear resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, and cast iron
- Designed with high flute count for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

For steel applications, see page 169 for *Aplus* coating



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 (h6)$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/4	1/4	.020	3/8	2	7	59959	HXF-S-070250-R.020
	1/4	.020	1/2	2	7	83517	HXF-SR-070250-R.020
	1/4	.020	3/4	2-1/2	7	59960	HXF-R-070250-R.020
3/8	3/8	.020	1/2	2	7	59961	HXF-S-070375-R.020
	3/8	.020	3/4	2-1/2	7	83518	HXF-SR-070375-R.020
	3/8	.020	1	3	7	59962	HXF-R-070375-R.020
	3/8	.020	1-1/4	3	7	83519	HXF-M-070375-R.020
1/2	1/2	.030	5/8	2-1/2	8	59963	HXF-S-080500-R.030
	1/2	.030	1	3	8	59964	HXF-SR-080500-R.030
	1/2	.030	1-1/4	3	8	59965	HXF-R-080500-R.030
	1/2	.030	1-5/8	3-1/2	8	83520	HXF-M-080500-R.030
3/4	3/4	.060	1	3	12	59966	HXF-S-120750-R.060
	3/4	.060	1-5/8	4	12	59967	HXF-R-120750-R.060

* .0005 max TIR



Speeds & Feeds on Page 170

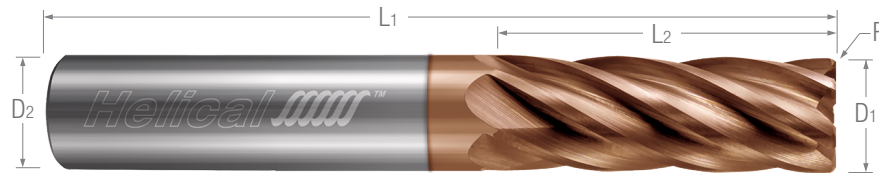
6 FLUTE - CORNER RADIUS New Items!



HVNI-6

Variable Pitch

- Specially engineered for optimal performance in Inconel 718 and other nickel-based superalloys in High Efficiency Milling (HEM) and traditional roughing toolpaths
- 6 flute variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Diameter* $D_1^{+.000}_{-.002}$	Shank Diameter D_2 (h6)	Corner Radius $R^{+.002}_{-.002}$	Length of Cut $L_2^{+.032}_{-.000}$	Overall Length $L_1^{+.062}_{-.062}$	Flutes	<i>Tplus</i> Coated	Tool Description	
1/4	1/4	.010	3/8	2	6	87301	HVNI-015-60250-R.010	new
	1/4	.010	1/2	2-1/2	6	86178	HVNI-020-60250-R.010	
	1/4	.010	3/4	2-1/2	6	86179	HVNI-030-60250-R.010	
	1/4	.010	1	3	6	86180	HVNI-040-60250-R.010	
	1/4	.030	3/8	2	6	87302	HVNI-015-60250-R.030	new
	1/4	.030	1/2	2-1/2	6	86181	HVNI-020-60250-R.030	
	1/4	.030	3/4	2-1/2	6	86182	HVNI-030-60250-R.030	
	1/4	.030	1	3	6	86183	HVNI-040-60250-R.030	
3/8	3/8	.010	3/4	2-1/2	6	87303	HVNI-020-60375-R.010	new
	3/8	.010	1	3	6	86184	HVNI-026-60375-R.010	
	3/8	.010	1-1/4	3	6	86185	HVNI-033-60375-R.010	
	3/8	.010	1-1/2	3-1/2	6	86186	HVNI-040-60375-R.010	
	3/8	.030	3/4	2-1/2	6	87304	HVNI-020-60375-R.030	new
	3/8	.030	1	3	6	86187	HVNI-026-60375-R.030	
	3/8	.030	1-1/4	3	6	86188	HVNI-033-60375-R.030	
	3/8	.030	1-1/2	3-1/2	6	86189	HVNI-040-60375-R.030	
1/2	1/2	.010	1	3	6	87305	HVNI-020-60500-R.010	new
	1/2	.010	1-1/4	3	6	87306	HVNI-025-60500-R.010	new
	1/2	.010	1-5/8	4	6	87307	HVNI-032-60500-R.010	new
	1/2	.010	2	4	6	87308	HVNI-040-60500-R.010	new
	1/2	.030	1	3	6	86190	HVNI-020-60500-R.030	
	1/2	.030	1-1/4	3	6	86191	HVNI-025-60500-R.030	
	1/2	.030	1-5/8	4	6	86192	HVNI-032-60500-R.030	
	1/2	.030	2	4	6	86193	HVNI-040-60500-R.030	
	1/2	.060	1	3	6	86194	HVNI-020-60500-R.060	
	1/2	.060	1-1/4	3	6	86195	HVNI-025-60500-R.060	
	1/2	.060	1-5/8	4	6	86196	HVNI-032-60500-R.060	
	1/2	.060	2	4	6	86197	HVNI-040-60500-R.060	

continued on next page

HVNI-6



New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

	Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Tplus Coated	Tool Description
	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 (h6)$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
new	1/2	1/2	.090	1	3	6	87309	HVNI-020-60500-R.090
new		1/2	.090	1-1/4	3	6	87310	HVNI-025-60500-R.090
new		1/2	.090	1-5/8	4	6	87311	HVNI-032-60500-R.090
new		1/2	.090	2	4	6	87312	HVNI-040-60500-R.090
		1/2	.120	1	3	6	86198	HVNI-020-60500-R.120
		1/2	.120	1-1/4	3	6	86199	HVNI-025-60500-R.120
		1/2	.120	1-5/8	4	6	86200	HVNI-032-60500-R.120
		1/2	.120	2	4	6	86201	HVNI-040-60500-R.120
new	5/8	5/8	.030	1-5/8	3-1/2	6	87728	HVNI-026-60625-R.030
new		5/8	.030	2-1/8	4	6	87729	HVNI-034-60625-R.030
new		5/8	.030	2-1/2	5	6	87730	HVNI-040-60625-R.030
new		5/8	.060	1-5/8	3-1/2	6	87731	HVNI-026-60625-R.060
new		5/8	.060	2-1/8	4	6	87732	HVNI-034-60625-R.060
new		5/8	.060	2-1/2	5	6	87733	HVNI-040-60625-R.060
new		5/8	.125	1-5/8	3-1/2	6	87734	HVNI-026-60625-R.125
new		5/8	.125	2-1/8	4	6	87735	HVNI-034-60625-R.125
new		5/8	.125	2-1/2	5	6	87736	HVNI-040-60625-R.125
new	3/4	3/4	.030	1-5/8	4	6	86202	HVNI-021-60750-R.030
		3/4	.030	2-1/4	5	6	86203	HVNI-030-60750-R.030
new		3/4	.030	2-3/4	5	6	87313	HVNI-036-60750-R.030
new		3/4	.030	3-1/4	6	6	87314	HVNI-043-60750-R.030
		3/4	.060	1-5/8	4	6	86204	HVNI-021-60750-R.060
		3/4	.060	2-1/4	5	6	86205	HVNI-030-60750-R.060
new		3/4	.060	2-3/4	5	6	87315	HVNI-036-60750-R.060
new		3/4	.060	3-1/4	6	6	87316	HVNI-043-60750-R.060
new		3/4	.090	1-5/8	4	6	87317	HVNI-021-60750-R.090
new		3/4	.090	2-1/4	5	6	87318	HVNI-030-60750-R.090
new		3/4	.090	2-3/4	5	6	87319	HVNI-036-60750-R.090
new		3/4	.090	3-1/4	6	6	87320	HVNI-043-60750-R.090
		3/4	.120	1-5/8	4	6	86206	HVNI-021-60750-R.120
		3/4	.120	2-1/4	5	6	86207	HVNI-030-60750-R.120
new		3/4	.120	2-3/4	5	6	87321	HVNI-036-60750-R.120
new		3/4	.120	3-1/4	6	6	87322	HVNI-043-60750-R.120

*.0005 max TIR

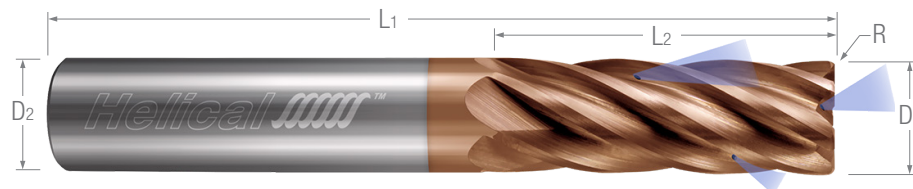
6 FLUTE - CORNER RADIUS New!



HVNIC-6

Variable Pitch - Coolant Through

- Specially engineered for optimal performance in Inconel 718 and other nickel-based superalloys in High Efficiency Milling (HEM) and traditional roughing tool paths
- 6 flute variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Tplus</i> Coated	Tool Description	
$D_1^{+.000}_{-.002}$	$D_2 (h6)$	$R^{+.002}_{-.002}$	$L_2^{+.032}_{-.000}$	$L_1^{+.062}_{-.062}$				
1/4	1/4	.010	1/2	2-1/2	6	87608	HVNIC-020-60250-R.010	new
	1/4	.010	3/4	2-1/2	6	87609	HVNIC-030-60250-R.010	new
	1/4	.030	1/2	2-1/2	6	87610	HVNIC-020-60250-R.030	new
	1/4	.030	3/4	2-1/2	6	87611	HVNIC-030-60250-R.030	new
3/8	3/8	.010	3/4	2-1/2	6	87612	HVNIC-020-60375-R.010	new
	3/8	.010	1	3	6	87613	HVNIC-027-60375-R.010	new
	3/8	.030	3/4	2-1/2	6	87614	HVNIC-020-60375-R.030	new
	3/8	.030	1	3	6	87615	HVNIC-027-60375-R.030	new
1/2	1/2	.030	1	3	6	87616	HVNIC-020-60500-R.030	new
	1/2	.030	1-1/4	3	6	87617	HVNIC-025-60500-R.030	new
	1/2	.030	1-5/8	4	6	87618	HVNIC-033-60500-R.030	new
	1/2	.060	1	3	6	87619	HVNIC-020-60500-R.060	new
	1/2	.060	1-1/4	3	6	87620	HVNIC-025-60500-R.060	new
	1/2	.060	1-5/8	4	6	87621	HVNIC-033-60500-R.060	new
3/4	3/4	.030	1-5/8	4	6	87622	HVNIC-022-60750-R.030	new
	3/4	.030	2-1/4	5	6	87623	HVNIC-030-60750-R.030	new
	3/4	.060	1-5/8	4	6	87624	HVNIC-022-60750-R.060	new
	3/4	.060	2-1/4	5	6	87625	HVNIC-030-60750-R.060	new

* .0005 max TIR

HVNI-6


SPEEDS & FEEDS
 6 Flute - Variable Pitch

HVNI-6 / HVNIC-6

Material Guide		Hardness	SFM	Inches per Tooth (IPT)														
				1/4			3/8			1/2			3/4			1		
				HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin	HEM	Rgh	Fin
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0060	.0028	.0018	.0088	.0041	.0021	.0116	.0054	.0025	.0165	.0077	.0029	.0212	.0099	.0036
		75 - 98 HRB	250	.0049	.0023	.0017	.0073	.0034	.0019	.0096	.0045	.0023	.0137	.0064	.0027	.0178	.0083	.0033
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0030	.0014	.0013	.0045	.0021	.0015	.0058	.0027	.0018	.0084	.0039	.0021	.0107	.0050	.0025
		21 - 36 HRC	75	.0030	.0014	.0013	.0043	.0020	.0015	.0056	.0026	.0017	.0081	.0038	.0020	.0105	.0049	.0025
		36 - 50 HRC	70	.0026	.0012	.0012	.0036	.0017	.0014	.0047	.0022	.0016	.0069	.0032	.0019	.0088	.0041	.0023
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0047	.0038	.0021	.0071	.0057	.0024	.0099	.0074	.0029	.0148	.0106	.0034	.0198	.0137	.0041
		75 - 98 HRB	275	.0040	.0032	.0019	.0059	.0048	.0023	.0082	.0062	.0026	.0123	.0089	.0031	.0165	.0115	.0038
		21 - 36 HRC	250	.0030	.0024	.0017	.0045	.0036	.0019	.0062	.0047	.0023	.0092	.0067	.0027	.0123	.0086	.0032
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0024	.0019	.0014	.0037	.0028	.0017	.0049	.0037	.0020	.0073	.0053	.0023	.0097	.0068	.0029
		36 - 50 HRC	160	.0022	.0017	.0014	.0032	.0026	.0016	.0044	.0034	.0019	.0067	.0048	.0023	.0089	.0062	.0027
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0034	.0016	.0014	.0051	.0024	.0016	.0066	.0031	.0019	.0096	.0045	.0022	.0122	.0057	.0027
		21 - 36 HRC	170	.0034	.0016	.0014	.0049	.0023	.0016	.0064	.0030	.0018	.0092	.0043	.0022	.0120	.0056	.0027
		36 - 50 HRC	65	.0021	.0010	.0011	.0034	.0016	.0013	.0043	.0020	.0015	.0062	.0029	.0018	.0081	.0038	.0022

MILLING PROCESS	ADOC	RDOC
HEM (High Efficiency Milling)	Up to Max LOC	Up to 10% Diameter
Rgh (Roughing)	Up to Max LOC	10%-20% Diameter
Fin (Finishing)	Up to Max LOC	4%-6% Diameter

Note: IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

Understanding Nickel Alloys: Popularity, Chemical Composition, & Classification

Nickel-based alloys have been a cornerstone of manufacturing for decades, desirable for their broad range of varying resistances to heat, oxidation, and corrosion. Learn more about this unique and advantageous material, and dive into what makes it truly a staple in machine shops, by reading our "In the Loupe" post: *Understanding Nickel Alloys: Popularity, Chemical Composition, & Classification*.

www.harveyprecision.com/in-the-loupe/nickel-alloys/

In The Loupe
MACHINISTS BLDG



SCAN TO READ

8 FLUTE - CORNER RADIUS New Items!



HVNI-8

Variable Pitch - For High Efficiency Milling

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of Inconel 718 and other nickel-based superalloys
- 8 flute variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Not for use in traditional slotting and roughing toolpaths
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



8 Flute

Cutter Diameter* $D_1^{+.000^*}_{-.002^*}$	Shank Diameter D_2 (h6)	Corner Radius $R^{+.002^*}_{-.002^*}$	Length of Cut $L_2^{+.032^*}_{-.000^*}$	Overall Length $L_1^{+.062^*}_{-.062^*}$	Flutes	<i>Tplus</i> Coated	Tool Description	
3/8	3/8	.010	3/4	2-1/2	8	87323	HVNI-020-80375-R.010	new
	3/8	.010	1	3	8	86238	HVNI-026-80375-R.010	
	3/8	.010	1-1/4	3	8	86239	HVNI-033-80375-R.010	
	3/8	.010	1-1/2	3-1/2	8	86240	HVNI-040-80375-R.010	
	3/8	.030	3/4	2-1/2	8	87324	HVNI-020-80375-R.030	new
	3/8	.030	1	3	8	86241	HVNI-026-80375-R.030	
	3/8	.030	1-1/4	3	8	86242	HVNI-033-80375-R.030	
	3/8	.030	1-1/2	3-1/2	8	86243	HVNI-040-80375-R.030	
1/2	1/2	.010	1	3	8	87325	HVNI-020-80500-R.010	new
	1/2	.010	1-1/4	3	8	87326	HVNI-025-80500-R.010	new
	1/2	.010	1-5/8	4	8	87327	HVNI-032-80500-R.010	new
	1/2	.010	2	4	8	87328	HVNI-040-80500-R.010	new
	1/2	.030	1	3	8	86244	HVNI-020-80500-R.030	
	1/2	.030	1-1/4	3	8	86245	HVNI-025-80500-R.030	
	1/2	.030	1-5/8	4	8	86246	HVNI-032-80500-R.030	
	1/2	.030	2	4	8	86247	HVNI-040-80500-R.030	
	1/2	.060	1	3	8	86248	HVNI-020-80500-R.060	
	1/2	.060	1-1/4	3	8	86249	HVNI-025-80500-R.060	
	1/2	.060	1-5/8	4	8	86250	HVNI-032-80500-R.060	
	1/2	.060	2	4	8	86251	HVNI-040-80500-R.060	
	1/2	.090	1	3	8	87329	HVNI-020-80500-R.090	new
	1/2	.090	1-1/4	3	8	87330	HVNI-025-80500-R.090	new
	1/2	.090	1-5/8	4	8	87331	HVNI-032-80500-R.090	new
	1/2	.090	2	4	8	87332	HVNI-040-80500-R.090	new
	1/2	.120	1	3	8	86252	HVNI-020-80500-R.120	
	1/2	.120	1-1/4	3	8	86253	HVNI-025-80500-R.120	
	1/2	.120	1-5/8	4	8	86254	HVNI-032-80500-R.120	
	1/2	.120	2	4	8	86255	HVNI-040-80500-R.120	

continued on next page

HVNI-8



New Items! 8 FLUTE - CORNER RADIUS

Variable Pitch - For High Efficiency Milling (cont.)

continued from previous page

	Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Tplus Coated	Tool Description
new	5/8	5/8	.030	1-5/8	3-1/2	8	87737	HVNI-026-80625-R.030
new		5/8	.030	2-1/8	4	8	87738	HVNI-034-80625-R.030
new		5/8	.030	2-1/2	5	8	87739	HVNI-040-80625-R.030
new		5/8	.060	1-5/8	3-1/2	8	87740	HVNI-026-80625-R.060
new		5/8	.060	2-1/8	4	8	87741	HVNI-034-80625-R.060
new		5/8	.060	2-1/2	5	8	87742	HVNI-040-80625-R.060
new		5/8	.125	1-5/8	3-1/2	8	87743	HVNI-026-80625-R.125
new		5/8	.125	2-1/8	4	8	87744	HVNI-034-80625-R.125
new		5/8	.125	2-1/2	5	8	87745	HVNI-040-80625-R.125
new		3/4	3/4	.030	1-5/8	4	8	86256
new	3/4		.030	2-1/4	5	8	86257	HVNI-030-80750-R.030
new	3/4		.030	2-3/4	5	8	87333	HVNI-036-80750-R.030
new	3/4		.030	3-1/4	6	8	87334	HVNI-043-80750-R.030
new	3/4		.060	1-5/8	4	8	86258	HVNI-021-80750-R.060
new	3/4		.060	2-1/4	5	8	86259	HVNI-030-80750-R.060
new	3/4		.060	2-3/4	5	8	87335	HVNI-036-80750-R.060
new	3/4		.060	3-1/4	6	8	87336	HVNI-043-80750-R.060
new	3/4		.090	1-5/8	4	8	87337	HVNI-021-80750-R.090
new	3/4		.090	2-1/4	5	8	87338	HVNI-030-80750-R.090
new	3/4		.090	2-3/4	5	8	87339	HVNI-036-80750-R.090
new	3/4		.090	3-1/4	6	8	87340	HVNI-043-80750-R.090
new	3/4		.120	1-5/8	4	8	86260	HVNI-021-80750-R.120
new	3/4		.120	2-1/4	5	8	86261	HVNI-030-80750-R.120
new	3/4		.120	2-3/4	5	8	87341	HVNI-036-80750-R.120
new	3/4		.120	3-1/4	6	8	87342	HVNI-043-80750-R.120
new	1	1	.060	2	4-1/2	8	86262	HVNI-020-81000-R.060
new		1	.060	2-5/8	5	8	86263	HVNI-026-81000-R.060
new		1	.060	3-1/4	6	8	87746	HVNI-033-81000-R.060
new		1	.060	4-1/4	6	8	87747	HVNI-043-81000-R.060
new		1	.125	2	4-1/2	8	87748	HVNI-020-81000-R.125
new		1	.125	2-5/8	5	8	87749	HVNI-026-81000-R.125
new		1	.125	3-1/4	6	8	87750	HVNI-033-81000-R.125
new		1	.125	4-1/4	6	8	87751	HVNI-043-81000-R.125



SPEEDS & FEEDS

8 Flute - Variable Pitch - For High Efficiency Milling

8 Flute

HVNI-8													
Material Guide		Hardness	SFM	Inches per Tooth (IPT)									
				1/4		3/8		1/2		3/4		1	
				HEM	Fin	HEM	Fin	HEM	Fin	HEM	Fin	HEM	Fin
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0051	.0020	.0079	.0023	.0100	.0027	.0148	.0033	.0187	.0040
		75 - 98 HRB	250	.0043	.0019	.0066	.0022	.0084	.0025	.0125	.0030	.0157	.0036
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0026	.0015	.0041	.0017	.0051	.0020	.0075	.0023	.0095	.0028
		21 - 36 HRC	75	.0025	.0014	.0039	.0016	.0049	.0019	.0072	.0023	.0092	.0028
		36 - 50 HRC	70	.0021	.0013	.0033	.0015	.0041	.0018	.0062	.0021	.0079	.0026
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0042	.0021	.0063	.0024	.0088	.0029	.0131	.0034	.0176	.0041
		75 - 98 HRB	275	.0035	.0019	.0053	.0023	.0073	.0026	.0110	.0031	.0146	.0038
		21 - 36 HRC	250	.0026	.0017	.0040	.0019	.0055	.0023	.0082	.0027	.0110	.0032
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0022	.0014	.0033	.0017	.0043	.0020	.0065	.0023	.0086	.0029
		36 - 50 HRC	160	.0019	.0014	.0029	.0016	.0039	.0019	.0059	.0023	.0079	.0027
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0030	.0016	.0046	.0018	.0057	.0021	.0085	.0025	.0108	.0031
		21 - 36 HRC	170	.0030	.0015	.0044	.0017	.0056	.0021	.0082	.0025	.0105	.0030
		36 - 50 HRC	65	.0020	.0013	.0030	.0015	.0038	.0017	.0056	.0020	.0071	.0024

MILLING PROCESS	ADOC	RDOC
HEM (High Efficiency Milling)	Up to Max LOC	Up to 10% Diameter
Fin (Finishing)	Up to Max LOC	4%-6% Diameter

Note: IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

Machining Nickel Alloys: Avoiding All-Too-Common Mishaps

In The Loupe
MACHINISTS BLOG

Don't make an all-too-common mistake when machining nickel-based alloys. Let us help! From work hardening to tool adhesion, and even excessive heat generation, CNC machining nickel-based alloys without the proper knowledge for avoiding these often devastating mishaps can result in scrapped parts. Our "In the Loupe" blog post: *Machining Nickel Alloys: Avoiding All-Too-Common Mishaps* is a great place to start.



SCAN TO READ

www.harveyperformance.com/in-the-loupe/machining-nickel-alloys/

HEV-C-5



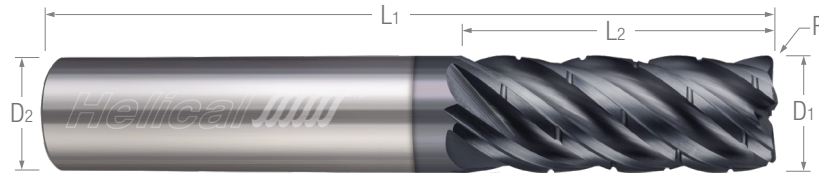
New Items!

5 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 5 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure

- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1^{+.000^*}_{-.002^*}$	D_2 (h6)	$R^{+.002^*}_{-.002^*}$	$L_2^{+.032^*}_{-.000^*}$	$L_1^{+.062^*}_{-.062^*}$			
new new new new new new new new new new new	1/8	.010	1/4	1-1/2	5	59391	HEV-C-S-50125-R.010
	1/8	.010	3/8	2	5	82213	HEV-C-SR-50125-R.010
	1/8	.010	1/2	2-1/2	5	59392	HEV-C-R-50125-R.010
	1/8	.010	5/8	2-1/2	5	82214	HEV-C-A-50125-R.010
	1/8	.010	3/4	2-1/2	5	83068	HEV-C-M-50125-R.010
	1/8	.020	1/4	1-1/2	5	87343	HEV-C-S-50125-R.020
	1/8	.020	3/8	2	5	87344	HEV-C-SR-50125-R.020
	1/8	.020	1/2	2-1/2	5	87345	HEV-C-R-50125-R.020
	1/8	.020	5/8	2-1/2	5	87346	HEV-C-A-50125-R.020
	1/8	.020	3/4	2-1/2	5	87347	HEV-C-M-50125-R.020
	1/8	.030	1/4	1-1/2	5	87348	HEV-C-S-50125-R.030
	1/8	.030	3/8	2	5	87349	HEV-C-SR-50125-R.030
	1/8	.030	1/2	2-1/2	5	87350	HEV-C-R-50125-R.030
1/8	.030	5/8	2-1/2	5	87351	HEV-C-A-50125-R.030	
1/8	.030	3/4	2-1/2	5	87352	HEV-C-M-50125-R.030	
new new new new new new new new new new new new new	3/16	.010	5/16	2	5	59393	HEV-C-S-50187-R.010
	3/16	.010	7/16	2	5	81956	HEV-C-SR-50187-R.010
	3/16	.010	9/16	2-1/2	5	59394	HEV-C-R-50187-R.010
	3/16	.010	3/4	2-1/2	5	81957	HEV-C-M-50187-R.010
	3/16	.010	1	2-1/2	5	83069	HEV-C-ML-50187-R.010
	3/16	.020	5/16	2	5	87353	HEV-C-S-50187-R.020
	3/16	.020	7/16	2	5	87354	HEV-C-SR-50187-R.020
	3/16	.020	9/16	2-1/2	5	87355	HEV-C-R-50187-R.020
	3/16	.020	3/4	2-1/2	5	87356	HEV-C-M-50187-R.020
	3/16	.020	1	2-1/2	5	87357	HEV-C-ML-50187-R.020
	3/16	.030	5/16	2	5	83070	HEV-C-S-50187-R.030
	3/16	.030	7/16	2	5	83071	HEV-C-SR-50187-R.030
	3/16	.030	9/16	2-1/2	5	83072	HEV-C-R-50187-R.030
3/16	.030	3/4	2-1/2	5	83073	HEV-C-M-50187-R.030	
3/16	.030	1	2-1/2	5	87358	HEV-C-ML-50187-R.030	

*.0005 max TIR

continued on next page



Speeds & Feeds on Page 83

5 FLUTE - CORNER RADIUS **New Items!**

HEV-C-5

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
D1 ^{+0.000"} / _{-0.002"}	D2 (h6)	R ^{+0.002"} / _{-0.002"}	L2 ^{+0.032"} / _{-0.000"}	L1 ^{+0.062"} / _{-0.062"}			
1/4	1/4	.020	3/8	2	5	59395	HEV-C-S-50250-R.020
	1/4	.020	1/2	2-1/2	5	59396	HEV-C-SR-50250-R.020
	1/4	.020	3/4	2-1/2	5	59397	HEV-C-R-50250-R.020
	1/4	.020	1	3	5	59398	HEV-C-M-50250-R.020
	1/4	.020	1-1/4	3	5	82215	HEV-C-L-50250-R.020
	1/4	.020	1-1/2	3	5	83074	HEV-C-LX-50250-R.020
	1/4	.030	3/8	2	5	83075	HEV-C-S-50250-R.030
	1/4	.030	1/2	2-1/2	5	83076	HEV-C-SR-50250-R.030
	1/4	.030	3/4	2-1/2	5	83077	HEV-C-R-50250-R.030
	1/4	.030	1	3	5	83078	HEV-C-M-50250-R.030
	1/4	.060	3/8	2	5	87359	HEV-C-S-50250-R.060 new
	1/4	.060	1/2	2-1/2	5	87360	HEV-C-SR-50250-R.060 new
	1/4	.060	3/4	2-1/2	5	87361	HEV-C-R-50250-R.060 new
1/4	.060	1	3	5	87362	HEV-C-M-50250-R.060 new	
5/16	5/16	.020	7/16	2	5	59399	HEV-C-S-50312-R.020
	5/16	.020	13/16	2-1/2	5	59400	HEV-C-R-50312-R.020
	5/16	.020	1-1/4	3	5	82216	HEV-C-L-50312-R.020
3/8	3/8	.020	1/2	2	5	59401	HEV-C-S-50375-R.020
	3/8	.020	3/4	2-1/2	5	81958	HEV-C-SR-50375-R.020
	3/8	.020	1	3	5	59402	HEV-C-R-50375-R.020
	3/8	.020	1-1/4	3	5	59403	HEV-C-M-50375-R.020
	3/8	.020	1-1/2	3-1/2	5	82217	HEV-C-L-50375-R.020
	3/8	.020	2	4	5	83079	HEV-C-LX-50375-R.020
	3/8	.030	1/2	2	5	83080	HEV-C-S-50375-R.030
	3/8	.030	3/4	2-1/2	5	83081	HEV-C-SR-50375-R.030
	3/8	.030	1	3	5	83082	HEV-C-R-50375-R.030
	3/8	.030	1-1/4	3	5	83083	HEV-C-M-50375-R.030
	3/8	.060	1/2	2	5	87363	HEV-C-S-50375-R.060 new
	3/8	.060	3/4	2-1/2	5	87364	HEV-C-SR-50375-R.060 new
	3/8	.060	1	3	5	87365	HEV-C-R-50375-R.060 new
3/8	.060	1-1/4	3	5	87366	HEV-C-M-50375-R.060 new	
1/2	1/2	.010	5/8	2-1/2	5	83084	HEV-C-S-50500-R.010
	1/2	.010	1	3	5	83085	HEV-C-SR-50500-R.010
	1/2	.010	1-1/4	3	5	83086	HEV-C-R-50500-R.010
	1/2	.010	1-5/8	4	5	83087	HEV-C-M-50500-R.010
	1/2	.010	2	4	5	83088	HEV-C-L-50500-R.010
	1/2	.030	5/8	2-1/2	5	59404	HEV-C-S-50500-R.030
	1/2	.030	1	3	5	59405	HEV-C-SR-50500-R.030
	1/2	.030	1-1/4	3	5	59406	HEV-C-R-50500-R.030
	1/2	.030	1-5/8	4	5	59407	HEV-C-M-50500-R.030
	1/2	.030	2	4	5	59408	HEV-C-L-50500-R.030
	1/2	.030	2-1/2	5	5	81959	HEV-C-LX-50500-R.030
	1/2	.030	3-1/8	6	5	82218	HEV-C-X-50500-R.030
	1/2	.030	3-5/8	6	5	82219	HEV-C-Y-50500-R.030

* .0005 max TIR

continued on next page

HEV-C-5



New Items!

5 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
D1 ^{+0.000"} -0.002"	D2 (h6)	R ^{+0.002"} -0.002"	L2 ^{+0.032"} -0.000"	L1 ^{+0.062"} -0.062"			
1/2	1/2	.060	5/8	2-1/2	5	81960	HEV-C-S-50500-R.060
	1/2	.060	1	3	5	81961	HEV-C-SR-50500-R.060
	1/2	.060	1-1/4	3	5	81962	HEV-C-R-50500-R.060
	1/2	.060	1-5/8	4	5	81963	HEV-C-M-50500-R.060
	1/2	.060	2	4	5	81964	HEV-C-L-50500-R.060
	1/2	.060	2-1/2	5	5	81965	HEV-C-LX-50500-R.060
	1/2	.060	3-1/8	6	5	83089	HEV-C-X-50500-R.060
	1/2	.125	5/8	2-1/2	5	87367	HEV-C-S-50500-R.125
	1/2	.125	1	3	5	87368	HEV-C-SR-50500-R.125
	1/2	.125	1-1/4	3	5	87369	HEV-C-R-50500-R.125
1/2	.125	1-5/8	4	5	87370	HEV-C-M-50500-R.125	
5/8	5/8	.030	3/4	3	5	59409	HEV-C-S-50625-R.030
	5/8	.030	1-1/4	3-1/2	5	59410	HEV-C-SR-50625-R.030
	5/8	.030	1-5/8	3-1/2	5	59411	HEV-C-R-50625-R.030
	5/8	.030	2-1/8	4	5	59412	HEV-C-M-50625-R.030
	5/8	.030	2-1/2	5	5	82220	HEV-C-L-50625-R.030
	5/8	.030	3-1/4	6	5	82221	HEV-C-LX-50625-R.030
	5/8	.060	3/4	3	5	81966	HEV-C-S-50625-R.060
	5/8	.060	1-1/4	3-1/2	5	81967	HEV-C-SR-50625-R.060
	5/8	.060	1-5/8	3-1/2	5	81968	HEV-C-R-50625-R.060
5/8	.060	2-1/8	4	5	81969	HEV-C-M-50625-R.060	
3/4	3/4	.030	1	3	5	59413	HEV-C-S-50750-R.030
	3/4	.030	1-5/8	4	5	59414	HEV-C-R-50750-R.030
	3/4	.030	2-1/4	5	5	59415	HEV-C-M-50750-R.030
	3/4	.030	2-3/4	5	5	59416	HEV-C-L-50750-R.030
	3/4	.030	3-1/4	6	5	59417	HEV-C-LX-50750-R.030
	3/4	.030	4	6-1/2	5	82222	HEV-C-X-50750-R.030
	3/4	.060	1	3	5	81970	HEV-C-S-50750-R.060
	3/4	.060	1-5/8	4	5	81971	HEV-C-R-50750-R.060
	3/4	.060	2-1/4	5	5	81972	HEV-C-M-50750-R.060
	3/4	.060	2-3/4	5	5	81973	HEV-C-L-50750-R.060
	3/4	.060	3-1/4	6	5	81974	HEV-C-LX-50750-R.060
	3/4	.125	1-5/8	4	5	87371	HEV-C-R-50750-R.125
	3/4	.125	2-1/4	5	5	87372	HEV-C-M-50750-R.125
	3/4	.125	2-3/4	5	5	87373	HEV-C-L-50750-R.125
3/4	.125	3-1/4	6	5	87374	HEV-C-LX-50750-R.125	
1	1	.030	1-1/4	4	5	59418	HEV-C-S-51000-R.030
	1	.030	2	4-1/2	5	59419	HEV-C-R-51000-R.030

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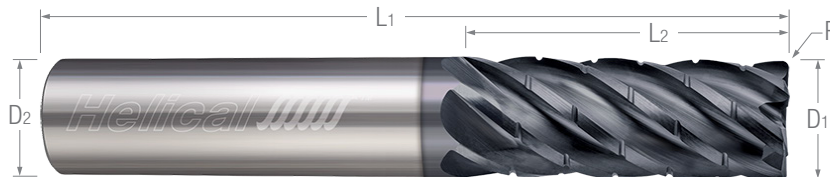
6 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch - For High Efficiency Milling



HVTI-C-6

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of Titanium 6Al4V and other titanium alloys
- 6 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- Not for use in traditional slotting and roughing toolpaths
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.010	1/2	2-1/2	6	84520	HVTI-C-020-60250-R.010
	1/4	.010	3/4	2-1/2	6	84521	HVTI-C-030-60250-R.010
	1/4	.010	1	3	6	84522	HVTI-C-040-60250-R.010
	1/4	.030	1/2	2-1/2	6	84523	HVTI-C-020-60250-R.030
	1/4	.030	3/4	2-1/2	6	84524	HVTI-C-030-60250-R.030
	1/4	.030	1	3	6	84525	HVTI-C-040-60250-R.030
3/8	3/8	.010	1	3	6	84526	HVTI-C-026-60375-R.010
	3/8	.010	1-1/4	3	6	84527	HVTI-C-033-60375-R.010
	3/8	.010	1-1/2	3-1/2	6	84528	HVTI-C-040-60375-R.010
	3/8	.030	1	3	6	84529	HVTI-C-026-60375-R.030
	3/8	.030	1-1/4	3	6	84530	HVTI-C-033-60375-R.030
	3/8	.030	1-1/2	3-1/2	6	84531	HVTI-C-040-60375-R.030
1/2	1/2	.010	1	3	6	84532	HVTI-C-020-60500-R.010
	1/2	.010	1-1/4	3	6	84533	HVTI-C-025-60500-R.010
	1/2	.010	1-5/8	4	6	84534	HVTI-C-032-60500-R.010
	1/2	.010	2	4	6	84535	HVTI-C-040-60500-R.010
	1/2	.030	1	3	6	84536	HVTI-C-020-60500-R.030
	1/2	.030	1-1/4	3	6	84537	HVTI-C-025-60500-R.030
	1/2	.030	1-5/8	4	6	84538	HVTI-C-032-60500-R.030
	1/2	.030	2	4	6	84539	HVTI-C-040-60500-R.030
	1/2	.060	1	3	6	84540	HVTI-C-020-60500-R.060
	1/2	.060	1-1/4	3	6	84541	HVTI-C-025-60500-R.060
	1/2	.060	1-5/8	4	6	84542	HVTI-C-032-60500-R.060
	1/2	.060	2	4	6	84543	HVTI-C-040-60500-R.060
	1/2	.120	1	3	6	84544	HVTI-C-020-60500-R.120
	1/2	.120	1-1/4	3	6	84545	HVTI-C-025-60500-R.120
1/2	.120	1-5/8	4	6	84546	HVTI-C-032-60500-R.120	
1/2	.120	2	4	6	84547	HVTI-C-040-60500-R.120	
3/4	3/4	.030	1-5/8	4	6	84548	HVTI-C-021-60750-R.030
	3/4	.030	2-1/4	5	6	84549	HVTI-C-030-60750-R.030
	3/4	.060	1-5/8	4	6	84550	HVTI-C-021-60750-R.060
	3/4	.060	2-1/4	5	6	84551	HVTI-C-030-60750-R.060
	3/4	.120	1-5/8	4	6	84552	HVTI-C-021-60750-R.120
	3/4	.120	2-1/4	5	6	84553	HVTI-C-030-60750-R.120

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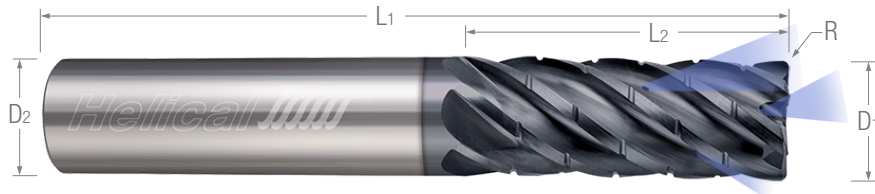
HVTIC-C-6



6 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Coolant Through - Variable Pitch - For High Efficiency Milling

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of Titanium 6Al4V and other titanium alloys
- 6 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- Not for use in traditional slotting and roughing toolpaths
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 \text{ (h6)}$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/4	1/4	.030	1/2	2-1/2	6	84610	HVTIC-C-020-60250-R.030
	1/4	.030	3/4	2-1/2	6	84611	HVTIC-C-030-60250-R.030
3/8	3/8	.010	1/2	2	6	84612	HVTIC-C-013-60375-R.010
	3/8	.010	1	3	6	84613	HVTIC-C-026-60375-R.010
	3/8	.030	1/2	2	6	84614	HVTIC-C-013-60375-R.030
	3/8	.030	1	3	6	84615	HVTIC-C-026-60375-R.030
1/2	1/2	.030	1	3	6	84616	HVTIC-C-020-60500-R.030
	1/2	.030	1-1/4	3	6	84617	HVTIC-C-025-60500-R.030
	1/2	.030	1-5/8	4	6	84618	HVTIC-C-032-60500-R.030
	1/2	.060	1	3	6	84619	HVTIC-C-020-60500-R.060
	1/2	.060	1-1/4	3	6	84620	HVTIC-C-025-60500-R.060
	1/2	.060	1-5/8	4	6	84621	HVTIC-C-032-60500-R.060
3/4	3/4	.030	1-5/8	4	6	84622	HVTIC-C-021-60750-R.030
	3/4	.030	2-1/4	5	6	84623	HVTIC-C-030-60750-R.030
	3/4	.060	1-5/8	4	6	84624	HVTIC-C-021-60750-R.060
	3/4	.060	2-1/4	5	6	84625	HVTIC-C-030-60750-R.060

* .0005 max TIR



SPEEDS & FEEDS

6 Flute - Corner Radius - Chipbreaker Rougher - Variable Pitch - For High Efficiency Milling


HVTIC-C-6

Roughers

HVTI-C-6 / HVTIC-C-6								
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)				
				1/4	3/8	1/2	3/4	1
				HEM	HEM	HEM	HEM	HEM
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0038	.0058	.0079	.0118	.0159
		75 - 98 HRB	250	.0032	.0049	.0066	.0099	.0134
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0019	.0029	.0041	.0060	.0081
		21 - 36 HRC	75	.0019	.0028	.0039	.0058	.0077
		36 - 50 HRC	70	.0016	.0024	.0034	.0049	.0066
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0052	.0079	.0110	.0164	.0220
		75 - 98 HRB	275	.0044	.0066	.0091	.0137	.0183
		21 - 36 HRC	250	.0033	.0050	.0069	.0102	.0137
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0027	.0041	.0054	.0081	.0108
		36 - 50 HRC	160	.0024	.0036	.0049	.0074	.0099
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0022	.0034	.0046	.0069	.0092
		21 - 36 HRC	170	.0021	.0032	.0044	.0067	.0088
		36 - 50 HRC	65	.0014	.0023	.0030	.0046	.0060

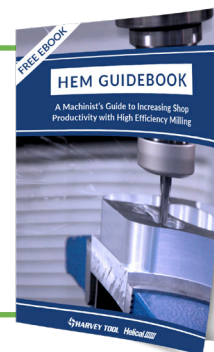
MILLING PROCESS	ADOC	RDOC
HEM (High Efficiency Milling)	Up to Max LOC	Up to 10% Diameter

NOTES:

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

Free HEM Guidebook

Download the free 50-page PDF and let High Efficiency Milling lead the way to a more profitable, productive shop. Scan the QR code to get started with HEM today.

helicaltool.com/hem


HEV-C-6



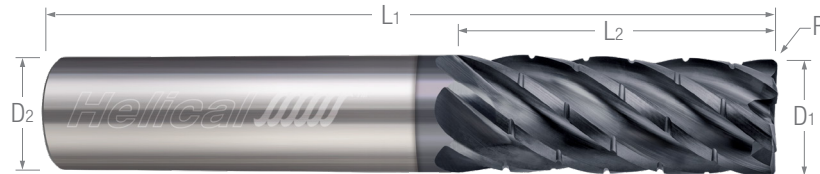
New Items!

6 FLUTE - CORNER RADIUS

Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 6 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure

- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter D_2 (h6)	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	6	84374	HEV-C-S-60125-R.010
	1/8	.010	3/8	2	6	84375	HEV-C-SR-60125-R.010
	1/8	.010	1/2	2-1/2	6	84376	HEV-C-R-60125-R.010
	1/8	.010	5/8	2-1/2	6	84377	HEV-C-A-60125-R.010
3/16	3/16	.010	5/16	2	6	84378	HEV-C-S-60187-R.010
	3/16	.010	7/16	2	6	84379	HEV-C-SR-60187-R.010
	3/16	.010	9/16	2-1/2	6	84380	HEV-C-R-60187-R.010
	3/16	.010	3/4	2-1/2	6	84381	HEV-C-M-60187-R.010
1/4	1/4	.010	3/8	2	6	83125	HEV-C-S-60250-R.010
	1/4	.010	1/2	2-1/2	6	83126	HEV-C-SR-60250-R.010
	1/4	.010	3/4	2-1/2	6	83127	HEV-C-R-60250-R.010
	1/4	.010	1	3	6	83128	HEV-C-M-60250-R.010
	1/4	.020	3/8	2	6	82223	HEV-C-S-60250-R.020
	1/4	.020	1/2	2-1/2	6	82224	HEV-C-SR-60250-R.020
	1/4	.020	3/4	2-1/2	6	82225	HEV-C-R-60250-R.020
	1/4	.020	1	3	6	82226	HEV-C-M-60250-R.020
	1/4	.030	3/8	2	6	87403	HEV-C-S-60250-R.030
	1/4	.030	1/2	2-1/2	6	87404	HEV-C-SR-60250-R.030
	1/4	.030	3/4	2-1/2	6	87405	HEV-C-R-60250-R.030
	1/4	.030	1	3	6	87406	HEV-C-M-60250-R.030
	1/4	.060	3/8	2	6	87407	HEV-C-S-60250-R.060
1/4	.060	1/2	2-1/2	6	87408	HEV-C-SR-60250-R.060	
1/4	.060	3/4	2-1/2	6	87409	HEV-C-R-60250-R.060	
1/4	.060	1	3	6	87410	HEV-C-M-60250-R.060	
3/8	3/8	.010	1/2	2	6	83129	HEV-C-S-60375-R.010
	3/8	.010	3/4	2-1/2	6	83130	HEV-C-SR-60375-R.010
	3/8	.010	1	3	6	83131	HEV-C-R-60375-R.010
	3/8	.010	1-1/4	3	6	83132	HEV-C-M-60375-R.010
	3/8	.020	1/2	2	6	87411	HEV-C-S-60375-R.020
	3/8	.020	3/4	2-1/2	6	87412	HEV-C-SR-60375-R.020
	3/8	.020	1	3	6	87413	HEV-C-R-60375-R.020
	3/8	.020	1-1/4	3	6	87414	HEV-C-M-60375-R.020

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6 FLUTE - CORNER RADIUS

New Items!



HEV-C-6

Chipbreaker Rougher - Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 $^{+.000}$ $_{-.002}$ "	Shank Diameter D2 (h6)	Corner Radius R $^{+.002}$ $_{-.002}$ "	Length of Cut L2 $^{+.032}$ $_{-.000}$ "	Overall Length L1 $^{+.062}$ $_{-.062}$ "	Flutes	Aplus Coated	Tool Description
3/8	3/8	.030	1/2	2	6	82227	HEV-C-S-60375-R.030
	3/8	.030	3/4	2-1/2	6	82228	HEV-C-SR-60375-R.030
	3/8	.030	1	3	6	82229	HEV-C-R-60375-R.030
	3/8	.030	1-1/4	3	6	82230	HEV-C-M-60375-R.030
	3/8	.060	1/2	2	6	87415	HEV-C-S-60375-R.060 new
	3/8	.060	3/4	2-1/2	6	87416	HEV-C-SR-60375-R.060 new
	3/8	.060	1	3	6	87417	HEV-C-R-60375-R.060 new
	3/8	.060	1-1/4	3	6	87418	HEV-C-M-60375-R.060 new
1/2	1/2	.010	5/8	2-1/2	6	83133	HEV-C-S-60500-R.010
	1/2	.010	1	3	6	83134	HEV-C-SR-60500-R.010
	1/2	.010	1-1/4	3	6	83135	HEV-C-R-60500-R.010
	1/2	.010	1-5/8	4	6	83136	HEV-C-M-60500-R.010
	1/2	.010	2	4	6	83137	HEV-C-L-60500-R.010
	1/2	.010	2-1/2	5	6	83138	HEV-C-LX-60500-R.010
	1/2	.030	5/8	2-1/2	6	82231	HEV-C-S-60500-R.030
	1/2	.030	1	3	6	82232	HEV-C-SR-60500-R.030
	1/2	.030	1-1/4	3	6	82233	HEV-C-R-60500-R.030
	1/2	.030	1-5/8	4	6	82234	HEV-C-M-60500-R.030
	1/2	.030	2	4	6	82235	HEV-C-L-60500-R.030
	1/2	.030	2-1/2	5	6	82236	HEV-C-LX-60500-R.030
	1/2	.060	5/8	2-1/2	6	82237	HEV-C-S-60500-R.060
	1/2	.060	1	3	6	82238	HEV-C-SR-60500-R.060
	1/2	.060	1-1/4	3	6	82239	HEV-C-R-60500-R.060
	1/2	.060	1-5/8	4	6	82240	HEV-C-M-60500-R.060
	1/2	.060	2	4	6	82241	HEV-C-L-60500-R.060
	1/2	.060	2-1/2	5	6	82242	HEV-C-LX-60500-R.060
	1/2	.125	5/8	2-1/2	6	87419	HEV-C-S-60500-R.125 new
1/2	.125	1	3	6	87420	HEV-C-SR-60500-R.125 new	
1/2	.125	1-1/4	3	6	87421	HEV-C-R-60500-R.125 new	
1/2	.125	1-5/8	4	6	87422	HEV-C-M-60500-R.125 new	
5/8	5/8	.030	1-1/4	3-1/2	6	83139	HEV-C-SR-60625-R.030
	5/8	.030	1-5/8	3-1/2	6	83140	HEV-C-R-60625-R.030
	5/8	.030	2	4	6	83141	HEV-C-M-60625-R.030
	5/8	.060	1-1/4	3-1/2	6	82243	HEV-C-SR-60625-R.060
	5/8	.060	1-5/8	3-1/2	6	82244	HEV-C-R-60625-R.060
	5/8	.060	2	4	6	82245	HEV-C-M-60625-R.060
3/4	3/4	.030	1-5/8	4	6	83142	HEV-C-R-60750-R.030
	3/4	.030	2-1/4	5	6	83143	HEV-C-M-60750-R.030
	3/4	.030	2-3/4	5	6	83144	HEV-C-L-60750-R.030
	3/4	.060	1-5/8	4	6	82246	HEV-C-R-60750-R.060
	3/4	.060	2-1/4	5	6	82247	HEV-C-M-60750-R.060
	3/4	.060	2-3/4	5	6	82248	HEV-C-L-60750-R.060
	3/4	.125	1-5/8	4	6	87423	HEV-C-R-60750-R.125 new
	3/4	.125	2-1/4	5	6	87424	HEV-C-M-60750-R.125 new
	3/4	.125	2-3/4	5	6	87425	HEV-C-L-60750-R.125 new

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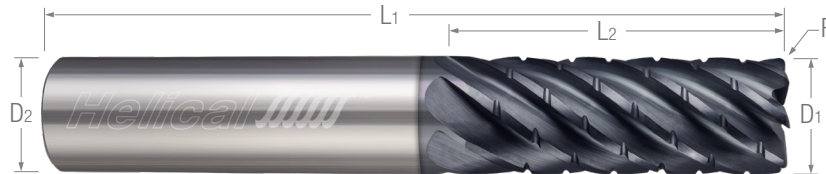
HEV-C-7



New Items!

7 FLUTE - CORNER RADIUS Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, reduced harmonics, and reduced tool pressure
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA

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Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
$D1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D2 (h6)$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
1/4	1/4	.020	3/8	2	7	59420	HEV-C-S-70250-R.020
	1/4	.020	1/2	2	7	59421	HEV-C-SR-70250-R.020
	1/4	.020	3/4	2-1/2	7	59422	HEV-C-R-70250-R.020
	1/4	.020	1	3	7	82249	HEV-C-M-70250-R.020
	1/4	.020	1-1/4	3	7	83163	HEV-C-L-70250-R.020
	1/4	.030	3/8	2	7	87174	HEV-C-S-70250-R.030
	1/4	.030	1/2	2	7	87175	HEV-C-SR-70250-R.030
	1/4	.030	3/4	2-1/2	7	87176	HEV-C-R-70250-R.030
3/8	3/8	.020	1/2	2	7	59423	HEV-C-S-70375-R.020
	3/8	.020	3/4	2-1/2	7	59424	HEV-C-SR-70375-R.020
	3/8	.020	1	2-1/2	7	59425	HEV-C-R-70375-R.020
	3/8	.020	1-1/2	3-1/2	7	82250	HEV-C-L-70375-R.020
	3/8	.030	1/2	2	7	87177	HEV-C-S-70375-R.030
	3/8	.030	3/4	2-1/2	7	87178	HEV-C-SR-70375-R.030
	3/8	.030	1	2-1/2	7	87179	HEV-C-R-70375-R.030
	3/8	.060	1/2	2	7	83164	HEV-C-S-70375-R.060
	3/8	.060	3/4	2-1/2	7	83165	HEV-C-SR-70375-R.060
3/8	.060	1	2-1/2	7	83166	HEV-C-R-70375-R.060	
1/2	1/2	.010	5/8	2-1/2	7	87180	HEV-C-S-70500-R.010
	1/2	.010	1	3	7	87181	HEV-C-SR-70500-R.010
	1/2	.010	1-1/4	3	7	87182	HEV-C-R-70500-R.010
	1/2	.010	1-5/8	4	7	87183	HEV-C-M-70500-R.010
	1/2	.010	2	4	7	87184	HEV-C-L-70500-R.010
	1/2	.020	5/8	2-1/2	7	83167	HEV-C-S-70500-R.020
	1/2	.020	1	3	7	83168	HEV-C-SR-70500-R.020
	1/2	.020	1-1/4	3	7	83169	HEV-C-R-70500-R.020
	1/2	.020	1-5/8	4	7	83170	HEV-C-M-70500-R.020
	1/2	.020	2	4	7	83171	HEV-C-L-70500-R.020
	1/2	.030	5/8	2-1/2	7	59426	HEV-C-S-70500-R.030
	1/2	.030	1	3	7	59427	HEV-C-SR-70500-R.030
	1/2	.030	1-1/4	3	7	59428	HEV-C-R-70500-R.030
	1/2	.030	1-5/8	4	7	59429	HEV-C-M-70500-R.030
	1/2	.030	2	4	7	81975	HEV-C-L-70500-R.030

* .0005 max TIR

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Speeds & Feeds on Page 90

7 FLUTE - CORNER RADIUS

New Items!



HEV-C-7

Chipbreaker Rougher - Variable Pitch (cont.)

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Cutter Diameter* D ₁ ^{+0.000"} _{-.002"}	Shank Diameter D ₂ (h6)	Corner Radius R ^{+0.002"} _{-.002"}	Length of Cut L ₂ ^{+0.032"} _{-.000"}	Overall Length L ₁ ^{+0.062"} _{-.062"}	Flutes	Aplus Coated	Tool Description
1/2	1/2	.030	2-1/2	5	7	82251	HEV-C-LX-70500-R.030
	1/2	.030	3-1/8	6	7	82252	HEV-C-X-70500-R.030
	1/2	.060	5/8	2-1/2	7	81978	HEV-C-S-70500-R.060
	1/2	.060	1	3	7	81979	HEV-C-SR-70500-R.060
	1/2	.060	1-1/4	3	7	81980	HEV-C-R-70500-R.060
	1/2	.060	1-5/8	4	7	81981	HEV-C-M-70500-R.060
	1/2	.060	2	4	7	81982	HEV-C-L-70500-R.060
	1/2	.060	2-1/2	5	7	83172	HEV-C-LX-70500-R.060
5/8	5/8	.030	3/4	3	7	83173	HEV-C-S-70625-R.030
	5/8	.030	1-1/4	3-1/2	7	59430	HEV-C-SR-70625-R.030
	5/8	.030	1-5/8	4	7	59431	HEV-C-R-70625-R.030
	5/8	.030	2-1/8	4	7	81976	HEV-C-M-70625-R.030
	5/8	.060	1-1/4	3-1/2	7	81983	HEV-C-SR-70625-R.060
	5/8	.060	1-5/8	4	7	81984	HEV-C-R-70625-R.060
	5/8	.060	2-1/8	4	7	81985	HEV-C-M-70625-R.060
3/4	3/4	.030	1-1/4	3-1/2	7	83174	HEV-C-SR-70750-R.030
	3/4	.030	1-5/8	4	7	59432	HEV-C-R-70750-R.030
	3/4	.030	2-1/4	5	7	59433	HEV-C-M-70750-R.030
	3/4	.030	2-3/4	5	7	81977	HEV-C-L-70750-R.030
	3/4	.030	3-1/4	6	7	83175	HEV-C-LX-70750-R.030
	3/4	.030	4	6-1/2	7	87185	HEV-C-X-70750-R.030
	3/4	.060	1-1/4	3-1/2	7	83176	HEV-C-SR-70750-R.060
	3/4	.060	1-5/8	4	7	81986	HEV-C-R-70750-R.060
	3/4	.060	2-1/4	5	7	81987	HEV-C-M-70750-R.060
	3/4	.060	2-3/4	5	7	81988	HEV-C-L-70750-R.060
	3/4	.060	3-1/4	6	7	87186	HEV-C-LX-70750-R.060
3/4	.060	4	6-1/2	7	87187	HEV-C-X-70750-R.060	
1	1	.030	2-5/8	5	7	87188	HEV-C-M-71000-R.030
	1	.030	3-1/4	6	7	87189	HEV-C-L-71000-R.030
	1	.030	4-1/8	7	7	87190	HEV-C-X-71000-R.030

new

new

new

new

new

new

*.0005 max TIR

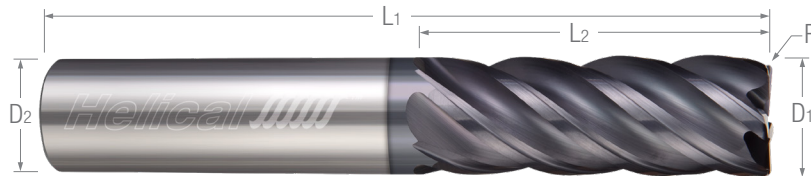
HEV-5



5 FLUTE - CORNER RADIUS

Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D ₁ ^{+0.000} / _{-0.002} "	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.002} / _{-0.002} "	LOC L ₂ ^{+0.032} / _{-0.000} "	OAL L ₁ ^{+0.062} / _{-0.062} "	Flutes	<i>Aplus</i> Coated	<i>Aplus</i> Coated + Weldon Flat	Tool Description
1/8	1/8	.010	1/4	1-1/2	5	34017		HEV-S-50125-R.010
	1/8	.010	3/8	2	5	81718		HEV-SR-50125-R.010
	1/8	.010	1/2	2-1/2	5	34032		HEV-R-50125-R.010
	1/8	.010	5/8	2-1/2	5	81719		HEV-A-50125-R.010
	1/8	.010	3/4	2-1/2	5	34047		HEV-M-50125-R.010
	1/8	.010	7/8	2-1/2	5	84636		HEV-L-50125-R.010
	1/8	.015	1/4	1-1/2	5	81720		HEV-S-50125-R.015
	1/8	.015	3/8	2	5	82530		HEV-SR-50125-R.015
	1/8	.015	1/2	2-1/2	5	81721		HEV-R-50125-R.015
	1/8	.015	5/8	2-1/2	5	84637		HEV-A-50125-R.015
	1/8	.020	1/4	1-1/2	5	84638		HEV-S-50125-R.020
	1/8	.020	3/8	2	5	84639		HEV-SR-50125-R.020
	1/8	.020	1/2	2-1/2	5	84640		HEV-R-50125-R.020
	1/8	.030	1/4	1-1/2	5	45017		HEV-S-50125-R.030
	1/8	.030	3/8	2	5	82531		HEV-SR-50125-R.030
	1/8	.030	1/2	2-1/2	5	45032		HEV-R-50125-R.030
1/8	.030	5/8	2-1/2	5	82532		HEV-A-50125-R.030	
1/8	.030	3/4	2-1/2	5	45047		HEV-M-50125-R.030	
1/8	.030	7/8	2-1/2	5	84641		HEV-L-50125-R.030	
5/32	3/16	.010	3/16	2	5	81722		HEV-S-50156-R.010
	3/16	.010	5/16	2	5	84642		HEV-SR-50156-R.010
	3/16	.010	7/16	2-1/2	5	81723		HEV-R-50156-R.010
	3/16	.010	9/16	2-1/2	5	81724		HEV-M-50156-R.010
	3/16	.010	3/4	2-1/2	5	84643		HEV-ML-50156-R.010
3/16	3/16	.010	5/16	2	5	34062		HEV-S-50187-R.010
	3/16	.010	7/16	2	5	81725		HEV-SR-50187-R.010
	3/16	.010	9/16	2-1/2	5	34077		HEV-R-50187-R.010
	3/16	.010	3/4	2-1/2	5	34092		HEV-M-50187-R.010
	3/16	.010	1	2-1/2	5	81726		HEV-ML-50187-R.010
	3/16	.010	1-3/16	3	5	84644		HEV-L-50187-R.010
	3/16	.015	5/16	2	5	81727		HEV-S-50187-R.015
	3/16	.015	7/16	2	5	82533		HEV-SR-50187-R.015
	3/16	.015	9/16	2-1/2	5	81728		HEV-R-50187-R.015
	3/16	.015	3/4	2-1/2	5	82534		HEV-M-50187-R.015
	3/16	.015	1	2-1/2	5	82535		HEV-ML-50187-R.015
	3/16	.020	5/16	2	5	84645		HEV-S-50187-R.020

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5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)



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Cutter Dia.* D1 $^{+.000}$ $_{-.002}$ "	Shank Dia. D2 (h6)	Corner Radius R $^{+.002}$ $_{-.002}$ "	LOC L2 $^{+.032}$ $_{-.000}$ "	OAL L1 $^{+.062}$ $_{-.062}$ "	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description	
3/16	3/16	.020	7/16	2	5	84646		HEV-SR-50187-R.020	
	3/16	.020	9/16	2-1/2	5	84647		HEV-R-50187-R.020	
	3/16	.030	5/16	2	5	45062		HEV-S-50187-R.030	
	3/16	.030	7/16	2	5	81729		HEV-SR-50187-R.030	
	3/16	.030	9/16	2-1/2	5	45077		HEV-R-50187-R.030	
	3/16	.030	3/4	2-1/2	5	45092		HEV-M-50187-R.030	
	3/16	.030	1	2-1/2	5	82536		HEV-ML-50187-R.030	
	3/16	.030	1-3/16	3	5	84648		HEV-L-50187-R.030	
7/32	1/4	.010	5/16	2	5	81730		HEV-S-50218-R.010	
	1/4	.010	7/16	2-1/2	5	81731		HEV-R-50218-R.010	
1/4	1/4	.010	3/8	2	5	81732		HEV-S-50250-R.010	
	1/4	.010	1/2	2-1/2	5	81733		HEV-SR-50250-R.010	
	1/4	.010	3/4	2-1/2	5	81734		HEV-R-50250-R.010	
	1/4	.010	1	3	5	82537		HEV-M-50250-R.010	
	1/4	.010	1-1/4	3	5	82538		HEV-L-50250-R.010	
	1/4	.015	3/8	2	5	81735		HEV-S-50250-R.015	
	1/4	.015	1/2	2-1/2	5	81736		HEV-SR-50250-R.015	
	1/4	.015	3/4	2-1/2	5	81737		HEV-R-50250-R.015	
	1/4	.015	1	3	5	82539		HEV-M-50250-R.015	
	1/4	.015	1-1/4	3	5	82540		HEV-L-50250-R.015	
	1/4	.020	3/8	2	5	34107	34107W	HEV-S-50250-R.020	
	1/4	.020	3/8	4	5	82958		HEV-S-50250-R.020	
	1/4	.020	1/2	2-1/2	5	34122	34122W	HEV-SR-50250-R.020	
	1/4	.020	3/4	2-1/2	5	34137	34137W	HEV-R-50250-R.020	
	1/4	.020	3/4	4	5	82959		HEV-R-50250-R.020	
	1/4	.020	1	3	5	34152	34152W	HEV-M-50250-R.020	
	1/4	.020	1-1/4	3	5	34157		HEV-L-50250-R.020	
	1/4	.020	1-1/2	3	5	82541		HEV-LX-50250-R.020	
	1/4	.030	3/8	2	5	45107	45107W	HEV-S-50250-R.030	
	1/4	.030	1/2	2-1/2	5	45122	45122W	HEV-SR-50250-R.030	
	1/4	.030	3/4	2-1/2	5	45137	45137W	HEV-R-50250-R.030	
	1/4	.030	1	3	5	45152	45152W	HEV-M-50250-R.030	
	1/4	.030	1-1/4	3	5	45157		HEV-L-50250-R.030	
	1/4	.030	1-1/2	3	5	82542		HEV-LX-50250-R.030	
	1/4	.060	3/8	2	5	45108	45108W	HEV-S-50250-R.060	
	1/4	.060	1/2	2-1/2	5	45123	45123W	HEV-SR-50250-R.060	
	1/4	.060	3/4	2-1/2	5	45138	45138W	HEV-R-50250-R.060	
	1/4	.060	1	3	5	45153	45153W	HEV-M-50250-R.060	
	1/4	.060	1-1/4	3	5	45158		HEV-L-50250-R.060	
	1/4	.060	1-1/2	3	5	82543		HEV-LX-50250-R.060	
	9/32	5/16	.020	7/16	2	5	81738		HEV-S-50281-R.020
		5/16	.020	3/4	2-1/2	5	81739		HEV-R-50281-R.020
5/16		.020	1	3	5	81740		HEV-M-50281-R.020	
5/16	5/16	.010	7/16	2	5	81741		HEV-S-50312-R.010	
	5/16	.010	13/16	2-1/2	5	81742		HEV-R-50312-R.010	
	5/16	.010	1	3	5	84649		HEV-M-50312-R.010	
	5/16	.015	7/16	2	5	84650		HEV-S-50312-R.015	
	5/16	.015	13/16	2-1/2	5	84651		HEV-R-50312-R.015	
	5/16	.015	1	3	5	84652		HEV-M-50312-R.015	
	5/16	.020	7/16	2	5	34167	34167W	HEV-S-50312-R.020	
	5/16	.020	5/8	2-1/2	5	84653		HEV-SR-50312-R.020	

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5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

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Cutter Dia.* D1 ^{+0.002"} -0.002"	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002"} -0.002"	LOC L2 ^{+0.032"} -0.000"	OAL L1 ^{+0.062"} -0.062"	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
5/16	5/16	.020	13/16	2-1/2	5	34182	34182W	HEV-R-50312-R.020
	5/16	.020	1	3	5	34197	34197W	HEV-M-50312-R.020
	5/16	.020	1-1/4	3	5	81743		HEV-L-50312-R.020
	5/16	.020	1-9/16	4	5	82544		HEV-LX-50312-R.020
	5/16	.030	7/16	2	5	45167	45167W	HEV-S-50312-R.030
	5/16	.030	5/8	2-1/2	5	84654		HEV-SR-50312-R.030
	5/16	.030	13/16	2-1/2	5	45182	45182W	HEV-R-50312-R.030
	5/16	.030	1	3	5	45197	45197W	HEV-M-50312-R.030
	5/16	.030	1-1/4	3	5	82545		HEV-L-50312-R.030
	5/16	.060	7/16	2	5	45168		HEV-S-50312-R.060
	5/16	.060	13/16	2-1/2	5	45183		HEV-R-50312-R.060
	5/16	.060	1	3	5	45198		HEV-M-50312-R.060
3/8	3/8	.010	1/2	2	5	81744		HEV-S-50375-R.010
	3/8	.010	3/4	2-1/2	5	82546		HEV-SR-50375-R.010
	3/8	.010	1	3	5	81745		HEV-R-50375-R.010
	3/8	.010	1-1/4	3	5	81746		HEV-M-50375-R.010
	3/8	.010	1-1/2	3-1/2	5	81747		HEV-L-50375-R.010
	3/8	.015	1/2	2	5	81748		HEV-S-50375-R.015
	3/8	.015	3/4	2-1/2	5	82547		HEV-SR-50375-R.015
	3/8	.015	1	3	5	81749		HEV-R-50375-R.015
	3/8	.015	1-1/4	3	5	82548		HEV-M-50375-R.015
	3/8	.020	1/2	2	5	34212	34212W	HEV-S-50375-R.020
	3/8	.020	1/2	4	5	82960		HEV-S-50375-R.020
	3/8	.020	3/4	2-1/2	5	81750		HEV-SR-50375-R.020
	3/8	.020	1	3	5	34227	34227W	HEV-R-50375-R.020
	3/8	.020	1	6	5	82961		HEV-R-50375-R.020
	3/8	.020	1-1/4	3	5	34242	34242W	HEV-M-50375-R.020
	3/8	.020	1-1/2	3-1/2	5	34247		HEV-L-50375-R.020
	3/8	.020	2	4	5	84655		HEV-LX-50375-R.020
	3/8	.030	1/2	2	5	45212	45212W	HEV-S-50375-R.030
	3/8	.030	3/4	2-1/2	5	81751		HEV-SR-50375-R.030
	3/8	.030	1	3	5	45227	45227W	HEV-R-50375-R.030
	3/8	.030	1-1/4	3	5	45242	45242W	HEV-M-50375-R.030
	3/8	.030	1-1/2	3-1/2	5	45247	45247W	HEV-L-50375-R.030
	3/8	.030	2	4	5	84656		HEV-LX-50375-R.030
	3/8	.060	1/2	2	5	45213	45213W	HEV-S-50375-R.060
	3/8	.060	3/4	2-1/2	5	81752		HEV-SR-50375-R.060
	3/8	.060	1	3	5	45228	45228W	HEV-R-50375-R.060
	3/8	.060	1-1/4	3	5	45243	45243W	HEV-M-50375-R.060
	3/8	.060	1-1/2	3-1/2	5	45248		HEV-L-50375-R.060
	3/8	.060	2	4	5	84657		HEV-LX-50375-R.060
	3/8	.090	1/2	2	5	45214		HEV-S-50375-R.090
	3/8	.090	3/4	2-1/2	5	84658		HEV-SR-50375-R.090
	3/8	.090	1	3	5	45229		HEV-R-50375-R.090
	3/8	.090	1-1/4	3	5	45244		HEV-M-50375-R.090
	3/8	.090	1-1/2	3-1/2	5	45249		HEV-L-50375-R.090
	3/8	.125	1/2	2	5	82549		HEV-S-50375-R.125
	3/8	.125	3/4	2-1/2	5	84659		HEV-SR-50375-R.125
3/8	.125	1	3	5	82550		HEV-R-50375-R.125	
3/8	.125	1-1/4	3	5	82551		HEV-M-50375-R.125	
3/8	.125	1-1/2	3-1/2	5	84660		HEV-L-50375-R.125	

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5 FLUTE - CORNER RADIUS



HEV-5

Variable Pitch (cont.)

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Cutter Dia.* D1 $^{+.000}$ $_{-.002}$ "	Shank Dia. D2 (h6)	Corner Radius R $^{+.002}$ $_{-.002}$ "	LOC L2 $^{+.032}$ $_{-.000}$ "	OAL L1 $^{+.062}$ $_{-.062}$ "	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
1/2	1/2	.010	5/8	2-1/2	5	81753	81753W	HEV-S-50500-R.010
	1/2	.010	1	3	5	81754	81754W	HEV-SR-50500-R.010
	1/2	.010	1-1/4	3	5	81755	81755W	HEV-R-50500-R.010
	1/2	.010	1-5/8	4	5	81756		HEV-M-50500-R.010
	1/2	.010	2	4	5	81757		HEV-L-50500-R.010
	1/2	.010	2-1/2	5	5	84661		HEV-LX-50500-R.010
	1/2	.015	5/8	2-1/2	5	81758	81758W	HEV-S-50500-R.015
	1/2	.015	1	3	5	81759	81759W	HEV-SR-50500-R.015
	1/2	.015	1-1/4	3	5	81760	81760W	HEV-R-50500-R.015
	1/2	.015	1-5/8	4	5	82552		HEV-M-50500-R.015
	1/2	.015	2	4	5	82553		HEV-L-50500-R.015
	1/2	.020	5/8	2-1/2	5	81761	81761W	HEV-S-50500-R.020
	1/2	.020	1	3	5	81762	81762W	HEV-SR-50500-R.020
	1/2	.020	1-1/4	3	5	81763	81763W	HEV-R-50500-R.020
	1/2	.020	1-5/8	4	5	82554		HEV-M-50500-R.020
	1/2	.020	2	4	5	82555		HEV-L-50500-R.020
	1/2	.030	5/8	2-1/2	5	34257	34257W	HEV-S-50500-R.030
	1/2	.030	5/8	4	5	82962		HEV-S-50500-R.030
	1/2	.030	1	3	5	34272	34272W	HEV-SR-50500-R.030
	1/2	.030	1-1/4	3	5	34287	34287W	HEV-R-50500-R.030
	1/2	.030	1-1/4	6	5	82963		HEV-R-50500-R.030
	1/2	.030	1-5/8	4	5	34302	34302W	HEV-M-50500-R.030
	1/2	.030	2	4	5	34307	34307W	HEV-L-50500-R.030
	1/2	.030	2-1/2	5	5	81764		HEV-LX-50500-R.030
	1/2	.030	3-1/8	6	5	82556		HEV-X-50500-R.030
	1/2	.030	3-5/8	6	5	82557		HEV-Y-50500-R.030
	1/2	.060	5/8	2-1/2	5	45257	45257W	HEV-S-50500-R.060
	1/2	.060	5/8	4	5	82964		HEV-S-50500-R.060
	1/2	.060	1	3	5	45272	45272W	HEV-SR-50500-R.060
	1/2	.060	1-1/4	3	5	45287	45287W	HEV-R-50500-R.060
	1/2	.060	1-1/4	6	5	82965		HEV-R-50500-R.060
	1/2	.060	1-5/8	4	5	45302	45302W	HEV-M-50500-R.060
	1/2	.060	2	4	5	45307	45307W	HEV-L-50500-R.060
	1/2	.060	2-1/2	5	5	81765		HEV-LX-50500-R.060
	1/2	.090	5/8	2-1/2	5	45258	45258W	HEV-S-50500-R.090
	1/2	.090	1	3	5	45273	45273W	HEV-SR-50500-R.090
	1/2	.090	1-1/4	3	5	45288	45288W	HEV-R-50500-R.090
	1/2	.090	1-5/8	4	5	45303		HEV-M-50500-R.090
	1/2	.090	2	4	5	45308		HEV-L-50500-R.090
	1/2	.090	2-1/2	5	5	82558		HEV-LX-50500-R.090
1/2	.120	5/8	2-1/2	5	45259	45259W	HEV-S-50500-R.120	
1/2	.120	1	3	5	45274	45274W	HEV-SR-50500-R.120	
1/2	.120	1-1/4	3	5	45289	45289W	HEV-R-50500-R.120	
1/2	.120	1-5/8	4	5	45304	45304W	HEV-M-50500-R.120	
1/2	.120	2	4	5	45309	45309W	HEV-L-50500-R.120	
1/2	.120	2-1/2	5	5	82559		HEV-LX-50500-R.120	
1/2	.125	5/8	2-1/2	5	81766		HEV-S-50500-R.125	
1/2	.125	1	3	5	81767		HEV-SR-50500-R.125	
1/2	.125	1-1/4	3	5	81768		HEV-R-50500-R.125	
1/2	.125	1-5/8	4	5	82560		HEV-M-50500-R.125	

*.0005 max TIR

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HEV-5



5 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Dia.* D1 ^{+0.000} -0.002	Shank Dia. D2 (h6)	Corner Radius R ^{+0.002} -0.002	LOC L2 ^{+0.032} -0.000	OAL L1 ^{+0.062} -0.062	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
5/8	5/8	.015	1-1/4	3-1/2	5	84662		HEV-SR-50625-R.015
	5/8	.015	1-5/8	3-1/2	5	84663		HEV-R-50625-R.015
	5/8	.015	2-1/8	4	5	84664		HEV-M-50625-R.015
	5/8	.030	3/4	3	5	34317		HEV-S-50625-R.030
	5/8	.030	1-1/4	3-1/2	5	34322	34322W	HEV-SR-50625-R.030
	5/8	.030	1-5/8	3-1/2	5	34332	34332W	HEV-R-50625-R.030
	5/8	.030	2-1/8	4	5	34347	34347W	HEV-M-50625-R.030
	5/8	.030	2-1/2	5	5	34352		HEV-L-50625-R.030
	5/8	.030	3-1/4	6	5	82561		HEV-LX-50625-R.030
	5/8	.060	3/4	3	5	45317		HEV-S-50625-R.060
	5/8	.060	1-1/4	3-1/2	5	45322		HEV-SR-50625-R.060
	5/8	.060	1-5/8	3-1/2	5	45332		HEV-R-50625-R.060
	5/8	.060	2-1/8	4	5	45347		HEV-M-50625-R.060
	5/8	.060	2-1/2	5	5	45352		HEV-L-50625-R.060
	5/8	.090	3/4	3	5	45318		HEV-S-50625-R.090
	5/8	.090	1-1/4	3-1/2	5	45323		HEV-SR-50625-R.090
	5/8	.090	1-5/8	3-1/2	5	45333		HEV-R-50625-R.090
	5/8	.090	2-1/8	4	5	45348		HEV-M-50625-R.090
	5/8	.090	2-1/2	5	5	45353		HEV-L-50625-R.090
	5/8	.120	3/4	3	5	45319		HEV-S-50625-R.120
5/8	.120	1-1/4	3-1/2	5	45324		HEV-SR-50625-R.120	
5/8	.120	1-5/8	3-1/2	5	45334		HEV-R-50625-R.120	
5/8	.120	2-1/8	4	5	45349		HEV-M-50625-R.120	
5/8	.120	2-1/2	5	5	45354		HEV-L-50625-R.120	
5/8	.120	3-1/4	6	5	82562		HEV-LX-50625-R.120	
3/4	3/4	.010	1	3	5	81769		HEV-S-50750-R.010
	3/4	.010	1-5/8	4	5	81770		HEV-R-50750-R.010
	3/4	.010	2-1/4	5	5	81771		HEV-M-50750-R.010
	3/4	.015	1	3	5	81772		HEV-S-50750-R.015
	3/4	.015	1-5/8	4	5	81773		HEV-R-50750-R.015
	3/4	.015	2-1/4	5	5	81774		HEV-M-50750-R.015
	3/4	.020	1	3	5	81775		HEV-S-50750-R.020
	3/4	.020	1-5/8	4	5	81776		HEV-R-50750-R.020
	3/4	.020	2-1/4	5	5	81777		HEV-M-50750-R.020
	3/4	.030	1	3	5	34362	34362W	HEV-S-50750-R.030
	3/4	.030	1	6	5	82966		HEV-S-50750-R.030
	3/4	.030	1-1/4	4	5	81778	81778W	HEV-SR-50750-R.030
	3/4	.030	1-5/8	4	5	34377	34377W	HEV-R-50750-R.030
	3/4	.030	1-5/8	6	5	82967		HEV-R-50750-R.030
	3/4	.030	2-1/4	5	5	34392	34392W	HEV-M-50750-R.030
	3/4	.030	2-3/4	5	5	34397	34397W	HEV-L-50750-R.030
	3/4	.030	3-1/4	6	5	34402	34402W	HEV-LX-50750-R.030
	3/4	.030	4	6-1/2	5	82563		HEV-X-50750-R.030
	3/4	.060	1	3	5	45362	45362W	HEV-S-50750-R.060
	3/4	.060	1	6	5	82968		HEV-S-50750-R.060
	3/4	.060	1-1/4	4	5	81779		HEV-SR-50750-R.060
	3/4	.060	1-5/8	4	5	45377	45377W	HEV-R-50750-R.060
	3/4	.060	1-5/8	6	5	82969		HEV-R-50750-R.060
	3/4	.060	2-1/4	5	5	45392	45392W	HEV-M-50750-R.060
3/4	.060	2-3/4	5	5	45397		HEV-L-50750-R.060	
3/4	.060	3-1/4	6	5	45402		HEV-LX-50750-R.060	
3/4	.060	4	6-1/2	5	82564		HEV-X-50750-R.060	

*.0005 max TIR

continued on next page

5 FLUTE - CORNER RADIUS



HEV-5

Variable Pitch (cont.)

continued from previous page

Cutter Dia.* $D_1^{+.000^*}_{-.002^*}$	Shank Dia. D_2 (h6)	Corner Radius $R^{+.002^*}_{-.002^*}$	LOC $L_2^{+.032^*}_{-.000^*}$	OAL $L_1^{+.062^*}_{-.062^*}$	Flutes	Aplus Coated	Aplus Coated + Weldon Flat	Tool Description
3/4	3/4	.090	1	3	5	45363		HEV-S-50750-R.090
	3/4	.090	1-1/4	4	5	84665		HEV-SR-50750-R.090
	3/4	.090	1-5/8	4	5	45378	45378W	HEV-R-50750-R.090
	3/4	.090	2-1/4	5	5	45393		HEV-M-50750-R.090
	3/4	.090	2-3/4	5	5	45398		HEV-L-50750-R.090
	3/4	.090	3-1/4	6	5	45403		HEV-LX-50750-R.090
	3/4	.120	1	3	5	45364		HEV-S-50750-R.120
	3/4	.120	1-1/4	4	5	81780		HEV-SR-50750-R.120
	3/4	.120	1-5/8	4	5	45379	45379W	HEV-R-50750-R.120
	3/4	.120	2-1/4	5	5	45394	45394W	HEV-M-50750-R.120
	3/4	.120	2-3/4	5	5	45399		HEV-L-50750-R.120
	3/4	.120	3-1/4	6	5	45404		HEV-LX-50750-R.120
	3/4	.190	1	3	5	45365		HEV-S-50750-R.190
	3/4	.190	1-1/4	4	5	84666		HEV-SR-50750-R.190
	3/4	.190	1-5/8	4	5	45380	45380W	HEV-R-50750-R.190
	3/4	.190	2-1/4	5	5	45395		HEV-M-50750-R.190
	3/4	.190	2-3/4	5	5	45400		HEV-L-50750-R.190
	3/4	.190	3-1/4	6	5	45405		HEV-LX-50750-R.190
	3/4	.250	1	3	5	45366		HEV-S-50750-R.250
	3/4	.250	1-1/4	4	5	84667		HEV-SR-50750-R.250
3/4	.250	1-5/8	4	5	45381	45381W	HEV-R-50750-R.250	
3/4	.250	2-1/4	5	5	45396		HEV-M-50750-R.250	
3/4	.250	2-3/4	5	5	45401	45401W	HEV-L-50750-R.250	
3/4	.250	3-1/4	6	5	45406		HEV-LX-50750-R.250	
1	1	.030	1-1/4	4	5	34407	34407W	HEV-S-51000-R.030
	1	.030	2	4-1/2	5	34422	34422W	HEV-R-51000-R.030
	1	.030	2-5/8	5	5	34437	34437W	HEV-M-51000-R.030
	1	.030	3-1/4	6	5	34442	34442W	HEV-L-51000-R.030
	1	.030	4-1/4	7	5	34447	34447W	HEV-X-51000-R.030
	1	.030	5-1/4	9	5	84668		HEV-Y-51000-R.030
	1	.060	1-1/4	4	5	45407		HEV-S-51000-R.060
	1	.060	2	4-1/2	5	45422		HEV-R-51000-R.060
	1	.060	2-5/8	5	5	45437		HEV-M-51000-R.060
	1	.060	3-1/4	6	5	45442		HEV-L-51000-R.060
	1	.060	4-1/4	7	5	45447		HEV-X-51000-R.060
	1	.090	1-1/4	4	5	45408		HEV-S-51000-R.090
	1	.090	2	4-1/2	5	45423		HEV-R-51000-R.090
	1	.090	2-5/8	5	5	45438		HEV-M-51000-R.090
	1	.120	1-1/4	4	5	45409		HEV-S-51000-R.120
	1	.120	2	4-1/2	5	45424		HEV-R-51000-R.120
	1	.120	2-5/8	5	5	45439		HEV-M-51000-R.120
	1	.120	3-1/4	6	5	45444		HEV-L-51000-R.120
	1	.120	4-1/4	7	5	45449		HEV-X-51000-R.120
	1	.190	2	4-1/2	5	45425		HEV-R-51000-R.190
1	.190	3-1/4	6	5	45445		HEV-L-51000-R.190	
1	.190	4-1/4	7	5	45450		HEV-X-51000-R.190	
1	.250	1-1/4	4	5	45411		HEV-S-51000-R.250	
1	.250	2	4-1/2	5	45426		HEV-R-51000-R.250	
1	.250	2-5/8	5	5	45441		HEV-M-51000-R.250	
1	.250	3-1/4	6	5	45446		HEV-L-51000-R.250	
1	.250	4-1/4	7	5	45451		HEV-X-51000-R.250	
1-1/4	1-1/4	.060	2	4-1/2	5	34467		HEV-R-51250-R.060
	1-1/4	.060	2-5/8	5-1/2	5	34482		HEV-M-51250-R.060
	1-1/4	.060	3-1/4	6	5	34497		HEV-L-51250-R.060
	1-1/4	.060	4-1/2	7	5	34512		HEV-LX-51250-R.060

*.0005 max TIR

MHEV-5

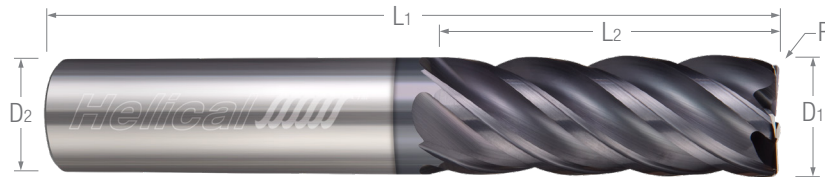
METRIC



5 FLUTE - CORNER RADIUS - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Dia.* D ₁ ^{+0.00 mm} / _{-0.05 mm}	Shank Dia. D ₂ (h6)	Corner Radius R ^{+0.05 mm} / _{-0.05 mm}	Length of Cut L ₂ ^{+0.80 mm} / _{-0.00 mm}	Overall Length L ₁ ^{+1.60 mm} / _{-1.60 mm}	Flutes	<i>Aplus</i> Coated	Tool Description
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	5	59517	MHEV-015-50600-R0.50
	6.00 mm	.50 mm	12.00 mm	63 mm	5	59535	MHEV-020-50600-R0.50
	6.00 mm	.50 mm	18.00 mm	63 mm	5	59569	MHEV-030-50600-R0.50
	6.00 mm	1.00 mm	9.00 mm	63 mm	5	59518	MHEV-015-50600-R1.00
	6.00 mm	1.00 mm	12.00 mm	63 mm	5	59536	MHEV-020-50600-R1.00
	6.00 mm	1.00 mm	18.00 mm	63 mm	5	59570	MHEV-030-50600-R1.00
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	5	59520	MHEV-015-50800-R0.50
	8.00 mm	.50 mm	16.00 mm	63 mm	5	59538	MHEV-020-50800-R0.50
	8.00 mm	.50 mm	24.00 mm	75 mm	5	59572	MHEV-030-50800-R0.50
	8.00 mm	1.00 mm	12.00 mm	63 mm	5	59521	MHEV-015-50800-R1.00
	8.00 mm	1.00 mm	16.00 mm	63 mm	5	59539	MHEV-020-50800-R1.00
	8.00 mm	1.00 mm	24.00 mm	75 mm	5	59573	MHEV-030-50800-R1.00
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	5	59523	MHEV-015-51000-R0.50
	10.00 mm	.50 mm	20.00 mm	63 mm	5	59541	MHEV-020-51000-R0.50
	10.00 mm	.50 mm	25.00 mm	75 mm	5	59555	MHEV-025-51000-R0.50
	10.00 mm	1.00 mm	15.00 mm	63 mm	5	59524	MHEV-015-51000-R1.00
	10.00 mm	1.00 mm	20.00 mm	63 mm	5	59542	MHEV-020-51000-R1.00
	10.00 mm	1.00 mm	25.00 mm	75 mm	5	59556	MHEV-025-51000-R1.00
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	5	59526	MHEV-015-51200-R0.50
	12.00 mm	.50 mm	24.00 mm	75 mm	5	59544	MHEV-020-51200-R0.50
	12.00 mm	.50 mm	30.00 mm	75 mm	5	59558	MHEV-025-51200-R0.50
	12.00 mm	1.00 mm	18.00 mm	75 mm	5	59527	MHEV-015-51200-R1.00
	12.00 mm	1.00 mm	24.00 mm	75 mm	5	59545	MHEV-020-51200-R1.00
	12.00 mm	1.00 mm	30.00 mm	75 mm	5	59559	MHEV-025-51200-R1.00
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	5	59529	MHEV-015-51600-R0.50
	16.00 mm	.50 mm	32.00 mm	89 mm	5	59547	MHEV-020-51600-R0.50
	16.00 mm	.50 mm	40.00 mm	89 mm	5	59561	MHEV-025-51600-R0.50
	16.00 mm	1.00 mm	24.00 mm	89 mm	5	59530	MHEV-015-51600-R1.00
	16.00 mm	1.00 mm	32.00 mm	89 mm	5	59548	MHEV-020-51600-R1.00
	16.00 mm	1.00 mm	40.00 mm	89 mm	5	59562	MHEV-025-51600-R1.00
20 mm	20.00 mm	.50 mm	30.00 mm	89 mm	5	59532	MHEV-015-52000-R0.50
	20.00 mm	.50 mm	40.00 mm	100 mm	5	59550	MHEV-020-52000-R0.50
	20.00 mm	.50 mm	50.00 mm	125 mm	5	59564	MHEV-025-52000-R0.50
	20.00 mm	1.00 mm	30.00 mm	89 mm	5	59533	MHEV-015-52000-R1.00
	20.00 mm	1.00 mm	40.00 mm	100 mm	5	59551	MHEV-020-52000-R1.00
	20.00 mm	1.00 mm	50.00 mm	125 mm	5	59565	MHEV-025-52000-R1.00
25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	5	59553	MHEV-020-52500-R1.00
	25.00 mm	1.00 mm	64.00 mm	125 mm	5	59567	MHEV-025-52500-R1.00

* .013 mm max TIR



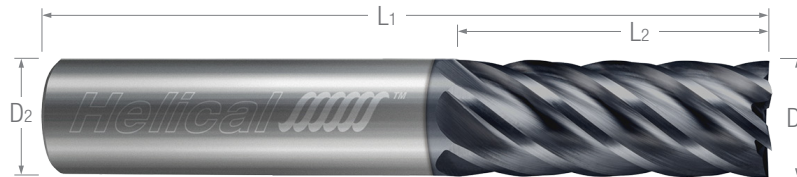
6 FLUTE - SQUARE New Items!



HVTI-6

Variable Pitch - For High Efficiency Milling

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of Titanium 6Al4V and other titanium alloys
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Not for use in traditional slotting and roughing toolpaths
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Extensive testing has proven HVTI-6's excellence in extending tool life for HEM operations in Titanium

Cutter Diameter* $D_1^{+0.000}_{-0.002}$	Shank Diameter D_2 (h6)	Length of Cut $L_2^{+0.032}_{-0.000}$	Overall Length $L_1^{+0.062}_{-0.062}$	Flutes	<i>Aplus</i> Coated	Tool Description	
1/8	1/4	1/4	2-1/2	6	87209	HVTI-020-60125	new
	1/4	3/8	2-1/2	6	87210	HVTI-030-60125	new
	1/4	1/2	2-1/2	6	87211	HVTI-040-60125	new
	1/4	5/8	2-1/2	6	87212	HVTI-050-60125	new
3/16	1/4	5/16	2-1/2	6	87213	HVTI-016-60187	new
	1/4	7/16	2-1/2	6	87214	HVTI-023-60187	new
	1/4	9/16	2-1/2	6	87215	HVTI-030-60187	new
	1/4	3/4	2-1/2	6	87216	HVTI-040-60187	new
1/4	1/4	3/8	2	6	87217	HVTI-015-60250	new
	1/4	1/2	2-1/2	6	84554	HVTI-020-60250	
	1/4	3/4	2-1/2	6	84555	HVTI-030-60250	
	1/4	1	3	6	84556	HVTI-040-60250	
	1/4	1-1/4	3	6	87218	HVTI-050-60250	new
5/16	5/16	7/16	2	6	87219	HVTI-014-60312	new
	5/16	3/4	2-1/2	6	87220	HVTI-024-60312	new
	5/16	1	3	6	87221	HVTI-032-60312	new
3/8	3/8	1/2	2	6	87222	HVTI-013-60375	new
	3/8	3/4	2-1/2	6	87223	HVTI-020-60375	new
	3/8	1	3	6	84557	HVTI-026-60375	
	3/8	1-1/4	3	6	84558	HVTI-033-60375	
	3/8	1-1/2	3-1/2	6	84559	HVTI-040-60375	
1/2	1/2	5/8	2-1/2	6	87224	HVTI-012-60500	new
	1/2	1	3	6	84560	HVTI-020-60500	
	1/2	1-1/4	3	6	84561	HVTI-025-60500	
	1/2	1-5/8	4	6	84562	HVTI-032-60500	
	1/2	2	4	6	84563	HVTI-040-60500	
5/8	5/8	1-1/4	3-1/2	6	87225	HVTI-020-60625	new
	5/8	1-5/8	3-1/2	6	87226	HVTI-026-60625	new
3/4	3/4	1-1/4	4	6	87227	HVTI-016-60750	new
	3/4	1-5/8	4	6	84564	HVTI-021-60750	
	3/4	2-1/4	5	6	84565	HVTI-030-60750	

* .0005 max TIR

HVTI-6

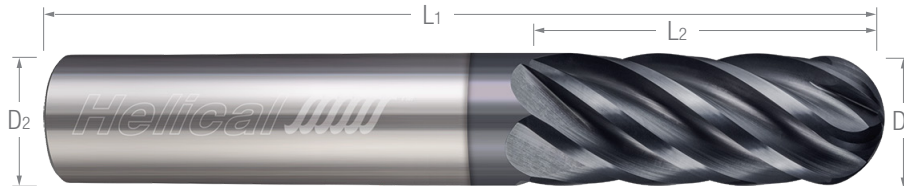


New Items!

6 FLUTE - BALL

Variable Pitch - For High Efficiency Milling

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of Titanium 6Al4V and other titanium alloys
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Not for use in traditional slotting and roughing toolpaths
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Extensive testing has proven HVTI-6's excellence in extending tool life for HEM operations in Titanium

	Cutter Diameter*	Shank Diameter	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
	$D_1 \begin{smallmatrix} +.000 \\ -.002 \end{smallmatrix}$ "	D_2 (h6)	$L_2 \begin{smallmatrix} +.032 \\ -.000 \end{smallmatrix}$ "	$L_1 \begin{smallmatrix} +.062 \\ -.062 \end{smallmatrix}$ "			
new	1/8	1/4	1/4	2-1/2	6	87228	HVTI-020-60125-BN
new		1/4	3/8	2-1/2	6	87229	HVTI-030-60125-BN
new		1/4	1/2	2-1/2	6	87230	HVTI-040-60125-BN
new		1/4	5/8	2-1/2	6	87231	HVTI-050-60125-BN
new	3/16	1/4	5/16	2-1/2	6	87232	HVTI-016-60187-BN
new		1/4	7/16	2-1/2	6	87233	HVTI-023-60187-BN
new		1/4	9/16	2-1/2	6	87234	HVTI-030-60187-BN
new		1/4	3/4	2-1/2	6	87235	HVTI-040-60187-BN
new	1/4	1/4	3/8	2	6	87236	HVTI-015-60250-BN
		1/4	1/2	2-1/2	6	84566	HVTI-020-60250-BN
		1/4	3/4	2-1/2	6	84567	HVTI-030-60250-BN
		1/4	1	3	6	84568	HVTI-040-60250-BN
new		1/4	1-1/4	3	6	87237	HVTI-050-60250-BN
new	5/16	5/16	7/16	2	6	87238	HVTI-014-60312-BN
new		5/16	3/4	2-1/2	6	87239	HVTI-024-60312-BN
new		5/16	1	3	6	87240	HVTI-032-60312-BN
new	3/8	3/8	1/2	2	6	87241	HVTI-013-60375-BN
new		3/8	3/4	2-1/2	6	87242	HVTI-020-60375-BN
		3/8	1	3	6	84569	HVTI-026-60375-BN
		3/8	1-1/4	3	6	84570	HVTI-033-60375-BN
		3/8	1-1/2	3-1/2	6	84571	HVTI-040-60375-BN
new	1/2	1/2	5/8	2-1/2	6	87243	HVTI-012-60500-BN
		1/2	1	3	6	84572	HVTI-020-60500-BN
		1/2	1-1/4	3	6	84573	HVTI-025-60500-BN
		1/2	1-5/8	4	6	84574	HVTI-032-60500-BN
		1/2	2	4	6	84575	HVTI-040-60500-BN
new	5/8	5/8	1-1/4	3-1/2	6	87244	HVTI-020-60625-BN
new		5/8	1-5/8	3-1/2	6	87245	HVTI-026-60625-BN
new	3/4	3/4	1-1/4	4	6	87246	HVTI-016-60750-BN
		3/4	1-5/8	4	6	84576	HVTI-021-60750-BN
		3/4	2-1/4	5	6	84577	HVTI-030-60750-BN

*.0005 max TIR

6 FLUTE - CORNER RADIUS

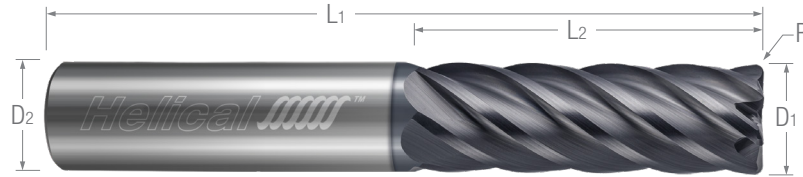
New Items!



HVTI-6

Variable Pitch - For High Efficiency Milling

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of Titanium 6Al4V and other titanium alloys
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Not for use in traditional slotting and roughing toolpaths
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Extensive testing has proven HVTI-6's excellence in extending tool life for HEM operations in Titanium

6 Flute

Cutter Diameter* D1 $^{+.000}$ / $_{-.002}$ "	Shank Diameter D2 (h6)	Corner Radius R $^{+.002}$ / $_{-.002}$ "	Length of Cut L2 $^{+.032}$ / $_{-.000}$ "	Overall Length L1 $^{+.062}$ / $_{-.062}$ "	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/4	.010	1/4	2-1/2	6	84358	HVTI-020-60125-R.010
	1/4	.010	3/8	2-1/2	6	84359	HVTI-030-60125-R.010
	1/4	.010	1/2	2-1/2	6	84360	HVTI-040-60125-R.010
	1/4	.010	5/8	2-1/2	6	84361	HVTI-050-60125-R.010
	1/4	.030	1/4	2-1/2	6	84362	HVTI-020-60125-R.030
	1/4	.030	3/8	2-1/2	6	84363	HVTI-030-60125-R.030
	1/4	.030	1/2	2-1/2	6	84364	HVTI-040-60125-R.030
	1/4	.030	5/8	2-1/2	6	84365	HVTI-050-60125-R.030
3/16	1/4	.010	5/16	2-1/2	6	84366	HVTI-016-60187-R.010
	1/4	.010	7/16	2-1/2	6	84367	HVTI-023-60187-R.010
	1/4	.010	9/16	2-1/2	6	84368	HVTI-030-60187-R.010
	1/4	.010	3/4	2-1/2	6	84369	HVTI-040-60187-R.010
	1/4	.010	1	2-1/2	6	87247	HVTI-053-60187-R.010 new
	1/4	.030	5/16	2-1/2	6	84370	HVTI-016-60187-R.030
	1/4	.030	7/16	2-1/2	6	84371	HVTI-023-60187-R.030
	1/4	.030	9/16	2-1/2	6	84372	HVTI-030-60187-R.030
	1/4	.030	3/4	2-1/2	6	84373	HVTI-040-60187-R.030
	1/4	.030	1	2-1/2	6	87248	HVTI-053-60187-R.030 new
1/4	1/4	.010	3/8	2	6	83887	HVTI-015-60250-R.010
	1/4	.010	1/2	2-1/2	6	82059	HVTI-020-60250-R.010
	1/4	.010	3/4	2-1/2	6	82060	HVTI-030-60250-R.010
	1/4	.010	1	3	6	82061	HVTI-040-60250-R.010
	1/4	.010	1-1/4	3	6	83888	HVTI-050-60250-R.010
	1/4	.020	3/8	2	6	87249	HVTI-015-60250-R.020 new
	1/4	.020	1/2	2-1/2	6	83889	HVTI-020-60250-R.020
	1/4	.020	3/4	2-1/2	6	83890	HVTI-030-60250-R.020
	1/4	.020	1	3	6	83891	HVTI-040-60250-R.020
	1/4	.030	3/8	2	6	83892	HVTI-015-60250-R.030
	1/4	.030	1/2	2-1/2	6	82062	HVTI-020-60250-R.030
	1/4	.030	3/4	2-1/2	6	82063	HVTI-030-60250-R.030
	1/4	.030	1	3	6	82064	HVTI-040-60250-R.030
	1/4	.030	1-1/4	3	6	83893	HVTI-050-60250-R.030
	1/4	.060	3/8	2	6	87250	HVTI-015-60250-R.060 new
	1/4	.060	1/2	2-1/2	6	83894	HVTI-020-60250-R.060
	1/4	.060	3/4	2-1/2	6	83895	HVTI-030-60250-R.060
	1/4	.060	1	3	6	83896	HVTI-040-60250-R.060

* .0005 max TIR

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HVTI-6



New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch - For High Efficiency Milling (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
5/16	5/16	.010	7/16	2	6	87251	HVTI-014-60312-R.010
	5/16	.010	3/4	2-1/2	6	87252	HVTI-024-60312-R.010
	5/16	.010	1	3	6	87253	HVTI-032-60312-R.010
	5/16	.010	1-1/4	3	6	87254	HVTI-040-60312-R.010
	5/16	.030	7/16	2	6	83897	HVTI-014-60312-R.030
	5/16	.030	3/4	2-1/2	6	83898	HVTI-024-60312-R.030
	5/16	.030	1	3	6	83899	HVTI-032-60312-R.030
	5/16	.030	1-1/4	3	6	83900	HVTI-040-60312-R.030
	5/16	.060	7/16	2	6	83901	HVTI-014-60312-R.060
	5/16	.060	3/4	2-1/2	6	83902	HVTI-024-60312-R.060
	5/16	.060	1	3	6	83903	HVTI-032-60312-R.060
	5/16	.060	1-1/4	3	6	83904	HVTI-040-60312-R.060
3/8	3/8	.010	1/2	2	6	83905	HVTI-013-60375-R.010
	3/8	.010	3/4	2-1/2	6	83906	HVTI-020-60375-R.010
	3/8	.010	1	3	6	82065	HVTI-026-60375-R.010
	3/8	.010	1-1/4	3	6	82066	HVTI-033-60375-R.010
	3/8	.010	1-1/2	3-1/2	6	82067	HVTI-040-60375-R.010
	3/8	.010	1-3/4	4	6	83907	HVTI-046-60375-R.010
	3/8	.020	1	3	6	83908	HVTI-026-60375-R.020
	3/8	.020	1-1/4	3	6	83909	HVTI-033-60375-R.020
	3/8	.020	1-1/2	3-1/2	6	83910	HVTI-040-60375-R.020
	3/8	.030	1/2	2	6	83911	HVTI-013-60375-R.030
	3/8	.030	3/4	2-1/2	6	83912	HVTI-020-60375-R.030
	3/8	.030	1	3	6	82068	HVTI-026-60375-R.030
	3/8	.030	1-1/4	3	6	82069	HVTI-033-60375-R.030
	3/8	.030	1-1/2	3-1/2	6	82070	HVTI-040-60375-R.030
	3/8	.030	1-3/4	4	6	83913	HVTI-046-60375-R.030
	3/8	.060	1	3	6	83914	HVTI-026-60375-R.060
	3/8	.060	1-1/4	3	6	83915	HVTI-033-60375-R.060
	3/8	.060	1-1/2	3-1/2	6	83916	HVTI-040-60375-R.060
1/2	1/2	.010	5/8	2-1/2	6	84980	HVTI-012-60500-R.010
	1/2	.010	1	3	6	82071	HVTI-020-60500-R.010
	1/2	.010	1-1/4	3	6	82072	HVTI-025-60500-R.010
	1/2	.010	1-5/8	4	6	82073	HVTI-032-60500-R.010
	1/2	.010	2	4	6	82074	HVTI-040-60500-R.010
	1/2	.010	2-1/2	5	6	83917	HVTI-050-60500-R.010
	1/2	.020	5/8	2-1/2	6	87255	HVTI-012-60500-R.020
	1/2	.020	1	3	6	83918	HVTI-020-60500-R.020
	1/2	.020	1-1/4	3	6	83919	HVTI-025-60500-R.020
	1/2	.020	1-5/8	4	6	83920	HVTI-032-60500-R.020
	1/2	.020	2	4	6	83921	HVTI-040-60500-R.020
	1/2	.030	5/8	2-1/2	6	83922	HVTI-012-60500-R.030
	1/2	.030	1	3	6	82075	HVTI-020-60500-R.030
	1/2	.030	1-1/4	3	6	82076	HVTI-025-60500-R.030
	1/2	.030	1-5/8	4	6	82077	HVTI-032-60500-R.030
	1/2	.030	2	4	6	82078	HVTI-040-60500-R.030
	1/2	.030	2-1/2	5	6	83923	HVTI-050-60500-R.030
	1/2	.030	3-1/8	6	6	83924	HVTI-062-60500-R.030
	1/2	.060	5/8	2-1/2	6	83925	HVTI-012-60500-R.060
	1/2	.060	1	3	6	82079	HVTI-020-60500-R.060
1/2	.060	1-1/4	3	6	82080	HVTI-025-60500-R.060	
1/2	.060	1-5/8	4	6	82081	HVTI-032-60500-R.060	
1/2	.060	2	4	6	82082	HVTI-040-60500-R.060	

*.0005 max TIR

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6 FLUTE - CORNER RADIUS New Items!



HVTI-6

Variable Pitch - For High Efficiency Milling (cont.)

continued from previous page

Cutter Diameter* $D_1 \begin{smallmatrix} +.0001 \\ -.002 \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Corner Radius $R \begin{smallmatrix} +.002 \\ -.002 \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032 \\ -.000 \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062 \\ -.062 \end{smallmatrix}$	Flutes	Aplus Coated	Tool Description	
1/2	1/2	.090	5/8	2-1/2	6	87256	HVTI-012-60500-R.090	new
	1/2	.090	1	3	6	84981	HVTI-020-60500-R.090	
	1/2	.090	1-1/4	3	6	84982	HVTI-025-60500-R.090	
	1/2	.090	1-5/8	4	6	84983	HVTI-032-60500-R.090	
	1/2	.090	2	4	6	87257	HVTI-040-60500-R.090	new
	1/2	.120	5/8	2-1/2	6	84984	HVTI-012-60500-R.120	
	1/2	.120	1	3	6	82083	HVTI-020-60500-R.120	
	1/2	.120	1-1/4	3	6	82084	HVTI-025-60500-R.120	
	1/2	.120	1-5/8	4	6	82085	HVTI-032-60500-R.120	
1/2	.120	2	4	6	82086	HVTI-040-60500-R.120		
5/8	5/8	.030	1-1/4	3-1/2	6	83926	HVTI-020-60625-R.030	
	5/8	.030	1-5/8	3-1/2	6	83927	HVTI-026-60625-R.030	
	5/8	.030	2	4	6	83928	HVTI-032-60625-R.030	
	5/8	.030	2-1/2	5	6	83929	HVTI-040-60625-R.030	
	5/8	.060	1-1/4	3-1/2	6	83930	HVTI-020-60625-R.060	
	5/8	.060	1-5/8	3-1/2	6	83931	HVTI-026-60625-R.060	
	5/8	.060	2	4	6	83932	HVTI-032-60625-R.060	
	5/8	.060	2-1/2	5	6	83933	HVTI-040-60625-R.060	
	5/8	.120	1-1/4	3-1/2	6	83934	HVTI-020-60625-R.120	
	5/8	.120	1-5/8	3-1/2	6	83935	HVTI-026-60625-R.120	
	5/8	.120	2	4	6	83936	HVTI-032-60625-R.120	
5/8	.120	2-1/2	5	6	83937	HVTI-040-60625-R.120		
3/4	3/4	.030	1-1/4	4	6	87258	HVTI-016-60750-R.030	new
	3/4	.030	1-5/8	4	6	82087	HVTI-021-60750-R.030	
	3/4	.030	2-1/4	5	6	82088	HVTI-030-60750-R.030	
	3/4	.030	2-3/4	5	6	83938	HVTI-036-60750-R.030	
	3/4	.030	3-1/4	6	6	84985	HVTI-043-60750-R.030	
	3/4	.030	4	6-1/2	6	87259	HVTI-053-60750-R.030	new
	3/4	.060	1-1/4	4	6	87260	HVTI-016-60750-R.060	new
	3/4	.060	1-5/8	4	6	82089	HVTI-021-60750-R.060	
	3/4	.060	2-1/4	5	6	82090	HVTI-030-60750-R.060	
	3/4	.060	2-3/4	5	6	83939	HVTI-036-60750-R.060	
	3/4	.060	3-1/4	6	6	87261	HVTI-043-60750-R.060	new
	3/4	.090	1-1/4	4	6	87262	HVTI-016-60750-R.090	new
	3/4	.090	1-5/8	4	6	82091	HVTI-021-60750-R.090	
	3/4	.090	2-1/4	5	6	82092	HVTI-030-60750-R.090	
	3/4	.090	2-3/4	5	6	87263	HVTI-036-60750-R.090	new
	3/4	.090	3-1/4	6	6	87264	HVTI-043-60750-R.090	new
	3/4	.120	1-1/4	4	6	87265	HVTI-016-60750-R.120	new
	3/4	.120	1-5/8	4	6	82093	HVTI-021-60750-R.120	
	3/4	.120	2-1/4	5	6	82094	HVTI-030-60750-R.120	
3/4	.120	2-3/4	5	6	83940	HVTI-036-60750-R.120		
3/4	.120	3-1/4	6	6	87266	HVTI-043-60750-R.120	new	
1	1	.030	2	4-1/2	6	82095	HVTI-020-61000-R.030	
	1	.030	2-5/8	5	6	82096	HVTI-026-61000-R.030	
	1	.060	2	4-1/2	6	82097	HVTI-020-61000-R.060	
	1	.060	2-5/8	5	6	82098	HVTI-026-61000-R.060	
	1	.120	2	4-1/2	6	82099	HVTI-020-61000-R.120	
	1	.120	2-5/8	5	6	82100	HVTI-026-61000-R.120	

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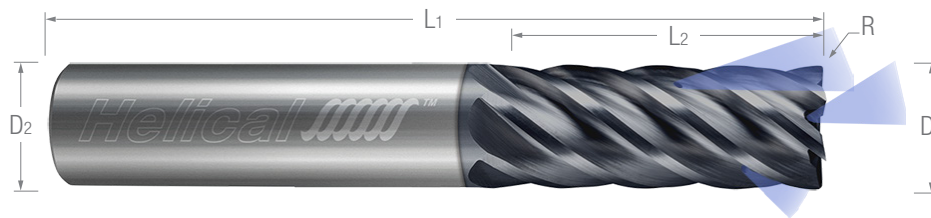
HVTIC-6



6 FLUTE - CORNER RADIUS

Coolant Through - Variable Pitch - For High Efficiency Milling

- Specially engineered for optimal performance in High Efficiency Milling (HEM) of Titanium 6Al4V and other titanium alloys
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Not for use in traditional slotting and roughing toolpaths
- Radial coolant holes for reduced heat, enhanced chip evacuation, and increased material removal rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Extensive testing has proven HVTI-6's excellence in extending tool life for HEM operations in Titanium

6 Flute

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D1^{+.000" / -.002"}$	$D2$ (h6)	$R^{+.002" / -.002"}$	$L2^{+.032" / -.000"}$	$L1^{+.062" / -.062"}$			
1/4	1/4	.030	1/2	2-1/2	6	84504	HVTIC-020-60250-R.030
	1/4	.030	3/4	2-1/2	6	84505	HVTIC-030-60250-R.030
3/8	3/8	.010	1/2	2	6	84506	HVTIC-013-60375-R.010
	3/8	.010	1	3	6	84507	HVTIC-026-60375-R.010
	3/8	.030	1/2	2	6	84508	HVTIC-013-60375-R.030
	3/8	.030	1	3	6	84509	HVTIC-026-60375-R.030
1/2	1/2	.030	1	3	6	84510	HVTIC-020-60500-R.030
	1/2	.030	1-1/4	3	6	84511	HVTIC-025-60500-R.030
	1/2	.030	1-5/8	4	6	84512	HVTIC-032-60500-R.030
	1/2	.060	1	3	6	84513	HVTIC-020-60500-R.060
	1/2	.060	1-1/4	3	6	84514	HVTIC-025-60500-R.060
	1/2	.060	1-5/8	4	6	84515	HVTIC-032-60500-R.060
3/4	3/4	.030	1-5/8	4	6	84516	HVTIC-021-60750-R.030
	3/4	.030	2-1/4	5	6	84517	HVTIC-030-60750-R.030
	3/4	.060	1-5/8	4	6	84518	HVTIC-021-60750-R.060
	3/4	.060	2-1/4	5	6	84519	HVTIC-030-60750-R.060

* .0005 max TIR



SPEEDS & FEEDS

6 Flute - For High Efficiency Milling



HVTI-6

HVTI-6 / HVTIC-6

	Hardness		1/8		3/16		1/4		3/8		1/2		3/4		1		
			HEM	Fin	HEM	Fin	HEM	Fin	HEM	Fin	HEM	Fin	HEM	Fin	HEM	Fin	
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0019	.0014	.0029	.0017	.0038	.0020	.0058	.0023	.0079	.0027	.0118	.0032	.0159	.0039
		75 - 98 HRB	250	.0016	.0012	.0024	.0015	.0032	.0018	.0049	.0021	.0066	.0025	.0099	.0029	.0134	.0036
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0010	.0010	.0014	.0012	.0019	.0014	.0029	.0016	.0041	.0019	.0060	.0023	.0081	.0028
		21 - 36 HRC	75	.0010	.0010	.0014	.0012	.0019	.0014	.0028	.0016	.0039	.0019	.0058	.0022	.0077	.0027
		36 - 50 HRC	70	.0008	.0009	.0012	.0011	.0016	.0013	.0024	.0015	.0034	.0017	.0049	.0021	.0066	.0025
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0026	.0015	.0039	.0019	.0052	.0023	.0079	.0027	.0110	.0032	.0164	.0038	.0220	.0046
		75 - 98 HRB	275	.0022	.0013	.0033	.0017	.0044	.0021	.0066	.0025	.0091	.0029	.0137	.0034	.0183	.0042
		21 - 36 HRC	250	.0017	.0015	.0025	.0017	.0033	.0019	.0050	.0021	.0069	.0025	.0102	.0030	.0137	.0036
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0014	.0010	.0020	.0013	.0027	.0016	.0041	.0019	.0054	.0022	.0081	.0026	.0108	.0032
		36 - 50 HRC	160	.0012	.0012	.0018	.0014	.0024	.0016	.0036	.0018	.0049	.0021	.0074	.0025	.0099	.0030
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0011	.0011	.0017	.0013	.0022	.0015	.0034	.0017	.0046	.0020	.0069	.0024	.0092	.0029
		21 - 36 HRC	170	.0011	.0011	.0016	.0013	.0021	.0015	.0032	.0017	.0044	.0020	.0067	.0024	.0088	.0029
		36 - 50 HRC	65	.0007	.0008	.0011	.0010	.0014	.0012	.0023	.0014	.0030	.0016	.0046	.0019	.0060	.0024

MILLING PROCESS	ADOC	RDOC
HEM (High Efficiency Milling)	Up to Max LOC	Up to 10% Diameter
Fin (Finishing)	Up to Max LOC	4%-6% Diameter

NOTES:

IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

High Efficiency Milling for Titanium Made Easy with Helical's HVTI Cutter

Titanium is a notoriously difficult material to machine, especially in aggressive toolpaths, such as those associated with High Efficiency Milling (HEM). Helical's HVTI-6 tool, is optimized for Titanium 6Al4V and other titanium alloys, and is engineered to achieve exceptional performance in HEM operations. Learn more about this unique tool by reading our "In the Loupe" blog post *High Efficiency Milling for Titanium Made Easy With Helical's HVTI Cutter*.

www.harveyprecision.com/in-the-loupe/hem-titanium-helical-hvti/



SCAN TO READ

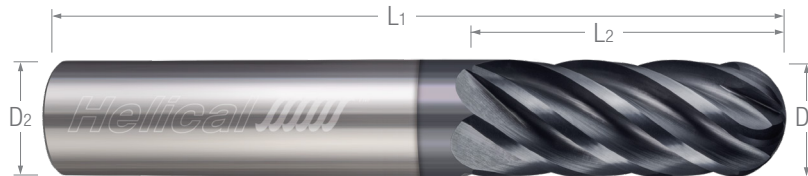
HEV-6



6 FLUTE - BALL

Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 ^{+0.000"} -0.002"	Shank Diameter D2 (h6)	Length of Cut L2 ^{+0.032"} -0.000"	Overall Length L1 ^{+0.062"} -0.062"	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	1/4	1-1/2	6	84406	HEV-S-60125-BN
	1/8	3/8	2	6	84407	HEV-SR-60125-BN
	1/8	1/2	2-1/2	6	84408	HEV-R-60125-BN
	1/8	5/8	2-1/2	6	84409	HEV-A-60125-BN
3/16	3/16	5/16	2	6	84410	HEV-S-60187-BN
	3/16	7/16	2	6	84411	HEV-SR-60187-BN
	3/16	9/16	2-1/2	6	84412	HEV-R-60187-BN
	3/16	3/4	2-1/2	6	84413	HEV-M-60187-BN
1/4	1/4	3/8	2	6	59434	HEV-S-60250-BN
	1/4	1/2	2-1/2	6	59435	HEV-SR-60250-BN
	1/4	3/4	2-1/2	6	59436	HEV-R-60250-BN
	1/4	1	3	6	59437	HEV-M-60250-BN
	1/4	1-1/4	3	6	59438	HEV-L-60250-BN
	1/4	1-1/2	3	6	83361	HEV-LX-60250-BN
5/16	5/16	7/16	2	6	59439	HEV-S-60312-BN
	5/16	3/4	2-1/2	6	59440	HEV-R-60312-BN
	5/16	1	3	6	59441	HEV-M-60312-BN
3/8	3/8	1/2	2	6	59442	HEV-S-60375-BN
	3/8	3/4	2-1/2	6	82592	HEV-SR-60375-BN
	3/8	1	3	6	59443	HEV-R-60375-BN
	3/8	1-1/4	3	6	59444	HEV-M-60375-BN
	3/8	1-1/2	3-1/2	6	59445	HEV-L-60375-BN
1/2	3/8	2	4	6	83362	HEV-LX-60375-BN
	1/2	5/8	2-1/2	6	59446	HEV-S-60500-BN
	1/2	1	3	6	59447	HEV-SR-60500-BN
	1/2	1-1/4	3	6	59448	HEV-R-60500-BN
	1/2	1-5/8	4	6	59449	HEV-M-60500-BN
	1/2	2	4	6	59450	HEV-L-60500-BN
5/8	1/2	2-1/2	5	6	82593	HEV-LX-60500-BN
	5/8	3/4	3	6	59451	HEV-S-60625-BN
	5/8	1-1/4	3-1/2	6	59452	HEV-SR-60625-BN
3/4	5/8	1-5/8	3-1/2	6	59453	HEV-R-60625-BN
	3/4	1	3	6	59454	HEV-S-60750-BN
	3/4	1-5/8	4	6	59455	HEV-R-60750-BN
	3/4	2-1/4	5	6	59456	HEV-M-60750-BN
1	3/4	2-3/4	5	6	83363	HEV-L-60750-BN
	1	2	4-1/2	6	59457	HEV-R-61000-BN
	1	2-5/8	5	6	82594	HEV-M-61000-BN

* .0005 max TIR



Speeds & Feeds on Page 152

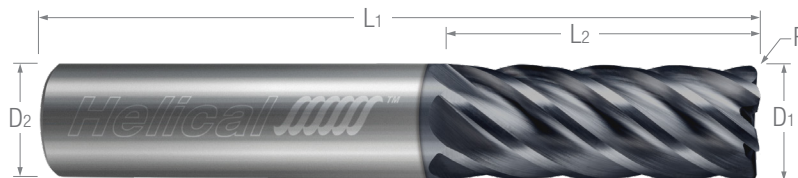
6 FLUTE - CORNER RADIUS New Items!



HEV-6

Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



6 Flute

Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	6	84390	HEV-S-60125-R.010
	1/8	.010	3/8	2	6	84391	HEV-SR-60125-R.010
	1/8	.010	1/2	2-1/2	6	84392	HEV-R-60125-R.010
	1/8	.010	5/8	2-1/2	6	84393	HEV-A-60125-R.010
	1/8	.030	1/4	1-1/2	6	84394	HEV-S-60125-R.030
	1/8	.030	3/8	2	6	84395	HEV-SR-60125-R.030
	1/8	.030	1/2	2-1/2	6	84396	HEV-R-60125-R.030
	1/8	.030	5/8	2-1/2	6	84397	HEV-A-60125-R.030
3/16	3/16	.010	5/16	2	6	84398	HEV-S-60187-R.010
	3/16	.010	7/16	2	6	84399	HEV-SR-60187-R.010
	3/16	.010	9/16	2-1/2	6	84400	HEV-R-60187-R.010
	3/16	.010	3/4	2-1/2	6	84401	HEV-M-60187-R.010
	3/16	.030	5/16	2	6	84402	HEV-S-60187-R.030
	3/16	.030	7/16	2	6	84403	HEV-SR-60187-R.030
	3/16	.030	9/16	2-1/2	6	84404	HEV-R-60187-R.030
	3/16	.030	3/4	2-1/2	6	84405	HEV-M-60187-R.030
1/4	1/4	.010	3/8	2	6	84995	HEV-S-60250-R.010
	1/4	.010	1/2	2-1/2	6	84996	HEV-SR-60250-R.010
	1/4	.010	3/4	2-1/2	6	84997	HEV-R-60250-R.010
	1/4	.010	1	3	6	87550	HEV-M-60250-R.010 new
	1/4	.010	1-1/4	3	6	87551	HEV-L-60250-R.010 new
	1/4	.010	1-1/2	3	6	87552	HEV-LX-60250-R.010 new
	1/4	.020	3/8	2	6	59280	HEV-S-60250-R.020
	1/4	.020	1/2	2-1/2	6	59283	HEV-SR-60250-R.020
	1/4	.020	3/4	2-1/2	6	59286	HEV-R-60250-R.020
	1/4	.020	1	3	6	59289	HEV-M-60250-R.020
	1/4	.020	1-1/4	3	6	59292	HEV-L-60250-R.020
	1/4	.020	1-1/2	3	6	82569	HEV-LX-60250-R.020
	1/4	.030	3/8	2	6	59281	HEV-S-60250-R.030
	1/4	.030	1/2	2-1/2	6	59284	HEV-SR-60250-R.030
	1/4	.030	3/4	2-1/2	6	59287	HEV-R-60250-R.030
	1/4	.030	1	3	6	59290	HEV-M-60250-R.030
1/4	.030	1-1/4	3	6	59293	HEV-L-60250-R.030	
1/4	.030	1-1/2	3	6	87553	HEV-LX-60250-R.030 new	

*.0005 max TIR

continued on next page



HEV-6



New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Aplus Coated	Tool Description
1/4	1/4	.060	3/8	2	6	59282	HEV-S-60250-R.060
	1/4	.060	1/2	2-1/2	6	59285	HEV-SR-60250-R.060
	1/4	.060	3/4	2-1/2	6	59288	HEV-R-60250-R.060
	1/4	.060	1	3	6	59291	HEV-M-60250-R.060
	1/4	.060	1-1/4	3	6	59294	HEV-L-60250-R.060
	1/4	.060	1-1/2	3	6	82570	HEV-LX-60250-R.060
5/16	5/16	.010	7/16	2	6	87554	HEV-S-60312-R.010
	5/16	.010	3/4	2-1/2	6	87555	HEV-R-60312-R.010
	5/16	.010	1	3	6	87556	HEV-M-60312-R.010
	5/16	.020	7/16	2	6	59295	HEV-S-60312-R.020
	5/16	.020	3/4	2-1/2	6	59298	HEV-R-60312-R.020
	5/16	.020	1	3	6	59301	HEV-M-60312-R.020
	5/16	.030	7/16	2	6	59296	HEV-S-60312-R.030
	5/16	.030	3/4	2-1/2	6	59299	HEV-R-60312-R.030
	5/16	.030	1	3	6	59302	HEV-M-60312-R.030
	5/16	.060	7/16	2	6	59297	HEV-S-60312-R.060
5/16	.060	3/4	2-1/2	6	59300	HEV-R-60312-R.060	
5/16	.060	1	3	6	59303	HEV-M-60312-R.060	
3/8	3/8	.010	1/2	2	6	84998	HEV-S-60375-R.010
	3/8	.010	3/4	2-1/2	6	84999	HEV-SR-60375-R.010
	3/8	.010	1	3	6	86000	HEV-R-60375-R.010
	3/8	.010	1-1/4	3	6	86001	HEV-M-60375-R.010
	3/8	.010	1-1/2	3-1/2	6	87557	HEV-L-60375-R.010
	3/8	.010	2	4	6	87558	HEV-LX-60375-R.010
	3/8	.020	1/2	2	6	59304	HEV-S-60375-R.020
	3/8	.020	3/4	2-1/2	6	82571	HEV-SR-60375-R.020
	3/8	.020	1	3	6	59308	HEV-R-60375-R.020
	3/8	.020	1-1/4	3	6	59312	HEV-M-60375-R.020
	3/8	.020	1-1/2	3-1/2	6	59316	HEV-L-60375-R.020
	3/8	.020	2	4	6	83318	HEV-LX-60375-R.020
	3/8	.030	1/2	2	6	59305	HEV-S-60375-R.030
	3/8	.030	3/4	2-1/2	6	82572	HEV-SR-60375-R.030
	3/8	.030	1	3	6	59309	HEV-R-60375-R.030
	3/8	.030	1-1/4	3	6	59313	HEV-M-60375-R.030
	3/8	.030	1-1/2	3-1/2	6	59317	HEV-L-60375-R.030
	3/8	.030	2	4	6	82573	HEV-LX-60375-R.030
	3/8	.060	1/2	2	6	59306	HEV-S-60375-R.060
	3/8	.060	3/4	2-1/2	6	82574	HEV-SR-60375-R.060
	3/8	.060	1	3	6	59310	HEV-R-60375-R.060
	3/8	.060	1-1/4	3	6	59314	HEV-M-60375-R.060
	3/8	.060	1-1/2	3-1/2	6	59318	HEV-L-60375-R.060
	3/8	.060	2	4	6	82575	HEV-LX-60375-R.060
3/8	.090	1/2	2	6	59307	HEV-S-60375-R.090	
3/8	.090	3/4	2-1/2	6	82576	HEV-SR-60375-R.090	
3/8	.090	1	3	6	59311	HEV-R-60375-R.090	
3/8	.090	1-1/4	3	6	59315	HEV-M-60375-R.090	
3/8	.090	1-1/2	3-1/2	6	59319	HEV-L-60375-R.090	
3/8	.090	2	4	6	82577	HEV-LX-60375-R.090	

*.0005 max TIR

continued on next page

6 FLUTE - CORNER RADIUS

New Items!



HEV-6

Variable Pitch (cont.)

continued from previous page

Cutter Diameter* D1 ^{+0.000"} _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} _{-.002"}	Length of Cut L2 ^{+0.032"} _{-.000"}	Overall Length L1 ^{+0.062"} _{-.062"}	Flutes	Aplus Coated	Tool Description	
3/8	3/8	.125	1/2	2	6	87559	HEV-S-60375-R.125	new
	3/8	.125	3/4	2-1/2	6	87560	HEV-SR-60375-R.125	new
	3/8	.125	1	3	6	87561	HEV-R-60375-R.125	new
	3/8	.125	1-1/4	3	6	87562	HEV-M-60375-R.125	new
1/2	1/2	.010	5/8	2-1/2	6	83319	HEV-S-60500-R.010	
	1/2	.010	1	3	6	82578	HEV-SR-60500-R.010	
	1/2	.010	1-1/4	3	6	82579	HEV-R-60500-R.010	
	1/2	.010	1-5/8	4	6	86002	HEV-M-60500-R.010	
	1/2	.010	2	4	6	87563	HEV-L-60500-R.010	new
	1/2	.010	2-1/2	5	6	87564	HEV-LX-60500-R.010	new
	1/2	.015	5/8	2-1/2	6	83320	HEV-S-60500-R.015	
	1/2	.015	1	3	6	82580	HEV-SR-60500-R.015	
	1/2	.015	1-1/4	3	6	82581	HEV-R-60500-R.015	
	1/2	.015	1-5/8	4	6	86003	HEV-M-60500-R.015	
	1/2	.015	2	4	6	87565	HEV-L-60500-R.015	new
	1/2	.015	2-1/2	5	6	87566	HEV-LX-60500-R.015	new
	1/2	.020	5/8	2-1/2	6	87567	HEV-S-60500-R.020	new
	1/2	.020	1	3	6	82582	HEV-SR-60500-R.020	
	1/2	.020	1-1/4	3	6	82583	HEV-R-60500-R.020	
	1/2	.020	2	4	6	87568	HEV-L-60500-R.020	new
	1/2	.020	2-1/2	5	6	87569	HEV-LX-60500-R.020	new
	1/2	.030	5/8	2-1/2	6	59320	HEV-S-60500-R.030	
	1/2	.030	1	3	6	59324	HEV-SR-60500-R.030	
	1/2	.030	1-1/4	3	6	59328	HEV-R-60500-R.030	
	1/2	.030	1-5/8	4	6	59332	HEV-M-60500-R.030	
	1/2	.030	2	4	6	59336	HEV-L-60500-R.030	
	1/2	.030	2-1/2	5	6	82584	HEV-LX-60500-R.030	
	1/2	.030	3-1/8	6	6	86004	HEV-X-60500-R.030	
	1/2	.060	5/8	2-1/2	6	59321	HEV-S-60500-R.060	
	1/2	.060	1	3	6	59325	HEV-SR-60500-R.060	
	1/2	.060	1-1/4	3	6	59329	HEV-R-60500-R.060	
	1/2	.060	1-5/8	4	6	59333	HEV-M-60500-R.060	
	1/2	.060	2	4	6	59337	HEV-L-60500-R.060	
	1/2	.060	2-1/2	5	6	82585	HEV-LX-60500-R.060	
	1/2	.090	5/8	2-1/2	6	59322	HEV-S-60500-R.090	
	1/2	.090	1	3	6	59326	HEV-SR-60500-R.090	
	1/2	.090	1-1/4	3	6	59330	HEV-R-60500-R.090	
	1/2	.090	1-5/8	4	6	59334	HEV-M-60500-R.090	
	1/2	.090	2	4	6	59338	HEV-L-60500-R.090	
	1/2	.090	2-1/2	5	6	82586	HEV-LX-60500-R.090	
	1/2	.120	5/8	2-1/2	6	87570	HEV-S-60500-R.120	new
	1/2	.120	1	3	6	87571	HEV-SR-60500-R.120	new
	1/2	.120	1-1/4	3	6	87572	HEV-R-60500-R.120	new
	1/2	.120	1-5/8	4	6	87573	HEV-M-60500-R.120	new
1/2	.125	5/8	2-1/2	6	59323	HEV-S-60500-R.125		
1/2	.125	1	3	6	59327	HEV-SR-60500-R.125		
1/2	.125	1-1/4	3	6	59331	HEV-R-60500-R.125		
1/2	.125	1-5/8	4	6	59335	HEV-M-60500-R.125		
1/2	.125	2	4	6	59339	HEV-L-60500-R.125		
1/2	.125	2-1/2	5	6	83321	HEV-LX-60500-R.125		

*.0005 max TIR

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6 Flute

HEV-6



New Items!

6 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description	
$D_1^{+.000^*}_{-.002^*}$	$D_2 (h6)$	$R^{+.002^*}_{-.002^*}$	$L_2^{+.032^*}_{-.000^*}$	$L_1^{+.062^*}_{-.062^*}$				
new	5/8	5/8	.030	3/4	3	6	59340	HEV-S-60625-R.030
		5/8	.030	1-1/4	3-1/2	6	59341	HEV-SR-60625-R.030
		5/8	.030	1-5/8	3-1/2	6	59345	HEV-R-60625-R.030
		5/8	.030	2	4	6	59349	HEV-M-60625-R.030
		5/8	.030	2-1/2	5	6	59353	HEV-L-60625-R.030
		5/8	.060	3/4	3	6	87574	HEV-S-60625-R.060
		5/8	.060	1-1/4	3-1/2	6	59342	HEV-SR-60625-R.060
		5/8	.060	1-5/8	3-1/2	6	59346	HEV-R-60625-R.060
		5/8	.060	2	4	6	59350	HEV-M-60625-R.060
		5/8	.060	2-1/2	5	6	87575	HEV-L-60625-R.060
		5/8	.090	1-1/4	3-1/2	6	59343	HEV-SR-60625-R.090
		5/8	.090	1-5/8	3-1/2	6	59347	HEV-R-60625-R.090
		5/8	.090	2	4	6	59351	HEV-M-60625-R.090
		5/8	.125	3/4	3	6	87576	HEV-S-60625-R.125
		5/8	.125	1-1/4	3-1/2	6	59344	HEV-SR-60625-R.125
		5/8	.125	1-5/8	3-1/2	6	59348	HEV-R-60625-R.125
5/8	.125	2	4	6	59352	HEV-M-60625-R.125		
5/8	.125	2-1/2	5	6	86005	HEV-L-60625-R.125		
new new new	3/4	3/4	.030	1	3	6	59354	HEV-S-60750-R.030
		3/4	.030	1-5/8	4	6	59360	HEV-R-60750-R.030
		3/4	.030	2-1/4	5	6	59366	HEV-M-60750-R.030
		3/4	.030	2-3/4	5	6	59372	HEV-L-60750-R.030
		3/4	.030	3-1/4	6	6	59378	HEV-LX-60750-R.030
		3/4	.030	4	6-1/2	6	86006	HEV-X-60750-R.030
		3/4	.060	1	3	6	59355	HEV-S-60750-R.060
		3/4	.060	1-5/8	4	6	59361	HEV-R-60750-R.060
		3/4	.060	2-1/4	5	6	59367	HEV-M-60750-R.060
		3/4	.060	2-3/4	5	6	59373	HEV-L-60750-R.060
		3/4	.060	3-1/4	6	6	83322	HEV-LX-60750-R.060
		3/4	.090	1	3	6	59356	HEV-S-60750-R.090
		3/4	.090	1-5/8	4	6	59362	HEV-R-60750-R.090
		3/4	.090	2-1/4	5	6	59368	HEV-M-60750-R.090
		3/4	.090	2-3/4	5	6	59374	HEV-L-60750-R.090
		3/4	.120	1	3	6	87577	HEV-S-60750-R.120
		3/4	.120	1-5/8	4	6	87578	HEV-R-60750-R.120
		3/4	.120	2-1/4	5	6	87579	HEV-M-60750-R.120
		3/4	.125	1	3	6	59357	HEV-S-60750-R.125
		3/4	.125	1-5/8	4	6	59363	HEV-R-60750-R.125
		3/4	.125	2-1/4	5	6	59369	HEV-M-60750-R.125
		3/4	.125	2-3/4	5	6	59375	HEV-L-60750-R.125
		3/4	.190	1	3	6	59358	HEV-S-60750-R.190
		3/4	.190	1-5/8	4	6	59364	HEV-R-60750-R.190
		3/4	.190	2-1/4	5	6	59370	HEV-M-60750-R.190
		3/4	.190	2-3/4	5	6	59376	HEV-L-60750-R.190
		3/4	.250	1	3	6	59359	HEV-S-60750-R.250
		3/4	.250	1-5/8	4	6	59365	HEV-R-60750-R.250
		3/4	.250	2-1/4	5	6	59371	HEV-M-60750-R.250
		3/4	.250	2-3/4	5	6	59377	HEV-L-60750-R.250
		3/4	.250	3-1/4	6	6	83323	HEV-LX-60750-R.250

*.0005 max TIR

continued on next page

6 FLUTE - CORNER RADIUS New Items!



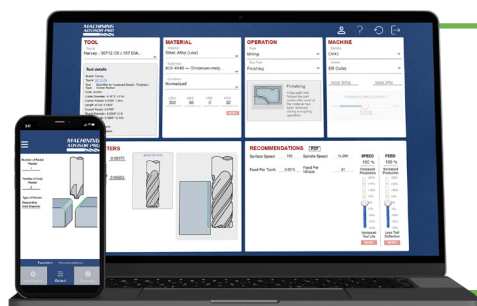
HEV-6

Variable Pitch (cont.)

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Cutter Diameter* $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Corner Radius $R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Aplus Coated	Tool Description
1	1	.030	2	4-1/2	6	59379	HEV-R-61000-R.030
	1	.030	2-5/8	5	6	59383	HEV-M-61000-R.030
	1	.030	3-1/4	6	6	59387	HEV-L-61000-R.030
	1	.060	2	4-1/2	6	59380	HEV-R-61000-R.060
	1	.060	2-5/8	5	6	59384	HEV-M-61000-R.060
	1	.060	3-1/4	6	6	59388	HEV-L-61000-R.060
	1	.125	2	4-1/2	6	59381	HEV-R-61000-R.125
	1	.125	2-5/8	5	6	59385	HEV-M-61000-R.125
	1	.125	3-1/4	6	6	59389	HEV-L-61000-R.125
	1	.250	2	4-1/2	6	59382	HEV-R-61000-R.250
	1	.250	2-5/8	5	6	59386	HEV-M-61000-R.250
	1	.250	3-1/4	6	6	59390	HEV-L-61000-R.250

*.0005 max TIR



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MHEV-6

METRIC

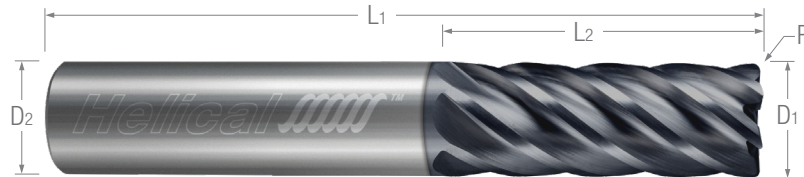


6 FLUTE - CORNER RADIUS - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- 6 flute variable pitch design for reduced harmonics and increased feed rates

- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 $\begin{smallmatrix} +.00 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	Shank Diameter D2 (h6)	Corner Radius R $\begin{smallmatrix} +.05 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	Length of Cut L2 $\begin{smallmatrix} +.80 \text{ mm} \\ -.00 \text{ mm} \end{smallmatrix}$	Overall Length L1 $\begin{smallmatrix} +1.6 \text{ mm} \\ -1.6 \text{ mm} \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	6	59575	MHEV-015-60600-R0.50
	6.00 mm	.50 mm	12.00 mm	63 mm	6	59593	MHEV-020-60600-R0.50
	6.00 mm	.50 mm	18.00 mm	63 mm	6	59627	MHEV-030-60600-R0.50
	6.00 mm	1.00 mm	9.00 mm	63 mm	6	59576	MHEV-015-60600-R1.00
	6.00 mm	1.00 mm	12.00 mm	63 mm	6	59594	MHEV-020-60600-R1.00
	6.00 mm	1.00 mm	18.00 mm	63 mm	6	59628	MHEV-030-60600-R1.00
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	6	59578	MHEV-015-60800-R0.50
	8.00 mm	.50 mm	16.00 mm	63 mm	6	59596	MHEV-020-60800-R0.50
	8.00 mm	.50 mm	24.00 mm	75 mm	6	59630	MHEV-030-60800-R0.50
	8.00 mm	1.00 mm	12.00 mm	63 mm	6	59579	MHEV-015-60800-R1.00
	8.00 mm	1.00 mm	16.00 mm	63 mm	6	59597	MHEV-020-60800-R1.00
	8.00 mm	1.00 mm	24.00 mm	75 mm	6	59631	MHEV-030-60800-R1.00
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	6	59581	MHEV-015-61000-R0.50
	10.00 mm	.50 mm	20.00 mm	63 mm	6	59599	MHEV-020-61000-R0.50
	10.00 mm	.50 mm	25.00 mm	75 mm	6	59613	MHEV-025-61000-R0.50
	10.00 mm	1.00 mm	15.00 mm	63 mm	6	59582	MHEV-015-61000-R1.00
	10.00 mm	1.00 mm	20.00 mm	63 mm	6	59600	MHEV-020-61000-R1.00
	10.00 mm	1.00 mm	25.00 mm	75 mm	6	59614	MHEV-025-61000-R1.00
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	6	59584	MHEV-015-61200-R0.50
	12.00 mm	.50 mm	24.00 mm	75 mm	6	59602	MHEV-020-61200-R0.50
	12.00 mm	.50 mm	30.00 mm	75 mm	6	59616	MHEV-025-61200-R0.50
	12.00 mm	1.00 mm	18.00 mm	75 mm	6	59585	MHEV-015-61200-R1.00
	12.00 mm	1.00 mm	24.00 mm	75 mm	6	59603	MHEV-020-61200-R1.00
	12.00 mm	1.00 mm	30.00 mm	75 mm	6	59617	MHEV-025-61200-R1.00
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	6	59587	MHEV-015-61600-R0.50
	16.00 mm	.50 mm	32.00 mm	89 mm	6	59605	MHEV-020-61600-R0.50
	16.00 mm	.50 mm	40.00 mm	89 mm	6	59619	MHEV-025-61600-R0.50
	16.00 mm	1.00 mm	24.00 mm	89 mm	6	59588	MHEV-015-61600-R1.00
	16.00 mm	1.00 mm	32.00 mm	89 mm	6	59606	MHEV-020-61600-R1.00
	16.00 mm	1.00 mm	40.00 mm	89 mm	6	59620	MHEV-025-61600-R1.00
20 mm	20.00 mm	.50 mm	30.00 mm	89 mm	6	59590	MHEV-015-62000-R0.50
	20.00 mm	.50 mm	40.00 mm	100 mm	6	59608	MHEV-020-62000-R0.50
	20.00 mm	.50 mm	50.00 mm	125 mm	6	59622	MHEV-025-62000-R0.50
	20.00 mm	1.00 mm	30.00 mm	89 mm	6	59591	MHEV-015-62000-R1.00
	20.00 mm	1.00 mm	40.00 mm	100 mm	6	59609	MHEV-020-62000-R1.00
	20.00 mm	1.00 mm	50.00 mm	125 mm	6	59623	MHEV-025-62000-R1.00
25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	6	59611	MHEV-020-62500-R1.00
	25.00 mm	1.00 mm	64.00 mm	125 mm	6	59625	MHEV-025-62500-R1.00

* .013 mm max TIR



Speeds & Feeds on Page 152

7 FLUTE - CORNER RADIUS

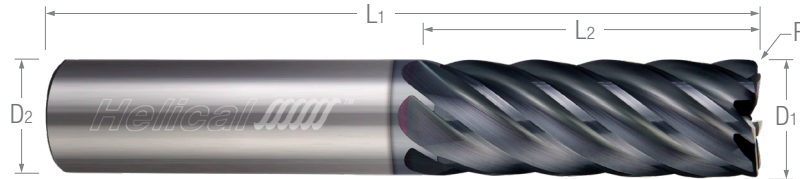
New Items!



HEV-7

Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* D1 ^{+0.000"} / _{-.002"}	Shank Diameter D2 (h6)	Corner Radius R ^{+0.002"} / _{-.002"}	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	<i>Aplus</i> Coated	Tool Description
1/8	1/8	.010	1/4	1-1/2	7	84422	HEV-S-70125-R.010
	1/8	.010	3/8	2	7	84423	HEV-SR-70125-R.010
	1/8	.010	1/2	2-1/2	7	84424	HEV-R-70125-R.010
	1/8	.010	5/8	2-1/2	7	84425	HEV-A-70125-R.010
	1/8	.030	1/4	1-1/2	7	84426	HEV-S-70125-R.030
	1/8	.030	3/8	2	7	84427	HEV-SR-70125-R.030
	1/8	.030	1/2	2-1/2	7	84428	HEV-R-70125-R.030
	1/8	.030	5/8	2-1/2	7	84429	HEV-A-70125-R.030
3/16	3/16	.010	5/16	2	7	84430	HEV-S-70187-R.010
	3/16	.010	7/16	2	7	84431	HEV-SR-70187-R.010
	3/16	.010	9/16	2-1/2	7	84432	HEV-R-70187-R.010
	3/16	.010	3/4	2-1/2	7	84433	HEV-M-70187-R.010
	3/16	.030	5/16	2	7	84434	HEV-S-70187-R.030
	3/16	.030	7/16	2	7	84435	HEV-SR-70187-R.030
	3/16	.030	9/16	2-1/2	7	84436	HEV-R-70187-R.030
	3/16	.030	3/4	2-1/2	7	84437	HEV-M-70187-R.030
1/4	1/4	.010	3/8	2	7	83376	HEV-S-70250-R.010
	1/4	.010	1/2	2	7	83377	HEV-SR-70250-R.010
	1/4	.010	3/4	2-1/2	7	83378	HEV-R-70250-R.010
	1/4	.010	1	3	7	83379	HEV-M-70250-R.010
	1/4	.010	1-1/4	3	7	86040	HEV-L-70250-R.010
	1/4	.020	3/8	2	7	27107	HEV-S-70250-R.020
	1/4	.020	1/2	2	7	27122	HEV-SR-70250-R.020
	1/4	.020	3/4	2-1/2	7	27137	HEV-R-70250-R.020
	1/4	.020	1	3	7	27152	HEV-M-70250-R.020
	1/4	.020	1-1/4	3	7	82655	HEV-L-70250-R.020
	1/4	.020	1-1/2	3	7	86041	HEV-LX-70250-R.020
	1/4	.030	3/8	2	7	87106	HEV-S-70250-R.030
	1/4	.030	1/2	2	7	87107	HEV-SR-70250-R.030
	1/4	.030	3/4	2-1/2	7	87108	HEV-R-70250-R.030
	1/4	.030	1	3	7	87109	HEV-M-70250-R.030
	1/4	.030	1-1/4	3	7	87110	HEV-L-70250-R.030
	1/4	.060	3/8	2	7	81807	HEV-S-70250-R.060
	1/4	.060	1/2	2	7	81808	HEV-SR-70250-R.060
	1/4	.060	3/4	2-1/2	7	81809	HEV-R-70250-R.060
	1/4	.060	1	3	7	81810	HEV-M-70250-R.060
1/4	.060	1-1/4	3	7	87111	HEV-L-70250-R.060	

new
new
new
new
new
new

*.0005 max TIR

continued on next page



HEV-7



New Items!

7 FLUTE - CORNER RADIUS

Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$D_2 (h6)$	$R \begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	$L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$			
3/8	3/8	.010	1/2	2	7	83380	HEV-S-70375-R.010
	3/8	.010	3/4	2-1/2	7	83381	HEV-SR-70375-R.010
	3/8	.010	1	2-1/2	7	83382	HEV-R-70375-R.010
	3/8	.010	1-1/4	3	7	86042	HEV-M-70375-R.010
	3/8	.010	1-1/2	3-1/2	7	83383	HEV-L-70375-R.010
	3/8	.020	1/2	2	7	27212	HEV-S-70375-R.020
	3/8	.020	3/4	2-1/2	7	27227	HEV-SR-70375-R.020
	3/8	.020	1	2-1/2	7	27242	HEV-R-70375-R.020
	3/8	.020	1-1/4	3	7	87112	HEV-M-70375-R.020
	3/8	.020	1-1/2	3-1/2	7	27247	HEV-L-70375-R.020
	3/8	.020	2	4	7	82656	HEV-LX-70375-R.020
	3/8	.030	1/2	2	7	87113	HEV-S-70375-R.030
	3/8	.030	3/4	2-1/2	7	87114	HEV-SR-70375-R.030
	3/8	.030	1	2-1/2	7	87115	HEV-R-70375-R.030
	3/8	.030	1-1/4	3	7	87116	HEV-M-70375-R.030
	3/8	.030	1-1/2	3-1/2	7	87117	HEV-L-70375-R.030
	3/8	.060	1/2	2	7	81811	HEV-S-70375-R.060
	3/8	.060	3/4	2-1/2	7	81812	HEV-SR-70375-R.060
	3/8	.060	1	2-1/2	7	81813	HEV-R-70375-R.060
	3/8	.060	1-1/4	3	7	87118	HEV-M-70375-R.060
3/8	.060	1-1/2	3-1/2	7	87119	HEV-L-70375-R.060	
3/8	.125	1/2	2	7	87120	HEV-S-70375-R.125	
3/8	.125	3/4	2-1/2	7	87121	HEV-SR-70375-R.125	
3/8	.125	1	2-1/2	7	87122	HEV-R-70375-R.125	
3/8	.125	1-1/4	3	7	87123	HEV-M-70375-R.125	
3/8	.125	1-1/2	3-1/2	7	87124	HEV-L-70375-R.125	
1/2	1/2	.010	5/8	2-1/2	7	83384	HEV-S-70500-R.010
	1/2	.010	1	3	7	83385	HEV-SR-70500-R.010
	1/2	.010	1-1/4	3	7	83386	HEV-R-70500-R.010
	1/2	.010	1-5/8	4	7	83387	HEV-M-70500-R.010
	1/2	.010	2	4	7	83388	HEV-L-70500-R.010
	1/2	.010	2-1/2	5	7	87125	HEV-LX-70500-R.010
	1/2	.020	5/8	2-1/2	7	81814	HEV-S-70500-R.020
	1/2	.020	1	3	7	81815	HEV-SR-70500-R.020
	1/2	.020	1-1/4	3	7	81816	HEV-R-70500-R.020
	1/2	.020	1-5/8	4	7	81817	HEV-M-70500-R.020
	1/2	.020	2	4	7	81818	HEV-L-70500-R.020
	1/2	.020	2-1/2	5	7	87126	HEV-LX-70500-R.020
	1/2	.030	5/8	2-1/2	7	27257	HEV-S-70500-R.030
	1/2	.030	1	3	7	27272	HEV-SR-70500-R.030
	1/2	.030	1-1/4	3	7	27287	HEV-R-70500-R.030
	1/2	.030	1-5/8	4	7	27302	HEV-M-70500-R.030
	1/2	.030	2	4	7	27307	HEV-L-70500-R.030
	1/2	.030	2-1/2	5	7	82657	HEV-LX-70500-R.030
1/2	.030	3-1/8	6	7	82658	HEV-X-70500-R.030	

*.0005 max TIR

continued on next page

7 FLUTE - CORNER RADIUS

New Items!



HEV-7

Variable Pitch (cont.)

continued from previous page

Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	Aplus Coated	Tool Description
$D_1^{+.000"}$ $-.002"$	$D_2(h6)$	$R^{+.002"}$ $-.002"$	$L_2^{+.032"}$ $-.000"$	$L_1^{+.062"}$ $-.062"$			
1/2	1/2	.060	5/8	2-1/2	7	81819	HEV-S-70500-R.060
	1/2	.060	1	3	7	81820	HEV-SR-70500-R.060
	1/2	.060	1-1/4	3	7	81821	HEV-R-70500-R.060
	1/2	.060	1-5/8	4	7	81822	HEV-M-70500-R.060
	1/2	.060	2	4	7	81823	HEV-L-70500-R.060
	1/2	.060	2-1/2	5	7	87127	HEV-LX-70500-R.060
	1/2	.125	5/8	2-1/2	7	87128	HEV-S-70500-R.125
	1/2	.125	1	3	7	87129	HEV-SR-70500-R.125
	1/2	.125	1-1/4	3	7	87130	HEV-R-70500-R.125
	1/2	.125	1-5/8	4	7	87131	HEV-M-70500-R.125
1/2	.125	2	4	7	87132	HEV-L-70500-R.125	
5/8	5/8	.010	3/4	3	7	87133	HEV-S-70625-R.010
	5/8	.010	1-1/4	3-1/2	7	87134	HEV-SR-70625-R.010
	5/8	.010	1-5/8	4	7	87135	HEV-R-70625-R.010
	5/8	.010	2-1/8	4	7	87136	HEV-M-70625-R.010
	5/8	.030	3/4	3	7	27317	HEV-S-70625-R.030
	5/8	.030	1-1/4	3-1/2	7	27322	HEV-SR-70625-R.030
	5/8	.030	1-5/8	4	7	27332	HEV-R-70625-R.030
	5/8	.030	2-1/8	4	7	27347	HEV-M-70625-R.030
	5/8	.030	2-1/2	5	7	82659	HEV-L-70625-R.030
	5/8	.060	3/4	3	7	86043	HEV-S-70625-R.060
	5/8	.060	1-1/4	3-1/2	7	81824	HEV-SR-70625-R.060
	5/8	.060	1-5/8	4	7	81825	HEV-R-70625-R.060
5/8	.060	2-1/8	4	7	86044	HEV-M-70625-R.060	
3/4	3/4	.030	1	3	7	27362	HEV-S-70750-R.030
	3/4	.030	1-1/4	3-1/2	7	27367	HEV-SR-70750-R.030
	3/4	.030	1-5/8	4	7	27377	HEV-R-70750-R.030
	3/4	.030	2-1/4	5	7	27392	HEV-M-70750-R.030
	3/4	.030	2-3/4	5	7	82660	HEV-L-70750-R.030
	3/4	.030	3-1/4	6	7	82661	HEV-LX-70750-R.030
	3/4	.060	1	3	7	81826	HEV-S-70750-R.060
	3/4	.060	1-5/8	4	7	81827	HEV-R-70750-R.060
	3/4	.060	2-1/4	5	7	81828	HEV-M-70750-R.060
	3/4	.060	2-3/4	5	7	86045	HEV-L-70750-R.060
	3/4	.060	3-1/4	6	7	87137	HEV-LX-70750-R.060
	3/4	.125	1	3	7	87138	HEV-S-70750-R.125
	3/4	.125	1-5/8	4	7	87139	HEV-R-70750-R.125
	3/4	.125	2-1/4	5	7	87140	HEV-M-70750-R.125
	3/4	.250	1	3	7	87141	HEV-S-70750-R.250
	3/4	.250	1-5/8	4	7	87142	HEV-R-70750-R.250
	3/4	.250	2-1/4	5	7	87143	HEV-M-70750-R.250
	1	1	.030	1-1/4	4	7	27407
1		.030	2	5	7	27422	HEV-R-71000-R.030
1		.030	2-5/8	5	7	86046	HEV-M-71000-R.030
1		.030	3-1/4	6	7	27442	HEV-L-71000-R.030
1		.030	4-1/4	7	7	86047	HEV-X-71000-R.030

* .0005 max TIR

MHEV-7

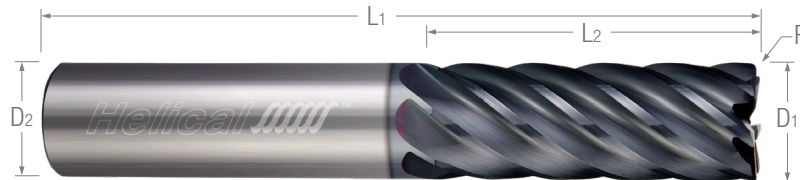
METRIC



7 FLUTE - CORNER RADIUS - METRIC

Variable Pitch

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Engineered for excellent performance in High Efficiency Milling (HEM)
- 7 flute variable pitch design for reduced harmonics and increased feed rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter*	Shank Diameter	Corner Radius	Length of Cut	Overall Length	Flutes	<i>Aplus</i> Coated	Tool Description
$D_1 \begin{smallmatrix} +.00 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	$D_2 \text{ (h6)}$	$R \begin{smallmatrix} +.05 \text{ mm} \\ -.05 \text{ mm} \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.80 \text{ mm} \\ -.00 \text{ mm} \end{smallmatrix}$	$L_1 \begin{smallmatrix} +1.60 \text{ mm} \\ -1.60 \text{ mm} \end{smallmatrix}$			
6 mm	6.00 mm	.50 mm	9.00 mm	63 mm	7	59633	MHEV-015-70600-R0.50
	6.00 mm	.50 mm	12.00 mm	63 mm	7	59651	MHEV-020-70600-R0.50
	6.00 mm	.50 mm	18.00 mm	63 mm	7	59685	MHEV-030-70600-R0.50
	6.00 mm	1.00 mm	9.00 mm	63 mm	7	59634	MHEV-015-70600-R1.00
	6.00 mm	1.00 mm	12.00 mm	63 mm	7	59652	MHEV-020-70600-R1.00
	6.00 mm	1.00 mm	18.00 mm	63 mm	7	59686	MHEV-030-70600-R1.00
8 mm	8.00 mm	.50 mm	12.00 mm	63 mm	7	59636	MHEV-015-70800-R0.50
	8.00 mm	.50 mm	16.00 mm	63 mm	7	59654	MHEV-020-70800-R0.50
	8.00 mm	.50 mm	24.00 mm	75 mm	7	59688	MHEV-030-70800-R0.50
	8.00 mm	1.00 mm	12.00 mm	63 mm	7	59637	MHEV-015-70800-R1.00
	8.00 mm	1.00 mm	16.00 mm	63 mm	7	59655	MHEV-020-70800-R1.00
	8.00 mm	1.00 mm	24.00 mm	75 mm	7	59689	MHEV-030-70800-R1.00
10 mm	10.00 mm	.50 mm	15.00 mm	63 mm	7	59639	MHEV-015-71000-R0.50
	10.00 mm	.50 mm	20.00 mm	63 mm	7	59657	MHEV-020-71000-R0.50
	10.00 mm	.50 mm	25.00 mm	75 mm	7	59671	MHEV-025-71000-R0.50
	10.00 mm	1.00 mm	15.00 mm	63 mm	7	59640	MHEV-015-71000-R1.00
	10.00 mm	1.00 mm	20.00 mm	63 mm	7	59658	MHEV-020-71000-R1.00
	10.00 mm	1.00 mm	25.00 mm	75 mm	7	59672	MHEV-025-71000-R1.00
12 mm	12.00 mm	.50 mm	18.00 mm	75 mm	7	59642	MHEV-015-71200-R0.50
	12.00 mm	.50 mm	24.00 mm	75 mm	7	59660	MHEV-020-71200-R0.50
	12.00 mm	.50 mm	30.00 mm	75 mm	7	59674	MHEV-025-71200-R0.50
	12.00 mm	1.00 mm	18.00 mm	75 mm	7	59643	MHEV-015-71200-R1.00
	12.00 mm	1.00 mm	24.00 mm	75 mm	7	59661	MHEV-020-71200-R1.00
	12.00 mm	1.00 mm	30.00 mm	75 mm	7	59675	MHEV-025-71200-R1.00
16 mm	16.00 mm	.50 mm	24.00 mm	89 mm	7	59645	MHEV-015-71600-R0.50
	16.00 mm	.50 mm	32.00 mm	89 mm	7	59663	MHEV-020-71600-R0.50
	16.00 mm	.50 mm	40.00 mm	89 mm	7	59677	MHEV-025-71600-R0.50
	16.00 mm	1.00 mm	24.00 mm	89 mm	7	59646	MHEV-015-71600-R1.00
	16.00 mm	1.00 mm	32.00 mm	89 mm	7	59664	MHEV-020-71600-R1.00
	16.00 mm	1.00 mm	40.00 mm	89 mm	7	59678	MHEV-025-71600-R1.00
20 mm	20.00 mm	.50 mm	30.00 mm	89 mm	7	59648	MHEV-015-72000-R0.50
	20.00 mm	.50 mm	40.00 mm	100 mm	7	59666	MHEV-020-72000-R0.50
	20.00 mm	.50 mm	50.00 mm	125 mm	7	59680	MHEV-025-72000-R0.50
	20.00 mm	1.00 mm	30.00 mm	89 mm	7	59649	MHEV-015-72000-R1.00
	20.00 mm	1.00 mm	40.00 mm	100 mm	7	59667	MHEV-020-72000-R1.00
	20.00 mm	1.00 mm	50.00 mm	125 mm	7	59681	MHEV-025-72000-R1.00
25 mm	25.00 mm	1.00 mm	50.00 mm	125 mm	7	59669	MHEV-020-72500-R1.00
	25.00 mm	1.00 mm	64.00 mm	125 mm	7	59683	MHEV-025-72500-R1.00

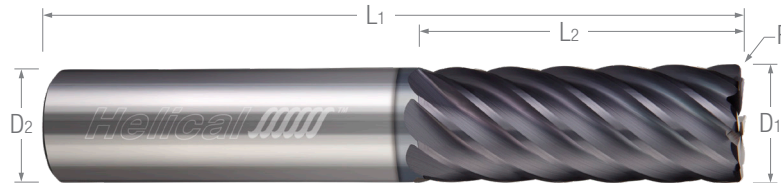
*.013 mm max TIR

MULTI-FLUTE - CORNER RADIUS

Finisher


HXF

- Offers outstanding performance and high temperature resistance in titanium and titanium alloys
- Designed with high flute count for excellent performance in light profiling, High Efficiency Milling (HEM), and finishing applications
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Cutter Diameter* $D_1 \begin{smallmatrix} +.000^* \\ -.002^* \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Corner Radius $R \begin{smallmatrix} +.002^* \\ -.002^* \end{smallmatrix}$	Length of Cut $L_2 \begin{smallmatrix} +.032^* \\ -.000^* \end{smallmatrix}$	Overall Length $L_1 \begin{smallmatrix} +.062^* \\ -.062^* \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
1/4	1/4	.020	3/8	2	7	36016	HXF-S-070250-R.020
	1/4	.020	1/2	2	7	81832	HXF-SR-070250-R.020
	1/4	.020	3/4	2-1/2	7	36031	HXF-R-070250-R.020
3/8	3/8	.020	1/2	2	7	36046	HXF-S-070375-R.020
	3/8	.020	3/4	2-1/2	7	81833	HXF-SR-070375-R.020
	3/8	.020	1	3	7	36061	HXF-R-070375-R.020
	3/8	.020	1-1/4	3	7	81834	HXF-M-070375-R.020
1/2	1/2	.030	5/8	2-1/2	8	36076	HXF-S-080500-R.030
	1/2	.030	1	3	8	36091	HXF-SR-080500-R.030
	1/2	.030	1-1/4	3	8	36106	HXF-R-080500-R.030
	1/2	.030	1-5/8	3-1/2	8	81835	HXF-M-080500-R.030
	1/2	.030	2	3-1/2	8	81836	HXF-L-080500-R.030
5/8	5/8	.060	3/4	3	10	36121	HXF-S-100625-R.060
	5/8	.060	1-5/8	3-1/2	10	36136	HXF-R-100625-R.060
3/4	3/4	.060	1	3	12	36151	HXF-S-120750-R.060
	3/4	.060	1-5/8	4	12	36166	HXF-R-120750-R.060
	3/4	.060	2	4	12	81837	HXF-M-120750-R.060
1	1	.060	1-1/4	4	14	36181	HXF-S-141000-R.060
	1	.060	2	4-1/2	14	36196	HXF-R-141000-R.060

*.0005 max TIR

HFAL-2

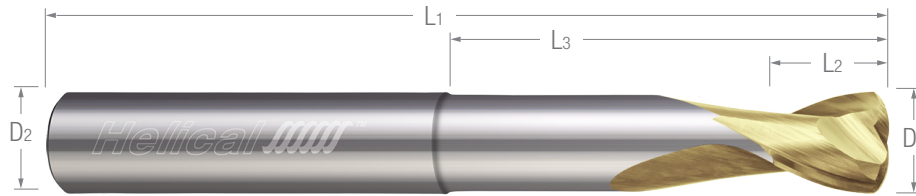
New Items!

HIGH FEED END MILLS

Aluminum - Reduced Neck

- Designed for outstanding performance and maximum feed rates in aluminum and non-ferrous materials
- Specifically engineered end profile for optimal tool engagement and reduced cutting forces
- Reduced neck provides maximum strength in long reach and deep pocketing applications

- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- Zplus coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA



Cutter Dia.* $D_1^{+.000/-0.002}$	Shank Dia. D_2 (h6)	Length of Cut $L_2^{+.032/-0.000}$	OAL $L_1^{+.062/-0.062}$	Reach (LBS) L_3	Neck Dia.	Flutes	Theoretical Radius**	Zplus Coated	Tool Description
new 1/8	1/4	1/8	2-1/2	1/2	.118	2	.0213	84439	HFAL-RN-040-20125
	1/4	1/8	2-1/2	3/4	.118	2	.0213	84441	HFAL-RN-060-20125
	1/4	1/8	2-1/2	1	.118	2	.0213	84443	HFAL-RN-080-20125
	1/4	1/8	2-1/2	1-1/4	.118	2	.0213	87287	HFAL-RN-100-20125
new 3/16	1/4	3/16	2-1/2	3/4	.178	2	.0319	84445	HFAL-RN-040-20187
	1/4	3/16	2-1/2	1-1/8	.178	2	.0319	84447	HFAL-RN-060-20187
	1/4	3/16	3	1-1/2	.178	2	.0319	84449	HFAL-RN-080-20187
	1/4	3/16	3	1-7/8	.178	2	.0319	87288	HFAL-RN-100-20187
new new 1/4	1/4	1/4	3	1	.237	2	.0425	84451	HFAL-RN-040-20250
	1/4	1/4	3	1-1/2	.237	2	.0425	84453	HFAL-RN-060-20250
	1/4	1/4	4	2	.237	2	.0425	84455	HFAL-RN-080-20250
	1/4	1/4	4	2-1/2	.237	2	.0425	87289	HFAL-RN-100-20250
new new 5/16	5/16	5/16	4	1-1/4	.296	2	.0531	87290	HFAL-RN-040-20312
	5/16	5/16	4	1-7/8	.296	2	.0531	87291	HFAL-RN-060-20312
	5/16	5/16	4	2-1/2	.296	2	.0531	87292	HFAL-RN-080-20312
new 3/8	3/8	3/8	4	1-1/2	.356	2	.0638	84457	HFAL-RN-040-20375
	3/8	3/8	4	2-1/4	.356	2	.0638	84459	HFAL-RN-060-20375
	3/8	3/8	6	3	.356	2	.0638	84461	HFAL-RN-080-20375
	3/8	3/8	6	3-3/4	.356	2	.0638	87293	HFAL-RN-100-20375
new new 1/2	1/2	1/2	5	2	.475	2	.0850	84463	HFAL-RN-040-20500
	1/2	1/2	5	3	.475	2	.0850	84465	HFAL-RN-060-20500
	1/2	1/2	7	4	.475	2	.0850	84467	HFAL-RN-080-20500
	1/2	1/2	7	5	.475	2	.0850	87294	HFAL-RN-100-20500
new new 5/8	5/8	5/8	4	2-1/2	.593	2	.1063	87295	HFAL-RN-040-20625
	5/8	5/8	6	3-3/4	.593	2	.1063	87296	HFAL-RN-060-20625
	5/8	5/8	7	5	.593	2	.1063	87297	HFAL-RN-080-20625
new new 3/4	3/4	3/4	6	3	.712	2	.1275	87298	HFAL-RN-040-20750
	3/4	3/4	7	4-1/2	.712	2	.1275	87299	HFAL-RN-060-20750
	3/4	3/4	8	6	.712	2	.1275	87300	HFAL-RN-080-20750

*.0005 max TIR **Theoretical radius for use when programming in CAM software

See page 272 for diagram of theoretical radius

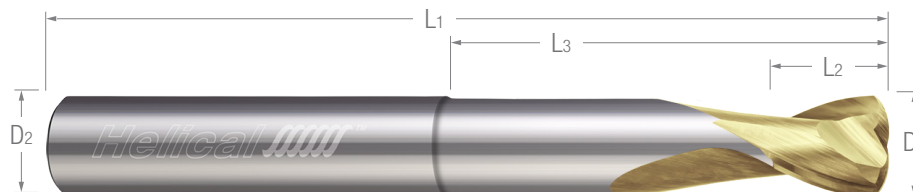
HIGH FEED END MILLS - METRIC

Aluminum - Reduced Neck

MHFAL-2

METRIC

- Designed for outstanding performance and maximum feed rates in aluminum and non-ferrous materials
- Specifically engineered end profile for optimal tool engagement and reduced cutting forces
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- Solid carbide
- CNC ground in the USA

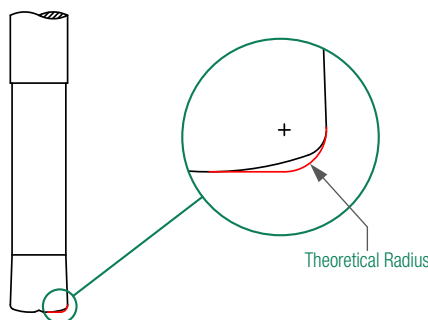


Cutter Dia.*	Shank Dia.	Length of Cut	OAL	Reach (LBS)	Neck Dia.	Flutes	Theoretical Radius**	Zplus Coated	Tool Description
$D1^{+0.00}_{-0.05} \text{ mm}$	$D2 \text{ (h6)}$	$L2^{+0.80}_{-0.00} \text{ mm}$	$L1^{+1.60}_{-1.60} \text{ mm}$	$L3$					
3 mm	6.00 mm	3.00 mm	63 mm	12.00 mm	2.85 mm	2	0.51 mm	84942	MHFAL-RN-040-20300
	6.00 mm	3.00 mm	63 mm	18.00 mm	2.85 mm	2	0.51 mm	84943	MHFAL-RN-060-20300
	6.00 mm	3.00 mm	63 mm	24.00 mm	2.85 mm	2	0.51 mm	84944	MHFAL-RN-080-20300
4 mm	6.00 mm	4.00 mm	63 mm	16.00 mm	3.80 mm	2	0.68 mm	84945	MHFAL-RN-040-20400
	6.00 mm	4.00 mm	63 mm	24.00 mm	3.80 mm	2	0.68 mm	84946	MHFAL-RN-060-20400
	6.00 mm	4.00 mm	63 mm	32.00 mm	3.80 mm	2	0.68 mm	84947	MHFAL-RN-080-20400
6 mm	6.00 mm	6.00 mm	75 mm	24.00 mm	5.70 mm	2	1.02 mm	84948	MHFAL-RN-040-20600
	6.00 mm	6.00 mm	75 mm	36.00 mm	5.70 mm	2	1.02 mm	84949	MHFAL-RN-060-20600
	6.00 mm	6.00 mm	75 mm	48.00 mm	5.70 mm	2	1.02 mm	84950	MHFAL-RN-080-20600
8 mm	8.00 mm	8.00 mm	100 mm	32.00 mm	7.60 mm	2	1.36 mm	84951	MHFAL-RN-040-20800
	8.00 mm	8.00 mm	100 mm	48.00 mm	7.60 mm	2	1.36 mm	84952	MHFAL-RN-060-20800
	8.00 mm	8.00 mm	100 mm	64.00 mm	7.60 mm	2	1.36 mm	84953	MHFAL-RN-080-20800
10 mm	10.00 mm	10.00 mm	125 mm	40.00 mm	9.50 mm	2	1.70 mm	84954	MHFAL-RN-040-21000
	10.00 mm	10.00 mm	125 mm	60.00 mm	9.50 mm	2	1.70 mm	84955	MHFAL-RN-060-21000
	10.00 mm	10.00 mm	125 mm	80.00 mm	9.50 mm	2	1.70 mm	84956	MHFAL-RN-080-21000
12 mm	12.00 mm	12.00 mm	125 mm	48.00 mm	11.40 mm	2	2.04 mm	84957	MHFAL-RN-040-21200
	12.00 mm	12.00 mm	125 mm	72.00 mm	11.40 mm	2	2.04 mm	84958	MHFAL-RN-060-21200
	12.00 mm	12.00 mm	150 mm	96.00 mm	11.40 mm	2	2.04 mm	84959	MHFAL-RN-080-21200

* .013 mm max TIR **Theoretical radius for use when programming in CAM software

Visit www.helicaltool.com to download precise Simulation Files for all Feed Mills.

In the absence of a Simulation File, use the Theoretical Radius to approximate Helical's feed mills as corner radius end mills within your CAM software.



HFAL-2

SPEEDS & FEEDS
High Feed End Mills - Aluminum

HFAL-2/MHFAL-2

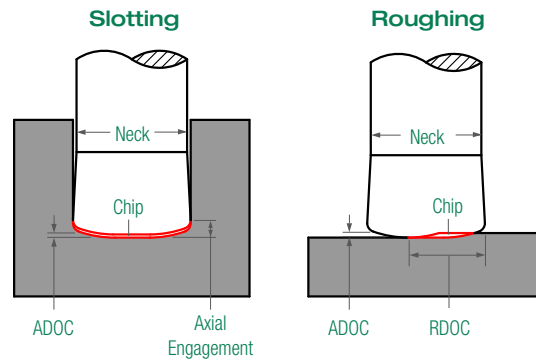
Material Guide		SFM	Inches per Tooth (IPT)													
			1/8		3/16		1/4		3/8		1/2		3/4		1	
			Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
WROUGHT ALUMINUM ALLOY	2014, 5062, 6061, 7050, 7075, 7475	2100	.0023	.0032	.0036	.0046	.0050	.0055	.0082	.0091	.0100	.0114	.0160	.0182	.0205	.0228
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	1400	.0041	.0046	.0068	.0082	.0082	.0100	.0128	.0160	.0160	.0205	.0251	.0319	.0319	.0410
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	770	.0027	.0036	.0041	.0055	.0055	.0068	.0091	.0100	.0114	.0137	.0182	.0205	.0228	.0274

MILLING PROCESS	ADOC	RDOC
Slot (Full Slotting)	3.00%-5.00% Diameter	100% Diameter
Rgh (Traditional Roughing)	3.00%-5.00% Diameter	Up to 65% Diameter

NOTES:

IPT values shown are for 4xD reach tools, for tools with reaches greater than 4xD, IPT should be reduced.

Please note for slotting applications, axial engagement will increase while axial stepdown (ADOC) remains the same.



The Secret Mechanics of High Feed End Mills

In The Loupe
MACHINISTS BLOG

A High Feed End Mill is a type of High Efficiency Milling (HEM) tool with a specialized end profile that allows the tool to utilize chip thinning to have dramatically increased feed rates. These tools are meant to operate with an extremely low axial depth of cut so that the cutting action takes place along the curved edge of the bottom profile. Read more from our "In the Loupe" blog post *The Secret Mechanics of High Feed End Mills*.

www.harveyprecision.com/in-the-loupe/the-secret-mechanics-of-high-feed-end-mills/



SCAN TO READ

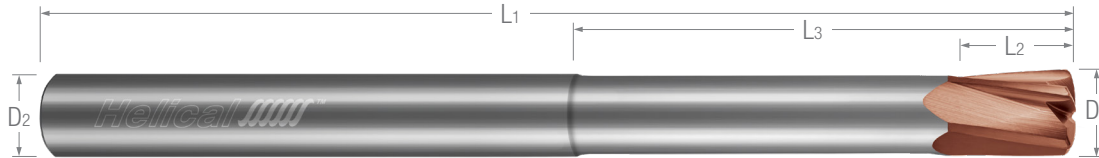
HIGH FEED END MILLS

New Items!

HFV

Steels Up to 45 Rc - Variable Pitch - Reduced Neck

- Specifically engineered end profile for optimal tool engagement and reduced cutting forces
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Geometry proven to achieve maximum feed rates in steels up to 45 Rc
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



Cutter Dia.*	Shank Dia.	Length of Cut	OAL	Reach (LBS)	Neck Dia.	Flutes	Theoretical Radius**	<i>Tplus</i> Coated	Tool Description
D1 ^{+0.000"} _{-.002"}	D2 (h6)	L2 ^{+0.032"} _{-.000"}	L1 ^{+0.062"} _{-.062"}	L3					
1/8	1/8	1/8	2	1/4	.110	4	.0157	82663	HFV-RN-020-40125
	1/8	1/8	2	1/2	.110	4	.0157	82664	HFV-RN-040-40125
	1/4	1/8	2-1/2	1/2	.110	4	.0157	83725	HFV-RN-040-40125
	1/8	1/8	2	3/4	.110	4	.0157	82665	HFV-RN-060-40125
	1/4	1/8	2-1/2	3/4	.110	4	.0157	83726	HFV-RN-060-40125
	1/4	1/8	2-1/2	1	.110	4	.0157	83727	HFV-RN-080-40125
	1/4	1/8	2-1/2	1-1/4	.110	4	.0157	83728	HFV-RN-100-40125
3/16	3/16	3/16	2-1/2	3/8	.165	4	.0235	82666	HFV-RN-020-40187
	3/16	3/16	2-1/2	3/4	.165	4	.0235	82667	HFV-RN-040-40187
	1/4	3/16	2-1/2	3/4	.165	4	.0235	83729	HFV-RN-040-40187
	3/16	3/16	2-1/2	1-1/8	.165	4	.0235	82668	HFV-RN-060-40187
	1/4	3/16	2-1/2	1-1/8	.165	4	.0235	83730	HFV-RN-060-40187
	1/4	3/16	3	1-1/2	.165	4	.0235	83731	HFV-RN-080-40187
	1/4	3/16	3	1-7/8	.165	4	.0235	83732	HFV-RN-100-40187
1/4	1/4	1/4	3	1/2	.220	5	.0314	82669	HFV-RN-020-50250
	1/4	1/4	3	1	.220	5	.0314	82670	HFV-RN-040-50250
	1/4	1/4	3	1-1/2	.220	5	.0314	82671	HFV-RN-060-50250
	1/4	1/4	4	2	.220	5	.0314	83719	HFV-RN-080-50250
	1/4	1/4	4	2-1/2	.220	5	.0314	83720	HFV-RN-100-50250
5/16	5/16	5/16	3	5/8	.275	5	.0393	87267	HFV-RN-020-50312 new
	5/16	5/16	4	1-1/4	.275	5	.0393	87268	HFV-RN-040-50312 new
	5/16	5/16	4	1-7/8	.275	5	.0393	87269	HFV-RN-060-50312 new
	5/16	5/16	4	2-1/2	.275	5	.0393	87270	HFV-RN-080-50312 new
3/8	3/8	3/8	4	3/4	.330	5	.0471	82672	HFV-RN-020-50375
	3/8	3/8	4	1-1/2	.330	5	.0471	82673	HFV-RN-040-50375
	3/8	3/8	4	2-1/4	.330	5	.0471	82674	HFV-RN-060-50375
	3/8	3/8	6	3	.330	5	.0471	83721	HFV-RN-080-50375
	3/8	3/8	6	3-3/4	.330	5	.0471	83722	HFV-RN-100-50375
1/2	1/2	1/2	5	1	.440	5	.0628	82675	HFV-RN-020-50500
	1/2	1/2	5	2	.440	5	.0628	82676	HFV-RN-040-50500
	1/2	1/2	5	3	.440	5	.0628	82677	HFV-RN-060-50500
	1/2	1/2	7	4	.440	5	.0628	83723	HFV-RN-080-50500
	1/2	1/2	7	5	.440	5	.0628	83724	HFV-RN-100-50500

* .0005 max TIR **Theoretical radius for use when programming in CAM software

continued on next page



HFV

New Items! **HIGH FEED END MILLS**
Steels Up to 45 Rc - Variable Pitch - Reduced Neck

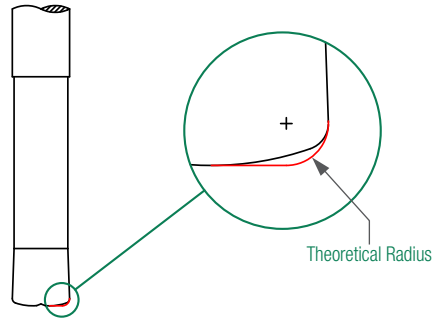
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	Cutter Dia.* $D1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Dia. $D2 \text{ (h6)}$	Length of Cut $L2 \begin{smallmatrix} +.032'' \\ -.000'' \end{smallmatrix}$	OAL $L1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Reach (LBS) $L3$	Neck Dia.	Flutes	Theoretical Radius**	<i>Tplus</i> Coated	Tool Description
new	5/8	5/8	5/8	4	1-1/4	.550	5	.0785	87271	HFV-RN-020-50625
new		5/8	5/8	4	2-1/2	.550	5	.0785	87272	HFV-RN-040-50625
new		5/8	5/8	6	3-3/4	.550	5	.0785	87273	HFV-RN-060-50625
new		5/8	5/8	7	5	.550	5	.0785	87274	HFV-RN-080-50625
new	3/4	3/4	3/4	4	1-1/2	.660	5	.0942	87275	HFV-RN-020-50750
new		3/4	3/4	6	3	.660	5	.0942	87276	HFV-RN-040-50750
new		3/4	3/4	7	4-1/2	.660	5	.0942	87277	HFV-RN-060-50750
new		3/4	3/4	8	6	.660	5	.0942	87278	HFV-RN-080-50750

*.0005 max TIR **Theoretical radius for use when programming in CAM software

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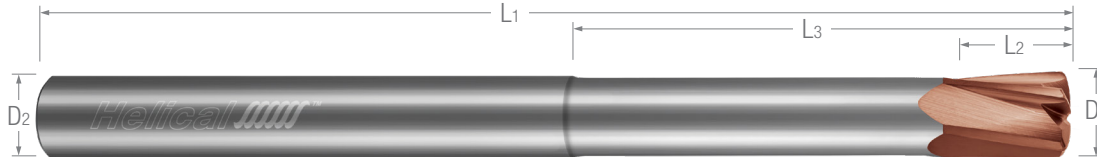
HIGH FEED END MILLS - METRIC

New Items!

**MHFV
METRIC**

Steels Up to 45 Rc - Variable Pitch - Reduced Neck

- Specifically engineered end profile for optimal tool engagement and reduced cutting forces
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Geometry proven to achieve maximum feed rates in steels up to 45 Rc
- Reduced neck provides maximum strength in long reach and deep pocketing applications
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

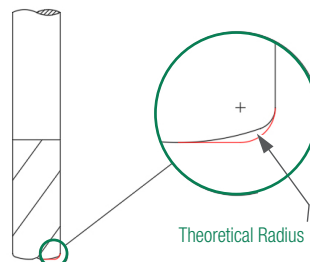


Cutter Dia.* D1 +0.00 mm -0.05 mm	Shank Dia. D2 (h6)	Length of Cut		Reach (LBS) L3	Neck Dia.	Flutes	Theoretical Radius**	Tplus Coated	Tool Description
		L2 +0.80 mm -0.00 mm	L1 +1.60 mm -1.60 mm						
3 mm	3.00 mm	3.00 mm	50 mm	6.00 mm	2.64 mm	4	.377 mm	82678	MHFV-RN-020-40300
	3.00 mm	3.00 mm	50 mm	12.00 mm	2.64 mm	4	.377 mm	82679	MHFV-RN-040-40300
	3.00 mm	3.00 mm	50 mm	18.00 mm	2.64 mm	4	.377 mm	82680	MHFV-RN-060-40300
	3.00 mm	3.00 mm	63 mm	24.00 mm	2.64 mm	4	.377 mm	87279	MHFV-RN-080-40300 new
4 mm	4.00 mm	4.00 mm	63 mm	8.00 mm	3.52 mm	4	.502 mm	82681	MHFV-RN-020-40400
	4.00 mm	4.00 mm	63 mm	16.00 mm	3.52 mm	4	.502 mm	82682	MHFV-RN-040-40400
	4.00 mm	4.00 mm	63 mm	24.00 mm	3.52 mm	4	.502 mm	82683	MHFV-RN-060-40400
	4.00 mm	4.00 mm	63 mm	32.00 mm	3.52 mm	4	.502 mm	87280	MHFV-RN-080-40400 new
6 mm	6.00 mm	6.00 mm	75 mm	12.00 mm	5.28 mm	5	.754 mm	82684	MHFV-RN-020-50600
	6.00 mm	6.00 mm	75 mm	24.00 mm	5.28 mm	5	.754 mm	82685	MHFV-RN-040-50600
	6.00 mm	6.00 mm	75 mm	36.00 mm	5.28 mm	5	.754 mm	82686	MHFV-RN-060-50600
	6.00 mm	6.00 mm	75 mm	48.00 mm	5.28 mm	5	.754 mm	87281	MHFV-RN-080-50600 new
8 mm	8.00 mm	8.00 mm	100 mm	16.00 mm	7.04 mm	5	1.005 mm	82687	MHFV-RN-020-50800
	8.00 mm	8.00 mm	100 mm	32.00 mm	7.04 mm	5	1.005 mm	82688	MHFV-RN-040-50800
	8.00 mm	8.00 mm	100 mm	48.00 mm	7.04 mm	5	1.005 mm	82689	MHFV-RN-060-50800
	8.00 mm	8.00 mm	100 mm	64.00 mm	7.04 mm	5	1.005 mm	87282	MHFV-RN-080-50800 new
10 mm	10.00 mm	10.00 mm	125 mm	20.00 mm	8.80 mm	5	1.257 mm	82690	MHFV-RN-020-51000
	10.00 mm	10.00 mm	125 mm	40.00 mm	8.80 mm	5	1.257 mm	82691	MHFV-RN-040-51000
	10.00 mm	10.00 mm	125 mm	60.00 mm	8.80 mm	5	1.257 mm	82692	MHFV-RN-060-51000
12 mm	12.00 mm	12.00 mm	125 mm	24.00 mm	10.55 mm	5	1.508 mm	82693	MHFV-RN-020-51200
	12.00 mm	12.00 mm	125 mm	48.00 mm	10.55 mm	5	1.508 mm	82694	MHFV-RN-040-51200
	12.00 mm	12.00 mm	125 mm	72.00 mm	10.55 mm	5	1.508 mm	82695	MHFV-RN-060-51200

*.013 mm max TIR **Theoretical radius for use when programming in CAM software

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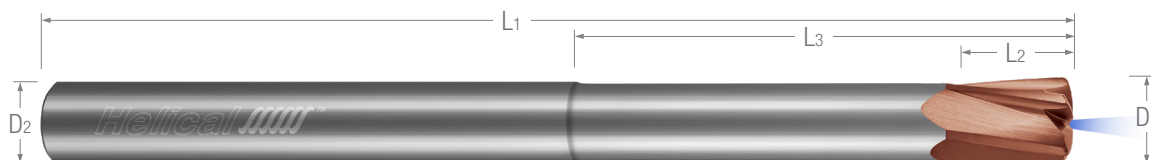


HFVC

HIGH FEED END MILLS

Steels up to 45 Rc - Variable Pitch - Coolant Through -
Reduced Neck

- Specifically engineered end profile for optimal tool engagement and reduced cutting forces
- Variable pitch geometry results in higher quality parts by decreasing chatter and harmonics
- Geometry proven to achieve maximum feed rates in steels up to 45 Rc
- Straight-through coolant hole for superior chip evacuation and heat management at the cutting edge
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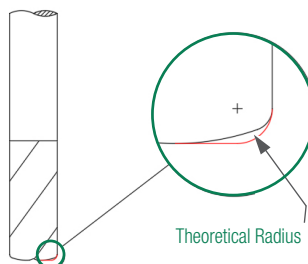


Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Length of Cut L2 ^{+0.032"} / _{-.000"}	OAL L1 ^{+0.062"} / _{-.062"}	Reach (LBS) L3	Neck Dia.	Flutes	Theoretical Radius**	Tplus Coated	Tool Description
1/4	1/4	1/4	3	1/2	.220	5	.0314	82696	HFVC-RN-020-50250
	1/4	1/4	3	1	.220	5	.0314	82697	HFVC-RN-040-50250
	1/4	1/4	3	1-1/2	.220	5	.0314	82698	HFVC-RN-060-50250
	1/4	1/4	4	2	.220	5	.0314	83733	HFVC-RN-080-50250
	1/4	1/4	4	2-1/2	.220	5	.0314	83734	HFVC-RN-100-50250
3/8	3/8	3/8	4	3/4	.330	5	.0471	82699	HFVC-RN-020-50375
	3/8	3/8	4	1-1/2	.330	5	.0471	82700	HFVC-RN-040-50375
	3/8	3/8	4	2-1/4	.330	5	.0471	82701	HFVC-RN-060-50375
	3/8	3/8	6	3	.330	5	.0471	83735	HFVC-RN-080-50375
	3/8	3/8	6	3-3/4	.330	5	.0471	83736	HFVC-RN-100-50375
1/2	1/2	1/2	5	1	.440	5	.0628	82702	HFVC-RN-020-50500
	1/2	1/2	5	2	.440	5	.0628	82703	HFVC-RN-040-50500
	1/2	1/2	5	3	.440	5	.0628	82704	HFVC-RN-060-50500
	1/2	1/2	7	4	.440	5	.0628	83737	HFVC-RN-080-50500
	1/2	1/2	7	5	.440	5	.0628	83738	HFVC-RN-100-50500

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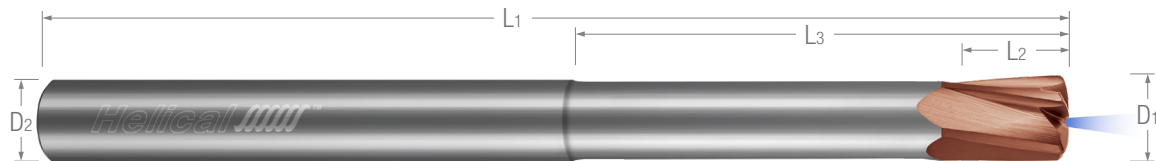
MHFVC

METRIC

HIGH FEED END MILLS - METRIC

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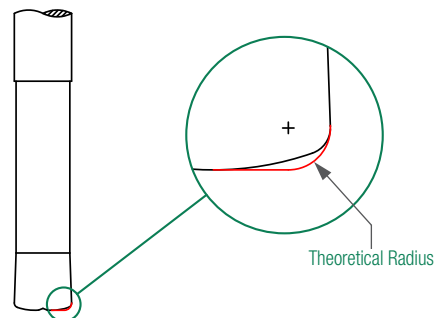


Cutter Dia.* D1 ^{+0.00} / _{-.05} mm	Shank Dia. D2 (h6)	Length of Cut L2 ⁺⁸⁰ / _{-.00} mm	OAL L1 ^{+1.60} / _{-1.60} mm	Reach (LBS) L3	Neck Diameter	Flutes	Theoretical Radius**	<i>Tplus</i> Coated	Tool Description
6 mm	6.00 mm	6.00 mm	75 mm	12.00 mm	5.28 mm	5	.734 mm	82705	MHFVC-RN-020-50600
	6.00 mm	6.00 mm	75 mm	24.00 mm	5.28 mm	5	.734 mm	82706	MHFVC-RN-040-50600
	6.00 mm	6.00 mm	75 mm	36.00 mm	5.28 mm	5	.734 mm	82707	MHFVC-RN-060-50600
8 mm	8.00 mm	8.00 mm	100 mm	16.00 mm	7.04 mm	5	.979 mm	82708	MHFVC-RN-020-50800
	8.00 mm	8.00 mm	100 mm	32.00 mm	7.04 mm	5	.979 mm	82709	MHFVC-RN-040-50800
	8.00 mm	8.00 mm	100 mm	48.00 mm	7.04 mm	5	.979 mm	82710	MHFVC-RN-060-50800
10 mm	10.00 mm	10.00 mm	125 mm	20.00 mm	8.80 mm	5	1.224 mm	82711	MHFVC-RN-020-51000
	10.00 mm	10.00 mm	125 mm	40.00 mm	8.80 mm	5	1.224 mm	82712	MHFVC-RN-040-51000
	10.00 mm	10.00 mm	125 mm	60.00 mm	8.80 mm	5	1.224 mm	82713	MHFVC-RN-060-51000
12 mm	12.00 mm	12.00 mm	125 mm	24.00 mm	10.55 mm	5	1.469 mm	82714	MHFVC-RN-020-51200
	12.00 mm	12.00 mm	125 mm	48.00 mm	10.55 mm	5	1.469 mm	82715	MHFVC-RN-040-51200
	12.00 mm	12.00 mm	125 mm	72.00 mm	10.55 mm	5	1.469 mm	82716	MHFVC-RN-060-51200

* .013 mm max TIR **Theoretical radius for use when programming in CAM software

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HFV

SPEEDS & FEEDS

High Feed End Mills

HFV / HFVC

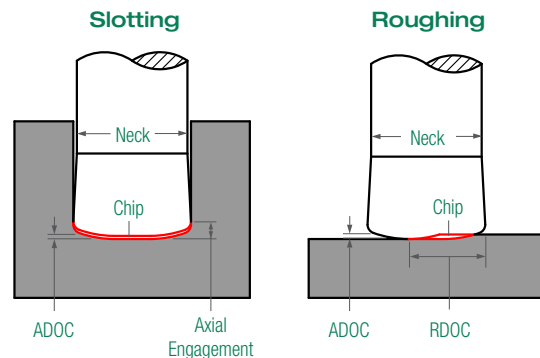
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)									
				1/8		3/16		1/4		3/8		1/2	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	800	.0027	.0057	.0040	.0085	.0053	.0113	.0080	.0140	.0107	.0187
		75 - 98 HRB	750	.0020	.0037	.0030	.0055	.0040	.0073	.0060	.0110	.0080	.0147
		21 - 36 HRC	700	.0013	.0025	.0020	.0038	.0027	.0050	.0040	.0075	.0053	.0100
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	600	.0027	.0057	.0040	.0085	.0053	.0113	.0080	.0140	.0107	.0187
		21 - 36 HRC	550	.0027	.0047	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187
		36 - 50 HRC	400	.0020	.0033	.0030	.0050	.0040	.0067	.0060	.0100	.0080	.0133
		> 50 HRC	350	.0013	.0020	.0020	.0030	.0027	.0040	.0040	.0060	.0053	.0080
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	550	.0027	.0057	.0040	.0085	.0053	.0113	.0080	.0140	.0107	.0187
		21 - 36 HRC	500	.0027	.0047	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187
		36 - 50 HRC	450	.0020	.0033	.0030	.0050	.0040	.0067	.0060	.0100	.0080	.0133
		> 50 HRC	400	.0013	.0020	.0020	.0030	.0027	.0040	.0040	.0060	.0053	.0080
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	450	.0027	.0067	.0040	.0100	.0053	.0133	.0080	.0140	.0107	.0187
		75 - 98 HRB	500	.0027	.0060	.0040	.0090	.0053	.0120	.0080	.0140	.0107	.0187
		21 - 36 HRC	450	.0027	.0047	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187
		36 - 50 HRC	400	.0020	.0033	.0030	.0050	.0040	.0067	.0060	.0100	.0080	.0133
		> 50 HRC	350	.0013	.0020	.0020	.0030	.0027	.0040	.0040	.0060	.0053	.0080
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	500	.0027	.0053	.0040	.0080	.0053	.0107	.0080	.0140	.0107	.0187
		21 - 36 HRC	450	.0027	.0047	.0040	.0070	.0053	.0093	.0080	.0140	.0107	.0187
		36 - 50 HRC	400	.0022	.0040	.0033	.0060	.0043	.0080	.0065	.0120	.0087	.0160
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	750	.0025	.0037	.0038	.0055	.0050	.0073	.0075	.0110	.0100	.0147
		21 - 36 HRC	650	.0027	.0053	.0040	.0080	.0053	.0107	.0080	.0140	.0107	.0187
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	450	.0025	.0037	.0038	.0055	.0050	.0073	.0075	.0110	.0100	.0147
		36 - 50 HRC	400	.0020	.0033	.0030	.0050	.0040	.0067	.0060	.0100	.0080	.0133
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	600	.0027	.0083	.0040	.0125	.0053	.0140	.0080	.0140	.0107	.0187
		21 - 36 HRC	550	.0027	.0063	.0040	.0095	.0053	.0127	.0080	.0140	.0107	.0187
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	550	.0027	.0056	.0040	.0084	.0053	.0111	.0080	.0140	.0107	.0187
		21 - 36 HRC	450	.0027	.0040	.0040	.0060	.0053	.0080	.0080	.0120	.0107	.0160
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	500	.0027	.0056	.0040	.0084	.0053	.0111	.0080	.0140	.0107	.0187
		21 - 36 HRC	450	.0027	.0040	.0040	.0060	.0053	.0080	.0080	.0120	.0107	.0160
		36 - 50 HRC	400	.0013	.0020	.0020	.0030	.0027	.0040	.0040	.0060	.0053	.0080
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	600	.0027	.0047	.0040	.0070	.0053	.0094	.0080	.0140	.0107	.0187
		75 - 98 HRB	550	.0027	.0043	.0040	.0065	.0053	.0087	.0080	.0130	.0107	.0172
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	200	.0027	.0038	.0040	.0056	.0053	.0075	.0080	.0113	.0107	.0150
		21 - 36 HRC	180	.0027	.0033	.0040	.0049	.0053	.0066	.0080	.0098	.0107	.0130
		36 - 50 HRC	150	.0022	.0028	.0033	.0042	.0043	.0056	.0065	.0084	.0087	.0112
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	350	.0027	.0047	.0040	.0070	.0053	.0094	.0080	.0140	.0107	.0187
		75 - 98 HRB	400	.0027	.0042	.0040	.0063	.0053	.0084	.0080	.0127	.0107	.0168
		21 - 36 HRC	325	.0027	.0040	.0040	.0060	.0053	.0080	.0080	.0120	.0107	.0158
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	300	.0027	.0033	.0040	.0049	.0053	.0066	.0080	.0098	.0107	.0130
		36 - 50 HRC	250	.0025	.0023	.0038	.0035	.0050	.0047	.0075	.0070	.0100	.0093
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	225	.0020	.0023	.0030	.0035	.0040	.0047	.0060	.0070	.0080	.0093
		21 - 36 HRC	150	.0027	.0035	.0040	.0053	.0053	.0070	.0080	.0105	.0107	.0140
		36 - 50 HRC	90	.0020	.0023	.0030	.0035	.0040	.0047	.0060	.0070	.0080	.0093

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	3.00%-5.00% Diameter	100% Diameter
	≥ 35 HRC	2.50%-4.00% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	3.00%-5.00% Diameter	Up to 65% Diameter
	≥ 35 HRC	2.75%-4.25% Diameter	Up to 65% Diameter

NOTES:

IPT values shown are for 3xD reach tools, and should be adjusted for longer or shorter reaches. For tools with reaches greater than 3xD, IPT should be reduced.

Please note for slotting applications, axial engagement will increase while axial stepdown (ADOC) remains the same.



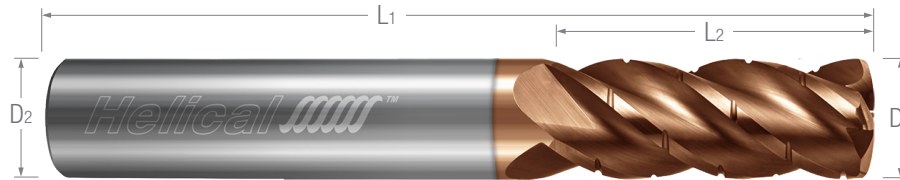


HEVF-C-4

COMBINATION FEED & HEM - 4 FLUTE

Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, cast iron, titanium, and titanium alloys
- Combination of specialized end profile and OD geometry for both high feed and HEM applications
- 4 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



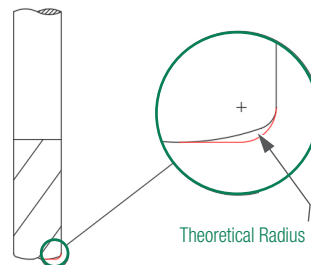
Combination

Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Theoretical Radius**	<i>Tplus</i> Coated	Tool Description
1/8	1/8	1/4	1-1/2	4	.0157	84468	HEVF-C-020-40125
	1/8	3/8	2	4	.0157	84469	HEVF-C-030-40125
	1/8	1/2	2-1/2	4	.0157	84470	HEVF-C-040-40125
3/16	3/16	5/16	2	4	.0235	84471	HEVF-C-016-40187
	3/16	7/16	2	4	.0235	84472	HEVF-C-023-40187
	3/16	9/16	2-1/2	4	.0235	84473	HEVF-C-030-40187
1/4	1/4	3/8	2	4	.0314	84474	HEVF-C-015-40250
	1/4	1/2	2-1/2	4	.0314	84475	HEVF-C-020-40250
	1/4	3/4	2-1/2	4	.0314	84476	HEVF-C-030-40250
3/8	3/8	1/2	2	4	.0471	84477	HEVF-C-013-40375
	3/8	1	3	4	.0471	84478	HEVF-C-026-40375
	3/8	1-1/4	3	4	.0471	84479	HEVF-C-033-40375
1/2	1/2	1	3	4	.0628	84480	HEVF-C-020-40500
	1/2	1-1/4	3	4	.0628	84481	HEVF-C-025-40500
	1/2	1-5/8	4	4	.0628	84482	HEVF-C-032-40500
5/8	5/8	1-1/4	3-1/2	4	.0785	84483	HEVF-C-020-40625
	5/8	1-5/8	3-1/2	4	.0785	84484	HEVF-C-026-40625
	5/8	2-1/8	4	4	.0785	84485	HEVF-C-034-40625
3/4	3/4	1	3	4	.0942	84486	HEVF-C-013-40750
	3/4	1-5/8	4	4	.0942	84487	HEVF-C-021-40750
	3/4	2-1/4	5	4	.0942	84488	HEVF-C-030-40750

*.0005 max TIR **Theoretical radius for use when programming in CAM software

Visit www.helicaltool.com to download precise Simulation Files for all Feed Mills.

In the absence of a Simulation File, use the Theoretical Radius to approximate Helical's feed mills as corner radius end mills within your CAM software.



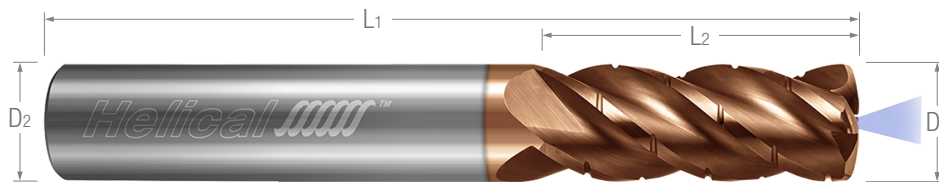
HEVFC-C-4



New!

COMBINATION FEED & HEM - 4 FLUTE Chipbreaker Rougher - Variable Pitch - Coolant Through

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, cast iron, titanium, and titanium alloys
- Combination of specialized end profile and OD geometry for both high feed and High Efficiency Milling (HEM) applications
- 4 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- Center coolant hole for reduced heat, enhanced chip evacuation, and increased material removal rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



	Cutter Dia.* $D_1^{+.000/-0.002}$	Shank Dia. D_2 (h6)	Length of Cut $L_2^{+.032/-0.000}$	Overall Length $L_1^{+.062/-0.062}$	Flutes	Theoretical Radius**	<i>Tplus</i> Coated	Tool Description
new	1/4	1/4	3/8	2	4	.0314	86412	HEVFC-C-015-40250
new		1/4	1/2	2-1/2	4	.0314	86413	HEVFC-C-020-40250
new		1/4	3/4	2-1/2	4	.0314	86414	HEVFC-C-030-40250
new	3/8	3/8	1/2	2	4	.0471	86415	HEVFC-C-013-40375
new		3/8	1	3	4	.0471	86416	HEVFC-C-026-40375
new		3/8	1-1/4	3	4	.0471	86417	HEVFC-C-033-40375
new	1/2	1/2	1	3	4	.0628	86418	HEVFC-C-020-40500
new		1/2	1-1/4	3	4	.0628	86419	HEVFC-C-025-40500
new		1/2	1-5/8	4	4	.0628	86420	HEVFC-C-032-40500
new	5/8	5/8	1-1/4	3-1/2	4	.0785	86421	HEVFC-C-020-40625
new		5/8	1-5/8	3-1/2	4	.0785	86422	HEVFC-C-026-40625
new		5/8	2-1/8	4	4	.0785	86423	HEVFC-C-034-40625
new	3/4	3/4	1	3	4	.0942	86424	HEVFC-C-013-40750
new		3/4	1-5/8	4	4	.0942	86425	HEVFC-C-021-40750
new		3/4	2-1/4	5	4	.0942	86426	HEVFC-C-030-40750

*.0005 max TIR **Theoretical radius for use when programming in CAM software

See page 280 for diagram of theoretical radius

4 Key Benefits of Combination Feed & HEM End Mills

In The Loupe
MACHINISTS BLOG

Machinists have lauded this tool's amazing benefits, including its ability to cut down on part cycle times, address machine limitations, and limit complexity of use, among others. For a full breakdown of this Helical fan-favorite, check out our "In the Loupe" blog post: *4 Key Benefits of Combination Feed & HEM End Mills*



www.harveyperformance.com/in-the-loupe/4-key-benefits-of-combination-feed-hem/

SCAN TO READ



Speeds & Feeds on Page 282

SPEEDS & FEEDS

Combination Feed & HEM - 4 Flute

HEVF-C-4

Combination

HEVF-C-4 / HEVFC-C-4																	
Material Guide		Hardness	SFM	Inches per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0027	.0012	.0040	.0018	.0053	.0024	.0080	.0036	.0107	.0047	.0160	.0067	.0214	.0086
		75 - 98 HRB	445	.0020	.0009	.0030	.0013	.0040	.0018	.0060	.0026	.0080	.0034	.0120	.0049	.0160	.0063
		21 - 36 HRC	400	.0013	.0006	.0020	.0009	.0027	.0011	.0040	.0017	.0053	.0022	.0080	.0032	.0106	.0041
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0027	.0008	.0040	.0011	.0053	.0015	.0080	.0023	.0107	.0030	.0160	.0043	.0214	.0054
		21 - 36 HRC	340	.0027	.0006	.0040	.0009	.0053	.0012	.0080	.0017	.0107	.0022	.0160	.0032	.0214	.0040
		36 - 50 HRC	260	.0020	.0005	.0030	.0007	.0040	.0010	.0060	.0015	.0080	.0019	.0120	.0028	.0160	.0035
		> 50 HRC	155	.0013	.0004	.0020	.0006	.0027	.0008	.0040	.0012	.0053	.0015	.0080	.0022	.0106	.0028
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0027	.0008	.0040	.0011	.0053	.0015	.0080	.0023	.0107	.0030	.0160	.0043	.0214	.0054
		21 - 36 HRC	250	.0027	.0006	.0040	.0009	.0053	.0012	.0080	.0018	.0107	.0024	.0160	.0034	.0214	.0043
		36 - 50 HRC	145	.0020	.0005	.0030	.0007	.0040	.0010	.0060	.0014	.0080	.0019	.0120	.0027	.0160	.0034
		> 50 HRC	85	.0013	.0004	.0020	.0006	.0027	.0008	.0040	.0012	.0053	.0015	.0080	.0022	.0106	.0028
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0027	.0010	.0040	.0015	.0053	.0020	.0080	.0030	.0107	.0039	.0160	.0056	.0214	.0071
		75 - 98 HRB	255	.0027	.0007	.0040	.0010	.0053	.0014	.0080	.0021	.0107	.0027	.0160	.0038	.0214	.0049
		21 - 36 HRC	175	.0027	.0006	.0040	.0009	.0053	.0012	.0080	.0018	.0107	.0024	.0160	.0034	.0214	.0044
		36 - 50 HRC	150	.0020	.0006	.0030	.0008	.0040	.0011	.0060	.0016	.0080	.0021	.0120	.0031	.0160	.0039
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0027	.0008	.0040	.0011	.0053	.0015	.0080	.0022	.0107	.0029	.0160	.0042	.0214	.0053
		21 - 36 HRC	225	.0027	.0007	.0040	.0010	.0053	.0014	.0080	.0020	.0107	.0026	.0160	.0038	.0214	.0048
		36 - 50 HRC	180	.0022	.0006	.0033	.0008	.0043	.0011	.0065	.0016	.0087	.0021	.0130	.0030	.0174	.0038
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0025	.0008	.0038	.0011	.0050	.0016	.0075	.0023	.0100	.0030	.0150	.0043	.0200	.0055
		21 - 36 HRC	280	.0027	.0007	.0040	.0010	.0053	.0013	.0080	.0020	.0107	.0026	.0160	.0037	.0214	.0047
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0025	.0006	.0038	.0008	.0050	.0011	.0075	.0017	.0100	.0022	.0150	.0031	.0200	.0040
		36 - 50 HRC	145	.0020	.0005	.0030	.0007	.0040	.0010	.0060	.0014	.0080	.0019	.0120	.0027	.0160	.0035
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0027	.0013	.0040	.0019	.0053	.0025	.0080	.0037	.0107	.0048	.0160	.0069	.0214	.0088
		21 - 36 HRC	370	.0027	.0007	.0040	.0010	.0053	.0013	.0080	.0020	.0107	.0026	.0160	.0038	.0214	.0048
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0027	.0008	.0040	.0012	.0053	.0016	.0080	.0023	.0107	.0031	.0160	.0044	.0214	.0056
		21 - 36 HRC	335	.0027	.0007	.0040	.0010	.0053	.0014	.0080	.0020	.0107	.0026	.0160	.0038	.0214	.0048
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0027	.0008	.0040	.0012	.0053	.0016	.0080	.0024	.0107	.0032	.0160	.0046	.0214	.0058
		21 - 36 HRC	260	.0027	.0006	.0040	.0008	.0053	.0011	.0080	.0016	.0107	.0021	.0160	.0030	.0214	.0039
		36 - 50 HRC	135	.0013	.0004	.0020	.0005	.0027	.0007	.0040	.0010	.0053	.0013	.0080	.0019	.0106	.0024
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0027	.0011	.0040	.0016	.0053	.0021	.0080	.0031	.0107	.0041	.0160	.0059	.0214	.0075
		75 - 98 HRB	250	.0027	.0009	.0040	.0013	.0053	.0018	.0080	.0026	.0107	.0034	.0160	.0049	.0214	.0063
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0027	.0005	.0040	.0008	.0053	.0011	.0080	.0016	.0107	.0021	.0160	.0030	.0214	.0038
		21 - 36 HRC	75	.0027	.0005	.0040	.0008	.0053	.0010	.0080	.0015	.0107	.0020	.0160	.0029	.0214	.0036
		36 - 50 HRC	70	.0022	.0005	.0033	.0007	.0043	.0009	.0065	.0013	.0087	.0017	.0130	.0025	.0174	.0031
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0027	.0015	.0040	.0022	.0053	.0029	.0080	.0043	.0107	.0057	.0160	.0081	.0214	.0103
		75 - 98 HRB	275	.0027	.0012	.0040	.0018	.0053	.0024	.0080	.0036	.0107	.0047	.0160	.0068	.0214	.0087
		21 - 36 HRC	250	.0027	.0009	.0040	.0014	.0053	.0018	.0080	.0027	.0107	.0036	.0160	.0051	.0214	.0065
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0027	.0007	.0040	.0011	.0053	.0014	.0080	.0021	.0107	.0028	.0160	.0040	.0214	.0051
		36 - 50 HRC	160	.0025	.0007	.0038	.0010	.0050	.0013	.0075	.0020	.0100	.0026	.0150	.0037	.0200	.0047
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0020	.0006	.0030	.0009	.0040	.0012	.0060	.0018	.0080	.0024	.0120	.0034	.0160	.0043
		21 - 36 HRC	170	.0027	.0006	.0040	.0009	.0053	.0012	.0080	.0017	.0107	.0023	.0160	.0033	.0214	.0042
		36 - 50 HRC	65	.0020	.0004	.0030	.0006	.0040	.0008	.0060	.0012	.0080	.0016	.0120	.0022	.0160	.0028

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	3.00%-5.00% Diameter	100% Diameter
	≥ 35 HRC	2.50%-4.00% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	25%-35% Diameter

NOTES:
 IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

HEVF-C-5



New Items!

COMBINATION FEED & HEM - 5 FLUTE

Chipbreaker Rougher - Variable Pitch

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, cast iron, titanium, and titanium alloys.
- Combination of specialized end profile and OD geometry for both high feed and HEM applications
- 5 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure

- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA



new

new

new

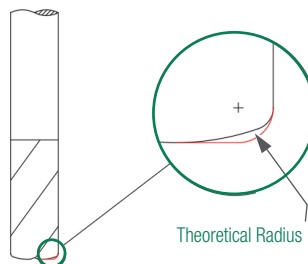
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Cutter Dia.* $D_1^{+.000^*}_{-.002^*}$	Shank Dia. D_2 (h6)	Length of Cut $L_2^{+.032^*}_{-.000^*}$	Overall Length $L_1^{+.062^*}_{-.062^*}$	Flutes	Theoretical Radius**	<i>Tplus</i> Coated	Tool Description
1/4	1/4	3/8	2	5	.0314	84489	HEVF-C-015-50250
	1/4	1/2	2-1/2	5	.0314	84490	HEVF-C-020-50250
	1/4	3/4	2-1/2	5	.0314	84491	HEVF-C-030-50250
	1/4	1	3	5	.0314	87283	HEVF-C-040-50250
3/8	3/8	1/2	2	5	.0471	84492	HEVF-C-013-50375
	3/8	1	3	5	.0471	84493	HEVF-C-026-50375
	3/8	1-1/4	3	5	.0471	84494	HEVF-C-033-50375
	3/8	1-1/2	3-1/2	5	.0471	87284	HEVF-C-040-50375
1/2	1/2	5/8	2-1/2	5	.0628	87285	HEVF-C-012-50500
	1/2	1	3	5	.0628	84495	HEVF-C-020-50500
	1/2	1-1/4	3	5	.0628	84496	HEVF-C-025-50500
	1/2	1-5/8	4	5	.0628	84497	HEVF-C-032-50500
	1/2	2	4	5	.0628	87286	HEVF-C-040-50500
5/8	5/8	1-1/4	3-1/2	5	.0785	84498	HEVF-C-020-50625
	5/8	1-5/8	3-1/2	5	.0785	84499	HEVF-C-026-50625
	5/8	2-1/8	4	5	.0785	84500	HEVF-C-034-50625
3/4	3/4	1	3	5	.0942	84501	HEVF-C-013-50750
	3/4	1-5/8	4	5	.0942	84502	HEVF-C-021-50750
	3/4	2-1/4	5	5	.0942	84503	HEVF-C-030-50750

*.0005 max TIR **Theoretical radius for use when programming in CAM software

Visit www.helicaltool.com to download precise Simulation Files for all Feed Mills.

In the absence of a Simulation File, use the Theoretical Radius to approximate Helical's feed mills as corner radius end mills within your CAM software.



COMBINATION FEED & HEM - 5 FLUTE

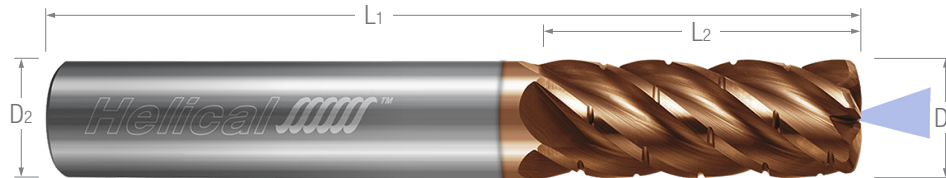
New!



HEVFC-C-5

Chipbreaker Rougher - Variable Pitch - Coolant Through

- Offers outstanding performance and high temperature resistance in a wide range of ferrous materials, including low and medium alloy steels, tool steels, cast iron, titanium, and titanium alloys
- Combination of specialized end profile and OD geometry for both high feed and High Efficiency Milling (HEM) applications
- 5 flute variable pitch and offset chipbreaker geometry for optimal chip evacuation, minimized harmonics, and reduced tool pressure
- Center coolant hole for reduced heat, enhanced chip evacuation, and increased material removal rates
- End cutting geometry (non-center cutting)
- h6 shank tolerance for high precision tool holders
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- Solid carbide
- CNC ground in the USA

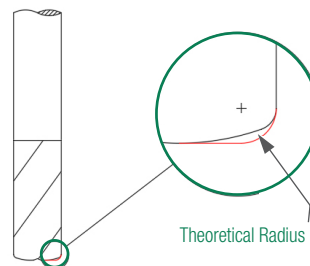


Cutter Dia.* D1 ^{+0.000"} / _{-.002"}	Shank Dia. D2 (h6)	Length of Cut L2 ^{+0.032"} / _{-.000"}	Overall Length L1 ^{+0.062"} / _{-.062"}	Flutes	Theoretical Radius**	Tplus Coated	Tool Description	
1/4	1/4	3/8	2	5	.0314	86427	HEVFC-C-015-50250	new
	1/4	1/2	2-1/2	5	.0314	86428	HEVFC-C-020-50250	new
	1/4	3/4	2-1/2	5	.0314	86429	HEVFC-C-030-50250	new
3/8	3/8	1/2	2	5	.0471	86430	HEVFC-C-013-50375	new
	3/8	1	3	5	.0471	86431	HEVFC-C-026-50375	new
	3/8	1-1/4	3	5	.0471	86432	HEVFC-C-033-50375	new
1/2	1/2	1	3	5	.0628	86433	HEVFC-C-020-50500	new
	1/2	1-1/4	3	5	.0628	86434	HEVFC-C-025-50500	new
	1/2	1-5/8	4	5	.0628	86435	HEVFC-C-032-50500	new
5/8	5/8	1-1/4	3-1/2	5	.0785	86436	HEVFC-C-020-50625	new
	5/8	1-5/8	3-1/2	5	.0785	86437	HEVFC-C-026-50625	new
	5/8	2-1/8	4	5	.0785	86438	HEVFC-C-034-50625	new
3/4	3/4	1	3	5	.0942	86439	HEVFC-C-013-50750	new
	3/4	1-5/8	4	5	.0942	86440	HEVFC-C-021-50750	new
	3/4	2-1/4	5	5	.0942	86441	HEVFC-C-030-50750	new

* .0005 max TIR **Theoretical radius for use when programming in CAM software

Visit www.helicaltool.com to download precise Simulation Files for all Feed Mills.

In the absence of a Simulation File, use the Theoretical Radius to approximate Helical's feed mills as corner radius end mills within your CAM software.



HEVF-C-5

SPEEDS & FEEDS
Combination Feed & End Mill - 5 Flute

HEVF-C-5 / HEVFC-C-5

Material Guide		Hardness	SFM	Inches Per Tooth (IPT)													
				1/8		3/16		1/4		3/8		1/2		3/4		1	
				Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh	Slot	Rgh
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0027	.0015	.0040	.0021	.0053	.0029	.0080	.0043	.0107	.0056	.0160	.0080	.0214	.0102
		75 - 98 HRB	445	.0020	.0011	.0030	.0015	.0040	.0021	.0060	.0031	.0080	.0041	.0120	.0059	.0160	.0075
		21 - 36 HRC	400	.0013	.0007	.0020	.0010	.0027	.0014	.0040	.0020	.0053	.0026	.0080	.0038	.0106	.0048
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0027	.0009	.0040	.0013	.0053	.0018	.0080	.0027	.0107	.0035	.0160	.0051	.0214	.0065
		21 - 36 HRC	340	.0027	.0007	.0040	.0010	.0053	.0013	.0080	.0020	.0107	.0026	.0160	.0038	.0214	.0048
		36 - 50 HRC	260	.0020	.0006	.0030	.0009	.0040	.0012	.0060	.0017	.0080	.0023	.0120	.0033	.0160	.0042
TOOL STEEL	A2, H13, L6, P20, S7	> 50 HRC	155	.0013	.0005	.0020	.0007	.0027	.0009	.0040	.0014	.0053	.0018	.0080	.0026	.0106	.0033
		75 - 98 HRB	340	.0027	.0009	.0040	.0013	.0053	.0018	.0080	.0027	.0107	.0035	.0160	.0051	.0214	.0065
		21 - 36 HRC	250	.0027	.0007	.0040	.0011	.0053	.0015	.0080	.0022	.0107	.0028	.0160	.0040	.0214	.0051
SPECIALTY STEEL	A2, H13, L6, P20, S7	36 - 50 HRC	145	.0020	.0006	.0030	.0008	.0040	.0011	.0060	.0017	.0080	.0022	.0120	.0031	.0160	.0040
		> 50 HRC	85	.0013	.0005	.0020	.0007	.0027	.0009	.0040	.0014	.0053	.0018	.0080	.0026	.0106	.0033
		< 75 HRB	290	.0027	.0012	.0040	.0018	.0053	.0024	.0080	.0035	.0107	.0046	.0160	.0066	.0214	.0085
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0027	.0009	.0040	.0013	.0053	.0018	.0080	.0026	.0107	.0034	.0160	.0049	.0214	.0063
		21 - 36 HRC	225	.0027	.0008	.0040	.0012	.0053	.0016	.0080	.0024	.0107	.0031	.0160	.0044	.0214	.0057
		36 - 50 HRC	180	.0022	.0007	.0033	.0009	.0043	.0013	.0065	.0019	.0087	.0025	.0130	.0036	.0174	.0045
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0025	.0009	.0038	.0013	.0050	.0018	.0075	.0027	.0100	.0035	.0150	.0051	.0200	.0065
		21 - 36 HRC	280	.0027	.0008	.0040	.0012	.0053	.0016	.0080	.0024	.0107	.0031	.0160	.0044	.0214	.0056
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0025	.0007	.0038	.0010	.0050	.0013	.0075	.0020	.0100	.0026	.0150	.0037	.0200	.0048
		36 - 50 HRC	145	.0020	.0006	.0030	.0009	.0040	.0012	.0060	.0017	.0080	.0023	.0120	.0032	.0160	.0041
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0027	.0015	.0040	.0022	.0053	.0029	.0080	.0044	.0107	.0057	.0160	.0082	.0214	.0104
		21 - 36 HRC	370	.0027	.0008	.0040	.0012	.0053	.0016	.0080	.0024	.0107	.0031	.0160	.0045	.0214	.0057
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0027	.0010	.0040	.0014	.0053	.0019	.0080	.0028	.0107	.0036	.0160	.0052	.0214	.0066
		21 - 36 HRC	335	.0027	.0008	.0040	.0012	.0053	.0016	.0080	.0024	.0107	.0031	.0160	.0045	.0214	.0057
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0027	.0010	.0040	.0014	.0053	.0020	.0080	.0029	.0107	.0038	.0160	.0054	.0214	.0069
		21 - 36 HRC	260	.0027	.0007	.0040	.0010	.0053	.0013	.0080	.0019	.0107	.0025	.0160	.0036	.0214	.0046
		36 - 50 HRC	135	.0013	.0004	.0020	.0006	.0027	.0008	.0040	.0012	.0053	.0016	.0080	.0023	.0106	.0029
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0027	.0013	.0040	.0018	.0053	.0025	.0080	.0037	.0107	.0049	.0160	.0070	.0214	.0089
		75 - 98 HRB	250	.0027	.0011	.0040	.0015	.0053	.0021	.0080	.0031	.0107	.0041	.0160	.0058	.0214	.0074
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0027	.0006	.0040	.0009	.0053	.0013	.0080	.0019	.0107	.0025	.0160	.0035	.0214	.0045
		21 - 36 HRC	75	.0027	.0006	.0040	.0009	.0053	.0012	.0080	.0018	.0107	.0024	.0160	.0034	.0214	.0043
		36 - 50 HRC	70	.0022	.0005	.0033	.0008	.0043	.0010	.0065	.0015	.0087	.0020	.0130	.0029	.0174	.0037
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0027	.0017	.0040	.0025	.0053	.0035	.0080	.0051	.0107	.0067	.0160	.0096	.0214	.0122
		75 - 98 HRB	275	.0027	.0015	.0040	.0021	.0053	.0029	.0080	.0043	.0107	.0056	.0160	.0081	.0214	.0103
		21 - 36 HRC	250	.0027	.0011	.0040	.0016	.0053	.0022	.0080	.0032	.0107	.0042	.0160	.0060	.0214	.0077
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0027	.0009	.0040	.0013	.0053	.0017	.0080	.0025	.0107	.0033	.0160	.0048	.0214	.0061
		36 - 50 HRC	160	.0025	.0008	.0038	.0012	.0050	.0016	.0075	.0023	.0100	.0030	.0150	.0043	.0200	.0055
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0020	.0007	.0030	.0011	.0040	.0015	.0060	.0021	.0080	.0028	.0120	.0040	.0160	.0051
		21 - 36 HRC	170	.0027	.0007	.0040	.0010	.0053	.0014	.0080	.0021	.0107	.0027	.0160	.0039	.0214	.0050
		36 - 50 HRC	65	.0020	.0005	.0030	.0007	.0040	.0010	.0060	.0014	.0080	.0018	.0120	.0026	.0160	.0034

Combination

MILLING PROCESS	HARDNESS	ADOC	RDOC
Slot (Full Slotting)	< 35 HRC	3.00%-5.00% Diameter	100% Diameter
	≥ 35 HRC	2.50%-4.00% Diameter	100% Diameter
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	15%-30% Diameter
	≥ 35 HRC	Up to Max LOC	10%-20% Diameter

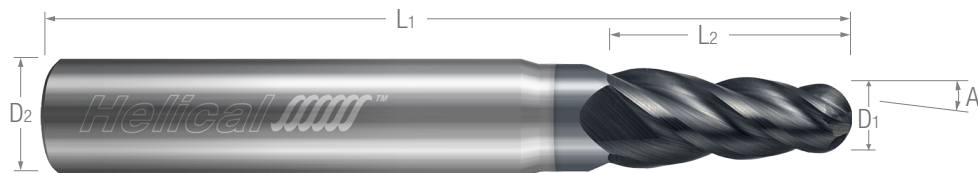
Note: IPT values shown are for 2.5xD length of cut tools, and should be adjusted for longer or shorter lengths of cut. For more accurate running parameters, please refer to Machining Advisor Pro.

TAPERED END MILLS - 4 FLUTE

HTPR-4

Ball - Variable Pitch

- Tapered profile designed for use in mold and die pockets and other tapered wall applications
- Engineered for excellent performance in light profiling and finishing applications
- 4 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Angle Per Side A1 ^{+0°30'} -0°30'	Cutter Diameter D1 ^{+0.000"} -0.002"	Shank Diameter D2 (h6)	Length of Cut L2	Overall Length L1 ^{+0.062"} -0.062"	Flutes	Aplus Coated	Tool Description
0.5°	1/8	3/16	3/8	2	4	84870	HTPR005-030-40125-BN
	1/8	3/16	5/8	2	4	84888	HTPR005-050-40125-BN
	3/16	1/4	5/8	2-1/2	4	84876	HTPR005-033-40187-BN
	3/16	1/4	1	2-1/2	4	84894	HTPR005-053-40187-BN
	1/4	5/16	3/4	2-1/2	4	84882	HTPR005-030-40250-BN
	1/4	5/16	1-1/4	3	4	84900	HTPR005-050-40250-BN
1°	1/8	3/16	3/8	2	4	84871	HTPR010-030-40125-BN
	1/8	3/16	5/8	2	4	84889	HTPR010-050-40125-BN
	3/16	1/4	5/8	2-1/2	4	84877	HTPR010-033-40187-BN
	3/16	1/4	1	2-1/2	4	84895	HTPR010-053-40187-BN
	1/4	5/16	3/4	2-1/2	4	84883	HTPR010-030-40250-BN
	1/4	5/16	1-1/4	3	4	84901	HTPR010-050-40250-BN
1.5°	1/8	3/16	3/8	2	4	84872	HTPR015-030-40125-BN
	1/8	3/16	5/8	2	4	84890	HTPR015-050-40125-BN
	3/16	1/4	5/8	2-1/2	4	84878	HTPR015-033-40187-BN
	3/16	1/4	1	2-1/2	4	84896	HTPR015-053-40187-BN
	1/4	5/16	3/4	2-1/2	4	84884	HTPR015-030-40250-BN
	1/4	3/8	1-1/4	3	4	84902	HTPR015-050-40250-BN
2°	1/8	3/16	3/8	2	4	84873	HTPR020-030-40125-BN
	1/8	3/16	5/8	2	4	84891	HTPR020-050-40125-BN
	3/16	1/4	5/8	2-1/2	4	84879	HTPR020-033-40187-BN
	3/16	5/16	1	2-1/2	4	84897	HTPR020-053-40187-BN
	1/4	5/16	3/4	2-1/2	4	84885	HTPR020-030-40250-BN
	1/4	3/8	1-1/4	3	4	84903	HTPR020-050-40250-BN
3°	1/8	3/16	3/8	2	4	84874	HTPR030-030-40125-BN
	1/8	1/4	5/8	2	4	84892	HTPR030-050-40125-BN
	3/16	5/16	5/8	2-1/2	4	84880	HTPR030-033-40187-BN
	3/16	5/16	1	2-1/2	4	84898	HTPR030-053-40187-BN
	1/4	3/8	3/4	2-1/2	4	84886	HTPR030-030-40250-BN
	1/4	1/2	1-1/4	3	4	84904	HTPR030-050-40250-BN
5°	1/8	1/4	3/8	2	4	84875	HTPR050-030-40125-BN
	1/8	1/4	5/8	2	4	84893	HTPR050-050-40125-BN
	3/16	5/16	5/8	2-1/2	4	84881	HTPR050-033-40187-BN
	3/16	3/8	1	2-1/2	4	84899	HTPR050-053-40187-BN
	1/4	1/2	3/4	2-1/2	4	84887	HTPR050-030-40250-BN
	1/4	1/2	1-1/4	3	4	84905	HTPR050-050-40250-BN

HTPR-4

SPEEDS & FEEDS

Tapered End Mill - 4 Flute - Ball - Variable Pitch

Tapered Mills

HTPR-4													
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)									
				1/8		3/16		1/4		3/8		1/2	
				Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0012	.0016	.0018	.0019	.0024	.0021	.0036	.0024	.0047	.0028
		75 - 98 HRB	445	.0009	.0014	.0013	.0016	.0018	.0018	.0026	.0021	.0034	.0024
		21 - 36 HRC	400	.0006	.0011	.0009	.0013	.0011	.0014	.0017	.0017	.0022	.0019
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0008	.0013	.0011	.0015	.0015	.0017	.0023	.0019	.0030	.0023
		21 - 36 HRC	340	.0006	.0011	.0009	.0013	.0012	.0014	.0017	.0017	.0022	.0019
		36 - 50 HRC	260	.0005	.0011	.0007	.0012	.0010	.0013	.0015	.0016	.0019	.0018
		> 50 HRC	155	.0004	.0009	.0006	.0010	.0008	.0012	.0012	.0014	.0015	.0016
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0008	.0013	.0011	.0015	.0015	.0017	.0023	.0019	.0030	.0023
		21 - 36 HRC	250	.0006	.0012	.0009	.0013	.0012	.0015	.0018	.0017	.0024	.0020
		36 - 50 HRC	145	.0005	.0010	.0007	.0012	.0010	.0013	.0014	.0015	.0019	.0018
		> 50 HRC	85	.0004	.0009	.0006	.0010	.0008	.0012	.0012	.0014	.0015	.0016
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0010	.0015	.0015	.0017	.0020	.0019	.0030	.0022	.0039	.0026
		75 - 98 HRB	255	.0007	.0012	.0010	.0014	.0014	.0016	.0021	.0018	.0027	.0021
		21 - 36 HRC	175	.0006	.0012	.0009	.0013	.0012	.0015	.0018	.0017	.0024	.0020
		36 - 50 HRC	150	.0006	.0011	.0008	.0012	.0011	.0014	.0016	.0016	.0021	.0019
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-TMO, 316, 316L, 321, 347	75 - 98 HRB	265	.0008	.0013	.0011	.0015	.0015	.0017	.0022	.0019	.0029	.0022
		21 - 36 HRC	225	.0007	.0012	.0010	.0014	.0014	.0016	.0020	.0018	.0026	.0021
		36 - 50 HRC	180	.0006	.0011	.0008	.0012	.0011	.0014	.0016	.0016	.0021	.0019
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0008	.0013	.0011	.0015	.0016	.0017	.0023	.0019	.0030	.0023
		21 - 36 HRC	280	.0007	.0012	.0010	.0014	.0013	.0016	.0020	.0018	.0026	.0021
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0006	.0011	.0008	.0012	.0011	.0014	.0017	.0016	.0022	.0019
		36 - 50 HRC	145	.0005	.0011	.0007	.0012	.0010	.0014	.0014	.0015	.0019	.0018
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0013	.0017	.0019	.0019	.0025	.0021	.0037	.0025	.0048	.0029
		21 - 36 HRC	370	.0007	.0012	.0010	.0014	.0013	.0016	.0020	.0018	.0026	.0021
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0008	.0013	.0012	.0015	.0016	.0017	.0023	.0019	.0031	.0023
		21 - 36 HRC	335	.0007	.0012	.0010	.0014	.0014	.0016	.0020	.0018	.0026	.0021
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0008	.0014	.0012	.0015	.0016	.0017	.0024	.0020	.0032	.0023
		21 - 36 HRC	260	.0006	.0011	.0008	.0012	.0011	.0014	.0016	.0016	.0021	.0019
		36 - 50 HRC	135	.0004	.0009	.0005	.0010	.0007	.0011	.0010	.0013	.0013	.0015
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0011	.0015	.0016	.0017	.0021	.0020	.0031	.0023	.0041	.0026
		75 - 98 HRB	250	.0009	.0014	.0013	.0016	.0018	.0018	.0026	.0021	.0034	.0024
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0005	.0011	.0008	.0012	.0011	.0014	.0016	.0016	.0021	.0019
		21 - 36 HRC	75	.0005	.0011	.0008	.0012	.0010	.0014	.0015	.0016	.0020	.0018
		36 - 50 HRC	70	.0005	.0010	.0007	.0011	.0009	.0013	.0013	.0015	.0017	.0017
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0015	.0018	.0022	.0020	.0029	.0023	.0043	.0027	.0057	.0031
		75 - 98 HRB	275	.0012	.0017	.0018	.0019	.0024	.0021	.0036	.0024	.0047	.0028
		21 - 36 HRC	250	.0009	.0014	.0014	.0016	.0018	.0018	.0027	.0021	.0036	.0025
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0007	.0013	.0011	.0014	.0014	.0016	.0021	.0019	.0028	.0022
		36 - 50 HRC	160	.0007	.0012	.0010	.0014	.0013	.0016	.0020	.0018	.0026	.0021
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0006	.0012	.0009	.0013	.0012	.0015	.0018	.0017	.0024	.0020
		21 - 36 HRC	170	.0006	.0011	.0009	.0013	.0012	.0015	.0017	.0017	.0023	.0020
		36 - 50 HRC	65	.0004	.0009	.0006	.0011	.0008	.0012	.0012	.0014	.0016	.0016

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	25%-35% Diameter
Fin (Finishing)	< 35 HRC	Up to Max LOC	4%-6% Diameter
	≥ 35 HRC	Up to Max LOC	4%-6% Diameter

Note: Speed (SFM) and feed (IPT) numbers shown in table above are considered to be average values. Use a tolerance of +/-25% as needed.

Effective cutter diameter should be used to select the proper chipload per tooth.

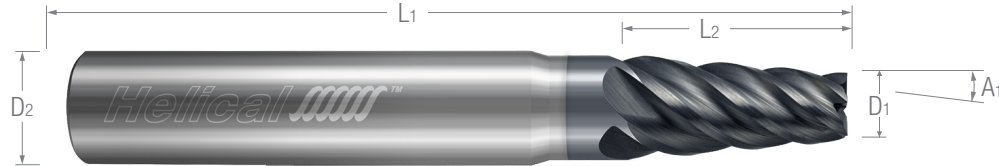
TAPERED END MILLS - 5 FLUTE

HTPR-5

Square - Variable Pitch

Tapered Mills

- Tapered profile designed for use in mold and die pockets and other tapered wall applications
- Engineered for excellent performance in light profiling and finishing applications
- 5 flute variable pitch design for reduced harmonics and increased feed rates
- Center cutting
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Angle Per Side $A_1 \begin{smallmatrix} +0^\circ30' \\ -0^\circ30' \end{smallmatrix}$	Cutter Dia. $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter $D_2 (h6)$	Length of Cut L_2	Overall Length $L_1 \begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	<i>Aplus</i> Coated	Tool Description
0.5°	1/8	3/16	3/8	2	5	84906	HTPR005-030-50125
	1/8	3/16	5/8	2	5	84924	HTPR005-050-50125
	3/16	1/4	5/8	2-1/2	5	84912	HTPR005-033-50187
	3/16	1/4	1	2-1/2	5	84930	HTPR005-053-50187
	1/4	5/16	3/4	2-1/2	5	84918	HTPR005-030-50250
	1/4	5/16	1-1/4	3	5	84936	HTPR005-050-50250
1°	1/8	3/16	3/8	2	5	84907	HTPR010-030-50125
	1/8	3/16	5/8	2	5	84925	HTPR010-050-50125
	3/16	1/4	5/8	2-1/2	5	84913	HTPR010-033-50187
	3/16	1/4	1	2-1/2	5	84931	HTPR010-053-50187
	1/4	5/16	3/4	2-1/2	5	84919	HTPR010-030-50250
	1/4	5/16	1-1/4	3	5	84937	HTPR010-050-50250
1.5°	1/8	3/16	3/8	2	5	84908	HTPR015-030-50125
	1/8	3/16	5/8	2	5	84926	HTPR015-050-50125
	3/16	1/4	5/8	2-1/2	5	84914	HTPR015-033-50187
	3/16	1/4	1	2-1/2	5	84932	HTPR015-053-50187
	1/4	5/16	3/4	2-1/2	5	84920	HTPR015-030-50250
	1/4	3/8	1-1/4	3	5	84938	HTPR015-050-50250
2°	1/8	3/16	3/8	2	5	84909	HTPR020-030-50125
	1/8	3/16	5/8	2	5	84927	HTPR020-050-50125
	3/16	1/4	5/8	2-1/2	5	84915	HTPR020-033-50187
	3/16	5/16	1	2-1/2	5	84933	HTPR020-053-50187
	1/4	5/16	3/4	2-1/2	5	84921	HTPR020-030-50250
	1/4	3/8	1-1/4	3	5	84939	HTPR020-050-50250
3°	1/8	3/16	3/8	2	5	84910	HTPR030-030-50125
	1/8	1/4	5/8	2	5	84928	HTPR030-050-50125
	3/16	5/16	5/8	2-1/2	5	84916	HTPR030-033-50187
	3/16	5/16	1	2-1/2	5	84934	HTPR030-053-50187
	1/4	3/8	3/4	2-1/2	5	84922	HTPR030-030-50250
	1/4	1/2	1-1/4	3	5	84940	HTPR030-050-50250
5°	1/8	1/4	3/8	2	5	84911	HTPR050-030-50125
	1/8	1/4	5/8	2	5	84929	HTPR050-050-50125
	3/16	5/16	5/8	2-1/2	5	84917	HTPR050-033-50187
	3/16	3/8	1	2-1/2	5	84935	HTPR050-053-50187
	1/4	1/2	3/4	2-1/2	5	84923	HTPR050-030-50250
	1/4	1/2	1-1/4	3	5	84941	HTPR050-050-50250

HTPR-5

SPEEDS & FEEDS

Tapered End Mill - 5 Flute - Square - Variable Pitch

Tapered Mills

HTPR-5													
Material Guide	Hardness	SFM	Inches Per Tooth (IPT)										
			1/8		3/16		1/4		3/8		1/2		
			Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	Rgh	Fin	
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0015	.0018	.0021	.0020	.0029	.0022	.0043	.0026	.0056	.0030
		75 - 98 HRB	445	.0011	.0015	.0015	.0017	.0021	.0019	.0031	.0022	.0041	.0026
		21 - 36 HRC	400	.0007	.0012	.0010	.0014	.0014	.0015	.0020	.0018	.0026	.0021
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0009	.0014	.0013	.0016	.0018	.0018	.0027	.0021	.0035	.0024
		21 - 36 HRC	340	.0007	.0012	.0010	.0013	.0013	.0015	.0020	.0018	.0026	.0021
		36 - 50 HRC	260	.0006	.0011	.0009	.0013	.0012	.0014	.0017	.0017	.0023	.0019
		> 50 HRC	155	.0005	.0010	.0007	.0011	.0009	.0013	.0014	.0015	.0018	.0017
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0009	.0014	.0013	.0016	.0018	.0018	.0027	.0021	.0035	.0024
		21 - 36 HRC	250	.0007	.0012	.0011	.0014	.0015	.0016	.0022	.0018	.0028	.0021
		36 - 50 HRC	145	.0006	.0011	.0008	.0012	.0011	.0014	.0017	.0016	.0022	.0019
		> 50 HRC	85	.0005	.0010	.0007	.0011	.0009	.0013	.0014	.0015	.0018	.0017
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0012	.0016	.0018	.0018	.0024	.0020	.0035	.0024	.0046	.0028
		75 - 98 HRB	255	.0008	.0013	.0012	.0015	.0016	.0017	.0024	.0019	.0032	.0023
		21 - 36 HRC	175	.0008	.0013	.0011	.0014	.0015	.0016	.0022	.0019	.0029	.0021
		36 - 50 HRC	150	.0007	.0012	.0010	.0013	.0013	.0015	.0019	.0017	.0026	.0020
		> 50 HRC	55	.0004	.0009	.0006	.0010	.0008	.0012	.0012	.0014	.0016	.0016
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0009	.0014	.0013	.0016	.0018	.0018	.0026	.0020	.0034	.0024
		21 - 36 HRC	225	.0008	.0013	.0012	.0015	.0016	.0017	.0024	.0019	.0031	.0023
		36 - 50 HRC	180	.0007	.0012	.0009	.0013	.0013	.0015	.0019	.0017	.0025	.0020
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0009	.0014	.0013	.0016	.0018	.0018	.0027	.0021	.0035	.0024
		21 - 36 HRC	280	.0008	.0013	.0012	.0015	.0016	.0017	.0024	.0019	.0031	.0022
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0007	.0012	.0010	.0013	.0013	.0015	.0020	.0018	.0026	.0021
		36 - 50 HRC	145	.0006	.0011	.0009	.0013	.0012	.0014	.0017	.0016	.0023	.0019
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0015	.0018	.0022	.0020	.0029	.0023	.0044	.0026	.0057	.0030
		21 - 36 HRC	370	.0008	.0013	.0012	.0015	.0016	.0017	.0024	.0019	.0031	.0022
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0010	.0014	.0014	.0016	.0019	.0018	.0028	.0021	.0036	.0024
		21 - 36 HRC	335	.0008	.0013	.0012	.0015	.0016	.0017	.0024	.0019	.0031	.0022
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0010	.0015	.0014	.0016	.0020	.0018	.0029	.0021	.0038	.0025
		21 - 36 HRC	260	.0007	.0012	.0010	.0013	.0013	.0015	.0019	.0017	.0025	.0020
		36 - 50 HRC	135	.0004	.0009	.0006	.0010	.0008	.0012	.0012	.0014	.0016	.0016
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0013	.0017	.0018	.0019	.0025	.0021	.0037	.0024	.0049	.0028
		75 - 98 HRB	250	.0011	.0015	.0015	.0017	.0021	.0019	.0031	.0022	.0041	.0026
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0006	.0012	.0009	.0013	.0013	.0015	.0019	.0017	.0025	.0020
		21 - 36 HRC	75	.0006	.0012	.0009	.0013	.0012	.0015	.0018	.0017	.0024	.0020
		36 - 50 HRC	70	.0005	.0010	.0008	.0012	.0010	.0014	.0015	.0015	.0020	.0018
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0017	.0019	.0025	.0022	.0035	.0025	.0051	.0028	.0067	.0033
		75 - 98 HRB	275	.0015	.0018	.0021	.0020	.0029	.0023	.0043	.0026	.0056	.0030
		21 - 36 HRC	250	.0011	.0015	.0016	.0017	.0022	.0020	.0032	.0022	.0042	.0026
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0009	.0014	.0013	.0015	.0017	.0017	.0025	.0020	.0033	.0023
		36 - 50 HRC	160	.0008	.0013	.0012	.0015	.0016	.0017	.0023	.0019	.0030	.0022
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0007	.0012	.0011	.0014	.0015	.0016	.0021	.0018	.0028	.0022
		21 - 36 HRC	170	.0007	.0012	.0010	.0014	.0014	.0016	.0021	.0018	.0027	.0021
		36 - 50 HRC	65	.0005	.0010	.0007	.0011	.0010	.0013	.0014	.0015	.0018	.0017

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	25%-35% Diameter
Fin (Finishing)	< 35 HRC	Up to Max LOC	4%-6% Diameter
	≥ 35 HRC	Up to Max LOC	4%-6% Diameter

Note: Speed (SFM) and feed (IPT) numbers shown in table above are considered to be average values. Use a tolerance of +/-25% as needed.

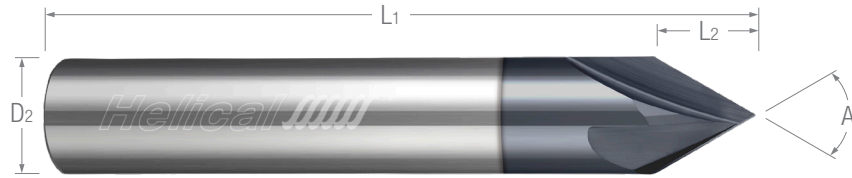
Effective cutter diameter should be used to select the proper chipload per tooth.

CHAMFER MILLS - STRAIGHT FLUTE

HCM

2 & 4 Flute

- Designed for universal chamfering applications
- Offered with 2 and 4 flutes for soft and hard materials
- Ground with positive axial rake and clearance for optimal performance
- h6 shank tolerance for high precision tool holders
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life
- Solid carbide
- CNC ground in the USA



Chamfer Mills

Included Angle	Shank Diameter*	Web Thickness	Length of Cut	Overall Length	Flutes	Uncoated	<i>Aplus</i> Coated	Tool Description
A $+0^{\circ}30'$ $-0^{\circ}30'$	D2 (h6)	(MAX)	L2	L1 $+0.02''$ $-0.02''$				
60°	1/8	.015	.108	2	2	06225	06228	HCM60-20125
	3/16	.018	.162	2	2	06240	06243	HCM60-20187
	3/16	.018	.162	2	4	06330	06333	HCM60-40187
	1/4	.020	.216	2-1/2	2	06255	06258	HCM60-20250
	1/4	.020	.216	2-1/2	4	06345	06348	HCM60-40250
	5/16	.028	.270	2-1/2	2	84772	84773	HCM60-20312
	5/16	.028	.270	2-1/2	4	84774	84775	HCM60-40312
	3/8	.035	.324	2-1/2	2	06270	06273	HCM60-20375
	3/8	.035	.324	2-1/2	4	06360	06363	HCM60-40375
	1/2	.040	.433	3	2	06285	06288	HCM60-20500
	1/2	.040	.433	3	4	06375	06378	HCM60-40500
	5/8	.043	.541	3	2	84780	84781	HCM60-20625
	5/8	.043	.541	3	4	84782	84783	HCM60-40625
	3/4	.045	.649	3	2	84788	84789	HCM60-20750
3/4	.045	.649	3	4	06390	06393	HCM60-40750	
90°	1/8	.015	.062	2	2	06015	06018	HCM90-20125
	3/16	.018	.093	2	2	06030	06033	HCM90-20187
	3/16	.018	.093	2	4	06120	06123	HCM90-40187
	1/4	.020	.125	2-1/2	2	06045	06048	HCM90-20250
	1/4	.020	.125	2-1/2	4	06135	06138	HCM90-40250
	5/16	.028	.156	2-1/2	2	84776	84777	HCM90-20312
	5/16	.028	.156	2-1/2	4	84778	84779	HCM90-40312
	3/8	.035	.187	2-1/2	2	06060	06063	HCM90-20375
	3/8	.035	.187	2-1/2	4	06150	06153	HCM90-40375
	1/2	.040	.250	3	2	06075	06078	HCM90-20500
	1/2	.040	.250	3	4	06165	06168	HCM90-40500
	5/8	.043	.312	3	2	84784	84785	HCM90-20625
	5/8	.043	.312	3	4	84786	84787	HCM90-40625
	3/4	.045	.375	3	2	84790	84791	HCM90-20750
3/4	.045	.375	3	4	06180	06183	HCM90-40750	
120°	1/8	.015	.037	2	2	06405	06408	HCM120-20125
	3/16	.018	.056	2	2	06420	06423	HCM120-20187
	3/16	.018	.056	2	4	06480	06483	HCM120-40187
	1/4	.020	.075	2-1/2	2	06435	06438	HCM120-20250
	1/4	.020	.075	2-1/2	4	06495	06498	HCM120-40250
	3/8	.035	.112	2-1/2	2	06450	06453	HCM120-20375
	3/8	.035	.112	2-1/2	4	06510	06513	HCM120-40375
	1/2	.040	.150	3	2	06465	06468	HCM120-20500
	1/2	.040	.150	3	4	06525	06528	HCM120-40500
	3/4	.045	.225	3	4	06540	06543	HCM120-40750

* .0005 max TIR

HCM

SPEEDS & FEEDS
Chamfer Mills - Straight Flute

HCM												
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)								
				Effective Cutting Diameter (Deff)								
				< .125	≥ .125 < .1875	≥ .1875 < .25	≥ .25 < .3125	≥ .3125 < .375	≥ .375 < .5	≥ .5 < .625	≥ .625 < .75	≥ .75
WROUGHT ALUMINUM ALLOY	2014, 5052, 6061, 7050, 7075, 7475	< 120 HBS	2200	.0009	.0018	.0028	.0035	.0045	.0055	.0070	.0090	.0110
		≥ 120 HBS	2200	.0006	.0012	.0018	.0022	.0028	.0035	.0045	.0055	.0070
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	< 120 HBS	1800	.0012	.0025	.0040	.0050	.0060	.0080	.0100	.0130	.0150
		≥ 120 HBS	1600	.0010	.0020	.0030	.0040	.0050	.0060	.0080	.0100	.0120
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	< 75 HRB	600	.0007	.0015	.0022	.0030	.0035	.0045	.0060	.0070	.0090
		75 - 98 HRB	450	.0007	.0015	.0022	.0028	.0035	.0045	.0055	.0070	.0090
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	450	.0010	.0020	.0030	.0040	.0050	.0060	.0080	.0100	.0120
		75 - 98 HRB	450	.0007	.0015	.0020	.0028	.0035	.0040	.0055	.0070	.0080
		21 - 36 HRC	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	400	.0006	.0012	.0018	.0025	.0030	.0035	.0050	.0060	.0070
		21 - 36 HRC	350	.0005	.0009	.0015	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	200	.0003	.0006	.0010	.0012	.0015	.0020	.0025	.0030	.0040
		> 50 HRC	90	.0002	.0005	.0007	.0010	.0012	.0015	.0020	.0025	.0030
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	325	.0005	.0011	.0018	.0022	.0028	.0035	.0045	.0055	.0070
		21 - 36 HRC	250	.0005	.0009	.0015	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	150	.0003	.0007	.0010	.0012	.0018	.0020	.0028	.0035	.0040
		> 50 HRC	50	.0002	.0005	.0007	.0010	.0012	.0015	.0020	.0025	.0030
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	350	.0006	.0012	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		75 - 98 HRB	400	.0005	.0011	.0015	.0020	.0028	.0030	.0040	.0055	.0060
		21 - 36 HRC	225	.0004	.0009	.0012	.0018	.0022	.0025	.0035	.0045	.0050
		36 - 50 HRC	140	.0004	.0008	.0012	.0015	.0020	.0022	.0030	.0040	.0045
		> 50 HRC	45	.0002	.0005	.0007	.0010	.0012	.0015	.0020	.0025	.0030
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-TMO, 316, 316L, 321, 347	75 - 98 HRB	250	.0004	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		21 - 36 HRC	225	.0004	.0009	.0012	.0018	.0022	.0025	.0035	.0045	.0050
		36 - 50 HRC	175	.0003	.0007	.0010	.0012	.0018	.0020	.0028	.0035	.0040
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	325	.0004	.0008	.0012	.0018	.0020	.0025	.0035	.0040	.0050
		21 - 36 HRC	300	.0005	.0011	.0018	.0022	.0028	.0035	.0045	.0055	.0070
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	225	.0004	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	120	.0003	.0007	.0010	.0012	.0018	.0020	.0028	.0035	.0040
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	450	.0011	.0022	.0035	.0045	.0055	.0070	.0090	.0110	.0130
		21 - 36 HRC	400	.0008	.0015	.0022	.0030	.0040	.0045	.0060	.0080	.0090
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	350	.0007	.0012	.0020	.0028	.0035	.0040	.0055	.0070	.0080
		21 - 36 HRC	300	.0005	.0009	.0015	.0020	.0022	.0028	.0040	.0045	.0055
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	325	.0007	.0012	.0020	.0028	.0035	.0040	.0055	.0070	.0080
		21 - 36 HRC	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060
		36 - 50 HRC	160	.0002	.0005	.0007	.0010	.0012	.0015	.0020	.0025	.0030
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	450	.0008	.0015	.0022	.0030	.0040	.0045	.0060	.0080	.0090
		75 - 98 HRB	450	.0007	.0015	.0020	.0028	.0035	.0040	.0055	.0070	.0080
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	175	.0004	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		21 - 36 HRC	150	.0004	.0008	.0012	.0015	.0020	.0025	.0030	.0040	.0050
		36 - 50 HRC	80	.0004	.0007	.0011	.0015	.0018	.0020	.0028	.0035	.0040
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	350	.0009	.0018	.0028	.0035	.0045	.0055	.0070	.0090	.0110
		75 - 98 HRB	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060
		21 - 36 HRC	350	.0005	.0011	.0015	.0022	.0028	.0030	.0045	.0055	.0060
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	200	.0004	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	140	.0004	.0007	.0010	.0015	.0018	.0022	.0030	.0035	.0045
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	225	.0003	.0006	.0008	.0010	.0015	.0018	.0022	.0028	.0035
		21 - 36 HRC	150	.0004	.0008	.0012	.0018	.0020	.0025	.0035	.0040	.0050
		36 - 50 HRC	80	.0003	.0006	.0010	.0012	.0015	.0020	.0025	.0030	.0040

NOTES:

Speed (SFM) and feed (IPT) numbers shown in the table above are considered to be average values. Use a tolerance of ± 25% as needed.

Hardness Scales: HBS = Brinell (500-kgf steel ball)

HRB = Rockwell B

HRC = Rockwell C

CHAMFER MILLS - HELICAL FLUTE

HPCM

2 & 4 Flute - High Performance - Pointed

- Helically ground with positive axial rake and clearance for high performance chamfering
- Helical flute geometry results in superior part finish
- Pointed tip for precise applications and detailed workpieces
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance
- *Aplus* coating for added lubricity and higher speeds and feeds in a wide variety of ferrous metals and titanium alloys
- Solid carbide
- CNC ground in the USA



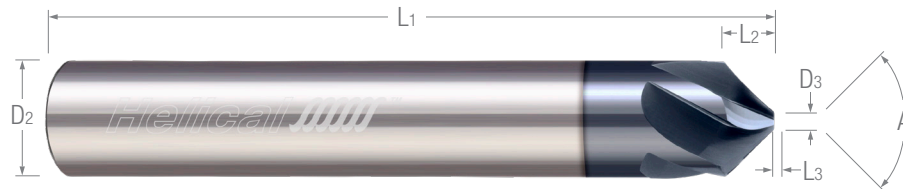
Incl. Angle A <small>+0°30'</small> <small>-0°30'</small>	Shank Dia.* D ₂ (h6)	LOC L ₂	Overall Length L ₁ <small>+0.062"</small> <small>-0.062"</small>	Web Thickness (MAX)	Flutes	Zplus Coated	Aplus Coated	Tool Description
60°	1/8	.100	1-1/2	.010	2	83836	83780	HPCM60-20125
	3/16	.154	2	.010	2	83838	83782	HPCM60-20187
	3/16	.154	2	.010	4		83784	HPCM60-40187
	1/4	.208	2-1/2	.010	2	83840	83786	HPCM60-20250
	1/4	.208	2-1/2	.010	4		83788	HPCM60-40250
	3/8	.316	2-1/2	.010	2	83842	83790	HPCM60-20375
	3/8	.316	2-1/2	.010	4		83792	HPCM60-40375
	1/2	.424	3	.010	2	83844	83794	HPCM60-20500
	1/2	.424	3	.010	4		83796	HPCM60-40500
90°	1/8	.058	1-1/2	.010	2	83846	83798	HPCM90-20125
	1/8	.058	1-1/2	.010	4		83800	HPCM90-40125
	3/16	.089	2	.010	2	83848	83802	HPCM90-20187
	3/16	.089	2	.010	4		83804	HPCM90-40187
	1/4	.120	2-1/2	.010	2	83850	83806	HPCM90-20250
	1/4	.120	2-1/2	.010	4		83808	HPCM90-40250
	3/8	.183	2-1/2	.010	2	83852	83810	HPCM90-20375
	3/8	.183	2-1/2	.010	4		83812	HPCM90-40375
	1/2	.245	3	.010	2	83854	83814	HPCM90-20500
	1/2	.245	3	.010	4		83816	HPCM90-40500
120°	1/8	.033	1-1/2	.010	2	83856	83818	HPCM120-20125
	3/16	.051	2	.010	2	83858	83820	HPCM120-20187
	3/16	.051	2	.010	4		83822	HPCM120-40187
	1/4	.069	2-1/2	.010	2	83860	83824	HPCM120-20250
	1/4	.069	2-1/2	.010	4		83826	HPCM120-40250
	3/8	.105	2-1/2	.010	2	83862	83828	HPCM120-20375
	3/8	.105	2-1/2	.010	4		83830	HPCM120-40375
		1/2	.141	3	.010	2	83864	83832
	1/2	.141	3	.010	4		83834	HPCM120-40500

* .0005 max TIR

HPCM

CHAMFER MILLS - HELICAL FLUTE
3 & 5 Flute - High Performance - Tipped-Off

- Helically ground with positive axial rake and clearance for high performance chamfering
- Helical flute geometry results in superior part finish
- Flat tip diameter for programming accuracy and increased strength
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance in non-ferrous materials
- *Aplus* coating offers added lubricity and high temperature resistance for faster speeds and feeds and improved tool life in ferrous materials
- Solid carbide
- CNC ground in the USA



Chamfer Mills

Incl. Angle	Shank Dia.*	LOC	Overall Length	Theoretical Tip Length	Tip Diameter	Flutes	Zplus Coated	Aplus Coated	Tool Description
A ^{+0°30'} _{-0°30'}	D2 (h6)	L2	L1 ^{+0.062"} _{-.062"}	L3	D3 ^{+0.002"} _{-.002"}				
60°	1/8	.074	1-1/2	.035	.040	3	83880	83866	HPCM60-30125
	1/8	.074	1-1/2	.035	.040	5		84582	HPCM60-50125
	3/16	.119	2	.043	.050	3	83882	83868	HPCM60-30187
	3/16	.119	2	.043	.050	5		83870	HPCM60-50187
	1/4	.164	2-1/2	.052	.060	3	59815	07001	HPCM60-30250
	1/4	.164	2-1/2	.052	.060	5		59806	HPCM60-50250
	3/8	.264	2-1/2	.061	.070	3	59816	07002	HPCM60-30375
	3/8	.264	2-1/2	.061	.070	5		07022	HPCM60-50375
	1/2	.364	3	.069	.080	3	59817	07003	HPCM60-30500
	1/2	.364	3	.069	.080	5		07023	HPCM60-50500
	5/8	.463	3	.078	.090	3	59818	07004	HPCM60-30625
	5/8	.463	3	.078	.090	5		07024	HPCM60-50625
	3/4	.562	3	.087	.100	3	59819	07005	HPCM60-30750
	3/4	.562	3	.087	.100	5		07025	HPCM60-50750
82°	1/8	.049	1-1/2	.023	.040	3	84595	84583	HPCM82-30125
	1/8	.049	1-1/2	.023	.040	5		84584	HPCM82-50125
	3/16	.079	2	.029	.050	3	84596	84585	HPCM82-30187
	3/16	.079	2	.029	.050	5		84586	HPCM82-50187
	1/4	.109	2-1/2	.035	.060	3	84607	84601	HPCM82-30250
	1/4	.109	2-1/2	.035	.060	5		84602	HPCM82-50250
	3/8	.175	2-1/2	.040	.070	3	84608	84603	HPCM82-30375
	3/8	.175	2-1/2	.040	.070	5		84604	HPCM82-50375
	1/2	.242	3	.046	.080	3	84609	84605	HPCM82-30500
	1/2	.242	3	.046	.080	5		84606	HPCM82-50500
90°	1/8	.043	1-1/2	.020	.040	3	83884	83872	HPCM90-30125
	1/8	.043	1-1/2	.020	.040	5		83874	HPCM90-50125
	3/16	.069	2	.025	.050	3	83886	83876	HPCM90-30187
	3/16	.069	2	.025	.050	5		83878	HPCM90-50187
	1/4	.095	2-1/2	.030	.060	3	59820	07008	HPCM90-30250
	1/4	.095	2-1/2	.030	.060	5		59807	HPCM90-50250
	3/8	.153	2-1/2	.035	.070	3	59821	07009	HPCM90-30375
	3/8	.153	2-1/2	.035	.070	5		07028	HPCM90-50375
	3/8	.153	4	.035	.070	5		81838	HPCM90-50375
	1/2	.210	3	.040	.080	3	59822	07010	HPCM90-30500

* .0005 max TIR

continued on next page



CHAMFER MILLS - HELICAL FLUTE

HPCM

3 & 5 Flute - High Performance - Tipped-Off (cont.)

continued from previous page

Incl. Angle	Shank Dia.*	LOC	Overall Length	Theoretical Tip Length	Tip Diameter	Flutes	Zplus Coated	Aplus Coated	Tool Description
A $+0^{\circ}30'$ $-0^{\circ}30'$	D ₂ (h6)	L ₂	L ₁ $+0.062''$ $-0.062''$	L ₃	D ₃ $+0.002''$ $-0.002''$				
90°	1/2	.210	3	.040	.080	5		07029	HPCM90-50500
	1/2	.210	6	.040	.080	5		81839	HPCM90-50500
	5/8	.268	3	.045	.090	3	59823	07011	HPCM90-30625
	5/8	.268	3	.045	.090	5		07030	HPCM90-50625
	3/4	.325	3	.050	.100	3	59824	07012	HPCM90-30750
	3/4	.325	3	.050	.100	5		07031	HPCM90-50750
	1	.440	4	.060	.120	5		82662	HPCM90-51000
100°	1/8	.036	1-1/2	.017	.040	3	84597	84587	HPCM100-30125
	1/8	.036	1-1/2	.017	.040	5		84588	HPCM100-50125
	3/16	.058	2	.021	.050	3	84598	84589	HPCM100-30187
	3/16	.058	2	.021	.050	5		84590	HPCM100-50187
	1/4	.080	2-1/2	.025	.060	3	59825	59809	HPCM100-30250
	1/4	.080	2-1/2	.025	.060	5		59812	HPCM100-50250
	3/8	.128	2-1/2	.029	.070	3	59826	59810	HPCM100-30375
	3/8	.128	2-1/2	.029	.070	5		59813	HPCM100-50375
	1/2	.176	3	.034	.080	3	59827	59811	HPCM100-30500
	1/2	.176	3	.034	.080	5		59814	HPCM100-50500
120°	1/8	.025	1-1/2	.012	.040	3	84599	84591	HPCM120-30125
	1/8	.025	1-1/2	.012	.040	5		84592	HPCM120-50125
	3/16	.040	2	.014	.050	3	84600	84593	HPCM120-30187
	3/16	.040	2	.014	.050	5		84594	HPCM120-50187
	1/4	.057	2-1/2	.017	.060	3	59828	07015	HPCM120-30250
	1/4	.057	2-1/2	.017	.060	5		59808	HPCM120-50250
	3/8	.091	2-1/2	.020	.070	3	59829	07016	HPCM120-30375
	3/8	.091	2-1/2	.020	.070	5		07034	HPCM120-50375
	1/2	.126	3	.023	.080	3	59830	07017	HPCM120-30500
	1/2	.126	3	.023	.080	5		07035	HPCM120-50500
	5/8	.157	3	.026	.090	3	59831	07018	HPCM120-30625
	5/8	.157	3	.026	.090	5		07036	HPCM120-50625
	3/4	.195	3	.029	.100	3	59832	07019	HPCM120-30750
	3/4	.195	3	.029	.100	5		07037	HPCM120-50750

* .0005 max TIR

Chamfer Mills

The Multiple Uses of a Chamfer Mill

In The Loupe
MACHINISTS BLOG

Did you know that a Chamfer Cutter, or Chamfer Mill, is one of the most versatile tools you can have in your carousel? Learn how this single tool can perform several different machining operations in our "In the Loupe" blog post *The Multiple Uses of a Chamfer Mill*.



www.harveyprecision.com/in-the-loupe/multiple-uses-chamfer-mill/

SCAN TO READ

HPCM

SPEEDS & FEEDS
Chamfer Mills - Helical Flute

HPCM												
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)								
				Effective Cutting Diameter (Deff)								
				< .125	≥ .125 < .1875	≥ .1875 < .25	≥ .25 < .3125	≥ .3125 < .375	≥ .375 < .5	≥ .5 < .625	≥ .625 < .75	≥ .75
WROUGHT ALUMINUM ALLOY	2014, 5052, 6061, 7050, 7075, 7475	< 120 HBS	2200	.0009	.0018	.0028	.0035	.0045	.0055	.0070	.0090	.0110
		≥ 120 HBS	2200	.0006	.0012	.0018	.0022	.0030	.0035	.0045	.0060	.0070
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	< 120 HBS	1800	.0012	.0028	.0040	.0055	.0070	.0080	.0110	.0130	.0160
		≥ 120 HBS	1600	.0011	.0022	.0030	.0045	.0055	.0060	.0090	.0110	.0130
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	< 75 HRB	600	.0008	.0015	.0022	.0030	.0040	.0045	.0060	.0080	.0090
		75 - 98 HRB	450	.0007	.0015	.0022	.0030	.0035	.0045	.0060	.0070	.0090
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	450	.0010	.0020	.0030	.0040	.0050	.0060	.0080	.0100	.0120
		75 - 98 HRB	450	.0007	.0015	.0022	.0028	.0035	.0045	.0055	.0070	.0090
		21 - 36 HRC	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	400	.0006	.0012	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		21 - 36 HRC	350	.0005	.0010	.0015	.0020	.0025	.0028	.0040	.0050	.0055
		36 - 50 HRC	200	.0003	.0007	.0010	.0012	.0018	.0020	.0028	.0035	.0040
		> 50 HRC	90	.0003	.0005	.0008	.0010	.0012	.0015	.0020	.0025	.0030
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	325	.0006	.0010	.0018	.0022	.0028	.0035	.0045	.0055	.0070
		21 - 36 HRC	250	.0005	.0010	.0015	.0020	.0025	.0028	.0040	.0050	.0055
		36 - 50 HRC	150	.0003	.0007	.0010	.0012	.0018	.0020	.0028	.0035	.0040
		> 50 HRC	50	.0002	.0005	.0007	.0010	.0012	.0015	.0020	.0025	.0030
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	350	.0006	.0012	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		75 - 98 HRB	400	.0005	.0011	.0018	.0022	.0028	.0035	.0045	.0055	.0070
		21 - 36 HRC	225	.0004	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	140	.0004	.0008	.0012	.0015	.0020	.0025	.0030	.0040	.0050
		> 50 HRC	45	.0003	.0005	.0008	.0010	.0012	.0015	.0020	.0025	.0030
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	250	.0005	.0009	.0015	.0018	.0022	.0028	.0035	.0045	.0055
		21 - 36 HRC	225	.0005	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	175	.0004	.0007	.0011	.0015	.0018	.0020	.0028	.0035	.0040
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	325	.0004	.0009	.0012	.0018	.0022	.0025	.0035	.0045	.0050
		21 - 36 HRC	300	.0006	.0012	.0018	.0022	.0028	.0035	.0045	.0055	.0070
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	225	.0005	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	120	.0003	.0007	.0010	.0015	.0018	.0020	.0028	.0035	.0040
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	450	.0012	.0022	.0035	.0045	.0055	.0070	.0090	.0110	.0140
		21 - 36 HRC	400	.0008	.0015	.0025	.0030	.0040	.0050	.0060	.0080	.0100
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	350	.0007	.0012	.0020	.0028	.0035	.0040	.0055	.0070	.0080
		21 - 36 HRC	300	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	325	.0007	.0015	.0020	.0028	.0035	.0040	.0055	.0070	.0080
		21 - 36 HRC	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060
		36 - 50 HRC	160	.0003	.0005	.0008	.0010	.0012	.0015	.0020	.0025	.0030
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	450	.0008	.0015	.0022	.0030	.0040	.0045	.0060	.0080	.0090
		75 - 98 HRB	450	.0007	.0015	.0022	.0030	.0035	.0045	.0060	.0070	.0090
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	175	.0005	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		21 - 36 HRC	150	.0004	.0008	.0012	.0018	.0020	.0025	.0035	.0040	.0050
		36 - 50 HRC	80	.0004	.0007	.0011	.0015	.0018	.0022	.0030	.0035	.0045
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	350	.0009	.0020	.0028	.0040	.0045	.0055	.0080	.0090	.0110
		75 - 98 HRB	400	.0005	.0011	.0015	.0020	.0028	.0030	.0040	.0055	.0060
		21 - 36 HRC	350	.0006	.0010	.0018	.0022	.0028	.0035	.0045	.0055	.0070
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	200	.0005	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	140	.0004	.0008	.0012	.0015	.0020	.0022	.0030	.0040	.0045
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	225	.0003	.0006	.0009	.0012	.0015	.0018	.0022	.0030	.0035
		21 - 36 HRC	150	.0004	.0009	.0012	.0018	.0022	.0028	.0035	.0045	.0055
		36 - 50 HRC	80	.0003	.0007	.0010	.0012	.0018	.0020	.0028	.0035	.0040

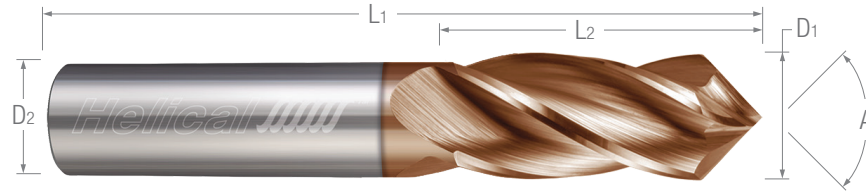
NOTES:
 Speed (SFM) and feed (IPT) numbers shown in the table above are considered to be average values. Use a tolerance of ± 25% as needed.
 Hardness Scales: HBS = Brinell (500-kgf steel ball)
 HRB = Rockwell B
 HRC = Rockwell C

COMBINATION CHAMFER / END MILLS

HCCM

4 Flute - High Performance

- Engineered for versatility and excellent performance in chamfering and side milling applications
- Specialized helically fluted tip design for superior performance, surface finish, and chip evacuation
- Variable geometry reduces chatter and harmonics and increases material removal rates
- *Tplus* coating offers high hardness for improved tool life and increased edge strength in difficult-to-machine materials
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA



Incl. Angle A $+0^{\circ}30'$ $-0^{\circ}30'$	Cutter Diameter* D1 $+0.000''$ $-0.002''$	Shank Diameter D2 (h6)	Web Thickness (MAX)	LOC L2 $+0.032''$ $-0.000''$	Overall Length L1 $+0.062''$ $-0.062''$	Flutes	<i>Tplus</i> Coated	Tool Description
60°	1/8	1/8	.009	1/2	1-1/2	4	83740	HCCM60-40125
	3/16	3/16	.010	5/8	2	4	83742	HCCM60-40187
	1/4	1/4	.010	3/4	2-1/2	4	83744	HCCM60-40250
	3/8	3/8	.013	7/8	2-1/2	4	83746	HCCM60-40375
	1/2	1/2	.013	1	3	4	83748	HCCM60-40500
90°	1/8	1/8	.009	1/2	1-1/2	4	83750	HCCM90-40125
	3/16	3/16	.010	5/8	2	4	83752	HCCM90-40187
	1/4	1/4	.010	3/4	2-1/2	4	83754	HCCM90-40250
	3/8	3/8	.013	7/8	2-1/2	4	83756	HCCM90-40375
	1/2	1/2	.013	1	3	4	83758	HCCM90-40500
100°	1/8	1/8	.009	1/2	1-1/2	4	83760	HCCM100-40125
	1/4	1/4	.010	3/4	2-1/2	4	83764	HCCM100-40250
	3/8	3/8	.013	7/8	2-1/2	4	83766	HCCM100-40375
	1/2	1/2	.013	1	3	4	83768	HCCM100-40500
120°	1/8	1/8	.009	1/2	1-1/2	4	83770	HCCM120-40125
	3/16	3/16	.010	5/8	2	4	83772	HCCM120-40187
	1/4	1/4	.010	3/4	2-1/2	4	83774	HCCM120-40250
	3/8	3/8	.013	7/8	2-1/2	4	83776	HCCM120-40375
	1/2	1/2	.013	1	3	4	83778	HCCM120-40500

* .0005 max TIR

Combination Mills

HCCM

SPEEDS AND FEEDS

Combination Chamfer / End Mills - 4 Flute - High Performance

HCCM													
Material Guide		Hardness	SFM	Inches Per Tooth (IPT)									
				1/8		3/16		1/4		3/8		1/2	
				Rgh	Chf	Rgh	Chf	Rgh	Chf	Rgh	Chf	Rgh	Chf
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0012	.0010	.0018	.0020	.0024	.0030	.0036	.0050	.0047	.0060
		75 - 98 HRB	445	.0009	.0007	.0013	.0015	.0018	.0022	.0026	.0035	.0034	.0045
		21 - 36 HRC	400	.0006	.0005	.0009	.0010	.0011	.0015	.0017	.0025	.0022	.0030
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0008	.0006	.0011	.0012	.0015	.0020	.0023	.0030	.0030	.0040
		21 - 36 HRC	340	.0006	.0005	.0009	.0010	.0012	.0015	.0017	.0025	.0022	.0028
		36 - 50 HRC	260	.0005	.0003	.0007	.0007	.0010	.0010	.0015	.0018	.0019	.0020
		> 50 HRC	155	.0004	.0003	.0006	.0005	.0008	.0008	.0012	.0012	.0015	.0015
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0008	.0005	.0011	.0010	.0015	.0018	.0023	.0028	.0030	.0035
		21 - 36 HRC	250	.0006	.0005	.0009	.0010	.0012	.0015	.0018	.0025	.0024	.0028
		36 - 50 HRC	145	.0005	.0003	.0007	.0007	.0010	.0010	.0014	.0018	.0019	.0020
		> 50 HRC	85	.0004	.0002	.0006	.0005	.0008	.0007	.0012	.0012	.0015	.0015
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0010	.0006	.0015	.0012	.0020	.0020	.0030	.0030	.0039	.0040
		75 - 98 HRB	255	.0007	.0005	.0010	.0014	.0014	.0018	.0021	.0028	.0027	.0035
		21 - 36 HRC	175	.0006	.0004	.0009	.0009	.0012	.0012	.0018	.0022	.0024	.0028
		36 - 50 HRC	150	.0006	.0004	.0008	.0008	.0011	.0012	.0016	.0020	.0021	.0025
		> 50 HRC	55	.0004	.0003	.0005	.0005	.0007	.0008	.0010	.0012	.0013	.0015
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0008	.0005	.0011	.0009	.0015	.0015	.0022	.0022	.0029	.0028
		21 - 36 HRC	225	.0007	.0005	.0010	.0009	.0014	.0012	.0020	.0022	.0026	.0028
		36 - 50 HRC	180	.0006	.0004	.0008	.0007	.0011	.0011	.0016	.0018	.0021	.0020
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0008	.0004	.0011	.0009	.0016	.0012	.0023	.0022	.0030	.0025
		21 - 36 HRC	280	.0007	.0006	.0010	.0012	.0013	.0018	.0020	.0028	.0026	.0035
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0006	.0005	.0008	.0009	.0011	.0012	.0017	.0022	.0022	.0028
		36 - 50 HRC	145	.0005	.0003	.0007	.0007	.0010	.0010	.0014	.0018	.0019	.0020
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0013	.0012	.0019	.0022	.0025	.0035	.0037	.0055	.0048	.0070
		21 - 36 HRC	370	.0007	.0008	.0010	.0015	.0013	.0025	.0020	.0040	.0026	.0050
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0008	.0007	.0012	.0012	.0016	.0020	.0023	.0035	.0031	.0040
		21 - 36 HRC	335	.0007	.0005	.0010	.0010	.0014	.0015	.0020	.0025	.0026	.0030
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0008	.0007	.0012	.0015	.0016	.0020	.0024	.0035	.0032	.0040
		21 - 36 HRC	260	.0006	.0005	.0008	.0010	.0011	.0015	.0016	.0025	.0021	.0030
		36 - 50 HRC	135	.0004	.0003	.0005	.0005	.0007	.0008	.0010	.0012	.0013	.0015
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0011	.0008	.0016	.0015	.0021	.0022	.0031	.0040	.0041	.0045
		75 - 98 HRB	250	.0009	.0007	.0013	.0015	.0018	.0022	.0026	.0035	.0034	.0045
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0005	.0005	.0008	.0009	.0011	.0012	.0016	.0022	.0021	.0028
		21 - 36 HRC	75	.0005	.0004	.0008	.0008	.0010	.0012	.0015	.0020	.0020	.0025
		36 - 50 HRC	70	.0005	.0004	.0007	.0007	.0009	.0011	.0013	.0018	.0017	.0022
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0015	.0009	.0022	.0020	.0029	.0028	.0043	.0045	.0057	.0055
		75 - 98 HRB	275	.0012	.0005	.0018	.0011	.0024	.0015	.0036	.0028	.0047	.0030
		21 - 36 HRC	250	.0009	.0006	.0014	.0010	.0018	.0018	.0027	.0028	.0036	.0035
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0007	.0005	.0011	.0009	.0014	.0012	.0021	.0022	.0028	.0028
		36 - 50 HRC	160	.0007	.0004	.0010	.0008	.0013	.0012	.0020	.0020	.0026	.0022
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0006	.0003	.0009	.0006	.0012	.0009	.0018	.0015	.0024	.0018
		21 - 36 HRC	170	.0006	.0004	.0009	.0009	.0012	.0012	.0017	.0028	.0023	.0028
		65	.0004	.0003	.0006	.0007	.0008	.0010	.0012	.0018	.0016	.0020	

Combination Mills

MILLING PROCESS	HARDNESS	ADOC	RDOC
Rgh (Traditional Roughing)	< 35 HRC	Up to Max LOC	30%-40% Diameter
	≥ 35 HRC	Up to Max LOC	25%-35% Diameter
Chf (Chamfering)	N/A	3 Passes	

NOTES:

Speed (SFM) and feed (IPT) numbers shown in table above are considered to be average values. Use a tolerance of +/-25% as needed.

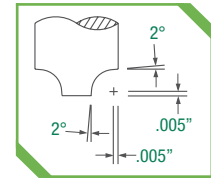
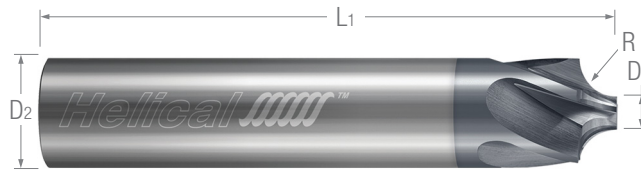
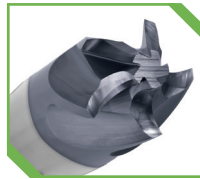
Effective cutter diameter should be used to select the proper chipload per tooth for chamfering operations.

CORNER ROUNDING END MILLS New!

HPCR

Helical Flute - 3 & 5 Flute - High Performance

- Helically ground with positive rake for high performance and superior part finish
- Large pilot diameters for maximum tool strength and consistent performance
- 2° flares for smooth transitions
- Radius center is offset .005" from OD and end of tool
- h6 shank tolerance for high precision tool holders
- *Zplus* coating offers higher hardness and added lubricity for maximum performance in aluminum and non-ferrous alloys
- *Aplus* coating for added lubricity and higher speeds and feeds in a wide variety of ferrous metals and titanium alloys
- Solid carbide
- CNC ground in the USA



Corner Rounding Mills

Radius R $\begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Pilot Diameter D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter D2 (h6)	Overall Length L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Zplus Coated	Aplus Coated	Tool Description	
.010	.095	1/8	1-1/2	3	87626	87645	HPCR-30125-R.010	new
.010	.095	1/8	1-1/2	5		87664	HPCR-50125-R.010	new
.015	.085	1/8	1-1/2	3	87627	87646	HPCR-30125-R.015	new
.015	.085	1/8	1-1/2	5		87665	HPCR-50125-R.015	new
.020	.075	1/8	1-1/2	3	87628	87647	HPCR-30125-R.020	new
.020	.075	1/8	1-1/2	5		87666	HPCR-50125-R.020	new
.025	.065	1/8	1-1/2	3	87629	87648	HPCR-30125-R.025	new
.025	.065	1/8	1-1/2	5		87667	HPCR-50125-R.025	new
.030	.055	1/8	1-1/2	3	87630	87649	HPCR-30125-R.030	new
.030	.055	1/8	1-1/2	5		87668	HPCR-50125-R.030	new
.031	.053	1/8	1-1/2	3	87631	87650	HPCR-30125-R.031	new
.031	.053	1/8	1-1/2	5		87669	HPCR-50125-R.031	new
.039	.099	3/16	2	3	87632	87651	HPCR-30187-R.039	new
.039	.099	3/16	2	5		87670	HPCR-50187-R.039	new
.040	.097	3/16	2	3	87633	87652	HPCR-30187-R.040	new
.040	.097	3/16	2	5		87671	HPCR-50187-R.040	new
.047	.083	3/16	2	3	87634	87653	HPCR-30187-R.047	new
.047	.083	3/16	2	5		87672	HPCR-50187-R.047	new
.050	.077	3/16	2	3	87635	87654	HPCR-30187-R.050	new
.050	.077	3/16	2	5		87673	HPCR-50187-R.050	new
.060	.120	1/4	2	3	87636	87655	HPCR-30250-R.060	new
.060	.120	1/4	2	5		87674	HPCR-50250-R.060	new
.062	.116	1/4	2	3	87637	87656	HPCR-30250-R.062	new
.062	.116	1/4	2	5		87675	HPCR-50250-R.062	new
.078	.156	5/16	2	3	87638	87657	HPCR-30312-R.078	new
.078	.156	5/16	2	5		87676	HPCR-50312-R.078	new

continued on next page

HPCR

New! CORNER ROUNDING END MILLS
Helical Flute - 3 & 5 Flute - High Performance (cont.)

continued from previous page

	Radius R $\begin{smallmatrix} +.002'' \\ -.002'' \end{smallmatrix}$	Pilot Diameter D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	Shank Diameter D2 (h6)	Overall Length L1 $\begin{smallmatrix} +.062'' \\ -.062'' \end{smallmatrix}$	Flutes	Zplus Coated	Aplus Coated	Tool Description
new	.093	.166	5/16	2	3	87639	87658	HPCR-30312-R.093
new	.093	.166	5/16	2	5		87677	HPCR-50312-R.093
new	.100	.165	3/8	2	3	87640	87659	HPCR-30375-R.100
new	.100	.165	3/8	2	5		87678	HPCR-50375-R.100
new	.125	.177	7/16	2-3/4	3	87641	87660	HPCR-30437-R.125
new	.125	.177	7/16	2-3/4	5		87679	HPCR-50437-R.125
new	.156	.177	1/2	2-1/2	3	87642	87661	HPCR-30500-R.156
new	.156	.177	1/2	2-1/2	5		87680	HPCR-50500-R.156
new	.187	.240	5/8	3	3	87643	87662	HPCR-30625-R.187
new	.187	.240	5/8	3	5		87681	HPCR-50625-R.187
new	.250	.239	3/4	3	3	87644	87663	HPCR-30750-R.250
new	.250	.239	3/4	3	5		87682	HPCR-50750-R.250

Corner Rounding Mills



@salmoniversolutions

Follow Helical Tools on Instagram and See How We Help You Run Faster. Push Harder. Machine Smarter.

SKU: [59807](#)
Coating: *Aplus*
Included Angle: 90°
Length of Cut: .095"
Tip Diameter: .060"

@helicaltools

Tag us and share what you are working on @helicaltools

SPEEDS AND FEEDS

Corner Rounding Mills - 3 & 5 Flute

HPCR

Corner Rounding Mills

HPCR										
Material Guide	Hardness	SFM	Inches Per Tooth (IPT)							
			Effective Cutting Diameter (Deff)							
			1/8	3/16	1/4	3/8	1/2	3/4	1	
WROUGHT ALUMINUM ALLOY	2014, 5052, 6061, 7050, 7075, 7475	< 120 HBS	2200	.0009	.0018	.0028	.0045	.0055	.0090	.0110
		≥ 120 HBS	2200	.0006	.0012	.0018	.0030	.0035	.0060	.0070
CAST ALUMINUM ALLOY	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	< 120 HBS	1800	.0012	.0028	.0040	.0070	.0080	.0130	.0180
		≥ 120 HBS	1600	.0011	.0022	.0030	.0055	.0060	.0110	.0130
COPPER ALLOY	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	< 75 HRB	600	.0008	.0015	.0022	.0040	.0045	.0080	.0090
		75 - 98 HRB	450	.0007	.0015	.0022	.0035	.0045	.0070	.0090
CARBON STEEL	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	< 75 HRB	455	.0012	.0018	.0025	.0036	.0048	.0068	.0087
		75 - 98 HRB	445	.0009	.0013	.0018	.0026	.0034	.0049	.0063
		21 - 36 HRC	400	.0006	.0009	.0011	.0018	.0022	.0032	.0041
LOW ALLOY STEEL	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	75 - 98 HRB	390	.0008	.0011	.0016	.0023	.0030	.0043	.0055
		21 - 36 HRC	340	.0006	.0009	.0011	.0017	.0022	.0032	.0041
		36 - 50 HRC	260	.0005	.0007	.0010	.0015	.0019	.0028	.0036
		> 50 HRC	155	.0004	.0006	.0008	.0011	.0015	.0022	.0028
TOOL STEEL	A2, H13, L6, P20, S7	75 - 98 HRB	340	.0008	.0011	.0016	.0023	.0030	.0043	.0055
		21 - 36 HRC	250	.0006	.0009	.0012	.0018	.0024	.0034	.0044
		36 - 50 HRC	145	.0005	.0007	.0010	.0014	.0018	.0026	.0034
		> 50 HRC	85	.0004	.0006	.0008	.0011	.0015	.0022	.0028
SPECIALTY STEEL	300M, Invar 36, Kovar, Maraging 200, Maraging 250, Maraging 300, Maraging 350	< 75 HRB	290	.0011	.0015	.0020	.0030	.0040	.0056	.0072
		75 - 98 HRB	255	.0007	.0011	.0014	.0020	.0027	.0039	.0049
		21 - 36 HRC	175	.0006	.0009	.0012	.0018	.0024	.0034	.0045
		36 - 50 HRC	150	.0005	.0008	.0011	.0017	.0022	.0031	.0040
AUSTENITIC STAINLESS STEEL	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	75 - 98 HRB	265	.0008	.0011	.0015	.0022	.0029	.0042	.0054
		21 - 36 HRC	225	.0007	.0010	.0013	.0020	.0026	.0038	.0048
		36 - 50 HRC	180	.0005	.0008	.0011	.0016	.0021	.0030	.0039
MARTENSITIC & FERRITIC STAINLESS STEEL	403, 410, 416, 420, 440, 430, 446	75 - 98 HRB	300	.0008	.0011	.0016	.0023	.0030	.0043	.0055
		21 - 36 HRC	280	.0007	.0010	.0013	.0020	.0026	.0038	.0048
PH STAINLESS STEEL	15-5, 17-4, Carpenter 450, Carpenter 465	21 - 36 HRC	200	.0006	.0009	.0011	.0017	.0022	.0032	.0041
		36 - 50 HRC	145	.0005	.0007	.0010	.0015	.0019	.0027	.0035
GRAY CAST IRON	SAE J431, ASTM A48	75 - 98 HRB	410	.0012	.0018	.0026	.0037	.0048	.0070	.0090
		21 - 36 HRC	370	.0007	.0010	.0013	.0020	.0026	.0038	.0048
MALLEABLE CAST IRON	ASTM A47, ASTM A220, ASTM A602	75 - 98 HRB	345	.0008	.0011	.0016	.0024	.0031	.0044	.0057
		21 - 36 HRC	335	.0007	.0010	.0014	.0020	.0026	.0038	.0049
NODULAR (DUCTILE) CAST IRON	ASTM A536, ASTM 897	75 - 98 HRB	310	.0008	.0012	.0017	.0025	.0032	.0046	.0059
		21 - 36 HRC	260	.0005	.0008	.0011	.0017	.0021	.0031	.0039
		36 - 50 HRC	135	.0004	.0005	.0007	.0011	.0013	.0019	.0025
PURE NICKEL	Nickel 200, Nickel 201	< 75 HRB	285	.0011	.0016	.0021	.0032	.0041	.0059	.0076
		75 - 98 HRB	250	.0009	.0013	.0018	.0026	.0034	.0049	.0063
NICKEL ALLOY	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	75 - 98 HRB	80	.0005	.0008	.0011	.0016	.0021	.0030	.0039
		21 - 36 HRC	75	.0005	.0008	.0011	.0015	.0020	.0029	.0037
		36 - 50 HRC	70	.0004	.0006	.0009	.0013	.0018	.0025	.0032
PURE TITANIUM	Ti Grade 1, Ti Grade 2, Ti Grade 3, Ti Grade 4, Ti Grade 7, Ti Grade 12	< 75 HRB	300	.0015	.0021	.0029	.0043	.0057	.0082	.0105
		75 - 98 HRB	275	.0012	.0018	.0025	.0036	.0048	.0069	.0088
		21 - 36 HRC	250	.0010	.0013	.0018	.0027	.0036	.0051	.0066
TITANIUM ALLOY	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	21 - 36 HRC	180	.0008	.0011	.0015	.0021	.0028	.0041	.0052
		36 - 50 HRC	160	.0007	.0010	.0013	.0019	.0026	.0037	.0048
COBALT ALLOY	ASTM F562, ASTM F90, ASTM F75, ASTM F799	75 - 98 HRB	210	.0006	.0009	.0012	.0018	.0024	.0034	.0044
		21 - 36 HRC	170	.0006	.0009	.0012	.0018	.0023	.0033	.0042
		36 - 50 HRC	65	.0004	.0006	.0008	.0012	.0016	.0022	.0029

MILLING PROCESS	HARDNESS	ADOC	RDOC
Non-Ferrous Corner Rounding	n/a	100%	1 Pass at Full Depth
Ferrous Corner Rounding	< 35 HRC	100%	1 Pass at Full Depth
	≥ 35 HRC	100%	2 Passes to Full Depth

NOTES:

Speed (SFM) numbers shown in table above are considered to be average values. Use a tolerance of +/-25% as needed

Feed (IPT) numbers shown in table above are considered to be starting values and may be increased given optimal conditions

Effective cutter diameter should be used to calculate RPM and to select the proper chipload per tooth

Effective Cutter Diameter = Pilot Diameter + Radius

CUSTOM TOOLS

How We Are Different

Our custom tools consistently outperform competition in even the most difficult-to-machine materials because we adopt a unique "end-to-end" approach to our custom tool program.

We start by gaining a detailed understanding of your requirements. We design your tool by utilizing our proprietary geometries, coatings, and edge prep technology. Your tool is then manufactured to your exact standards. After you receive your custom design, our engineers are on standby to provide technical support and the ideal running parameters for your tool.

Our Capabilities

Our specials are ground from Solid carbide on state-of-the-art CNC equipment. We manufacture configurations that our competitors won't even quote, including end mills up to 6" in diameter and up to 27" in overall length.

While we specialize in end mills, our team of professional engineers regularly design and manufacture form tools, drills, coolant-fed tooling, step drills, Christmas tree cutters, end mills, and more.

We are committed to providing turnkey solutions for our customers, and we pay attention to the intricate details of every tool to certify its quality and performance.

We Provide

- + Expert knowledge
- + Quick quoting
- + Unbeatable service
- + Fast lead times
- + Quality tooling
- + Machining assistance

Our Custom Tool Process



Detailed Understanding of Your Requirements

During the quoting process, **we set ourselves apart** with a team of engineers eager to understand every aspect of your project, from work material and part envelope to machine capabilities and other critical factors.



Designs Optimized for Your Specific Application

Our objective is to return a quote **within 48 hours** that includes tool design, dimensions, and expected lead time. We will also provide a copy of your quote to your preferred distributor at a **very competitive price**.



Outstanding Quality & Reliable Lead Times

After you receive your tool within our reliable lead time windows, our engineers will provide running parameters that assure your tool delivers **ideal performance** while providing accuracy, strength, and **impressive results**.

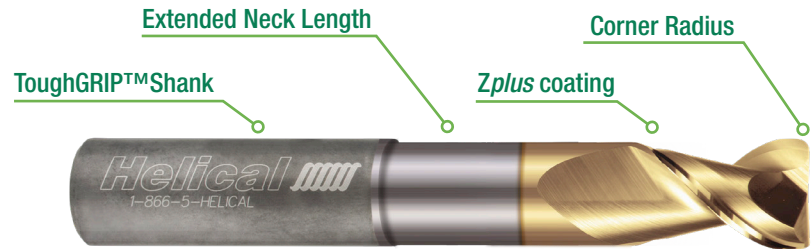
Call 1-866-543-5422 or email helicaltech@harveyperformance.com

TOOL MODIFICATIONS

What We Offer

Custom tool needs can often be accommodated by modifying one of our standard tools. We're able to modify our standard tools in a variety of ways, including by adding corner radii, coatings, neck lengthening (or additions), overall length adjustments, or even chipbreakers.

Upon receiving a custom tool RFQ, we will evaluate each modification request to confirm optimal performance. Should we feel a full custom tool design is warranted, we'll quote accordingly. Call your preferred distributor today to get started!



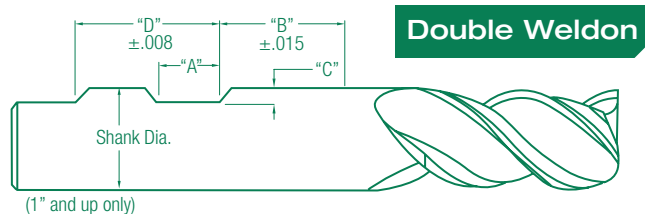
SHANK MODIFICATIONS

Weldon Flat Specifications

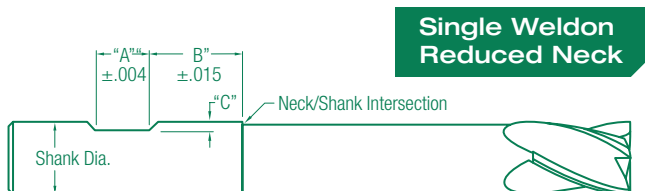
Factory-ground flats have several key advantages, including that they are ground parallel with the centerline of the tool, are consistently level for the entire length of the flat, and are accurately ground with no excess runout. Helical Solutions employs a "flat location procedure" to ensure that flutes will not end up inside of the tool holder, avoiding chip compaction, and that tool "stick out" is minimal in order to achieve optimum tool strength.



Single Weldon



Double Weldon



Single Weldon Reduced Neck

In reduced neck tooling, weldon flat are measured from neck/shank intersection

Weldon Flat Specifications

Shank Dia.	"A"	"B"	"C"	"D"
.1250	.155	.500	.012 +.005/- .000	-
.1875	.155	.500	.015 +.005/- .000	-
.250	.155	.500	.017 +.005/- .000	-
.3125	.295	.750	.020 +.005/- .000	-
.375	.295	.750	.050 +.015/- .000	-
.4375	.345	.835	.060 +.015/- .000	-
.500	.345	.835	.060 +.015/- .000	-
.625	.415	.900	.065 +.015/- .000	-
.750	.470	.900	.075 +.015/- .000	-
1.0000	.530	1.000	.075 +.015/- .000	.900*
1.2500	.530	1.000	.095 +.015/- .000	.900*

*Note: Not applicable to 1" dia. tools with ≤4 OAL.

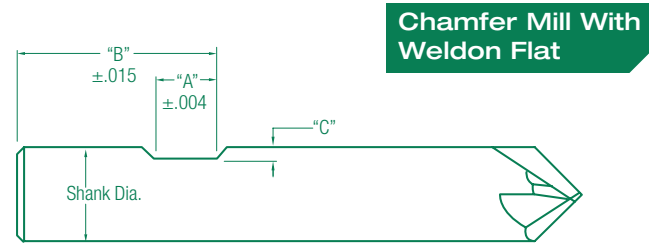
Weldon Flat specifications are typically based on NAS 986, a high speed steel tool standard, and are measured from the shank end. Currently, there is no standardized specification for high performance solid carbide end mills. All flats will be ground using the dimension chart above unless specified otherwise at the time of quote/order. Some tool holding systems on the market are designed to the exact NAS 986 standard, and may not be directly compatible with the Helical Solutions Weldon dimensions outlined here.

SHANK MODIFICATIONS

Chamfer Mill with Weldon Flat Specifications

Shank Dia.	"A"	"B"	"C"
.1250	.155	.928	.012 +.005/-.000
.1875	.155	.928	.015 +.005/-.000
.2500	.155	.928	.017 +.005/-.000
.3750	.295	.928	.050 +.015/-.000
.5000	.345	1.064	.060 +.015/-.000
.7500	.470	1.250	.075 +.015/-.000

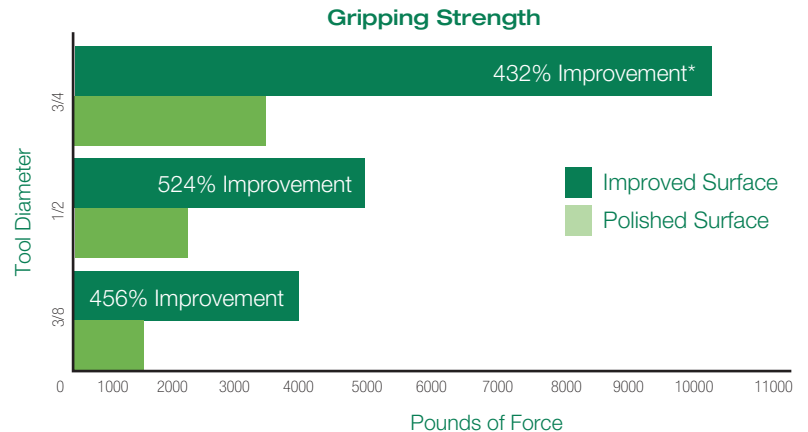
Weldon Flat specifications are typically based on NAS 986, a high speed steel tool standard, and are measured from the shank end. Currently, there is no standardized specification for high performance solid carbide end mills. All flats will be ground using the dimension chart above unless specified otherwise at the time of quote/order. Some tool holding systems on the market are designed to the exact NAS 986 standard, and may not be directly compatible with the Helical Solutions Weldon dimensions outlined here.



ToughGRIP™ Shank

Are you familiar with ToughGRIP™ Shanks? They provide increased friction for superior gripping strength, as the mirror finish provided on most shanks does not always provide the necessary amount of tool holding security. Helical's ToughGRIP™ Shank maintains shank concentricity and h6 shrink-fit tolerance, and features 30 +/- 3 Ra surface roughness, consistent with 2 Ra.

ToughGRIP™ Shank provides increased friction for superior gripping strength



Based on independent laboratory testing. All tests were completed utilizing Command Tooling Systems' line of HYDRO-GRIP® HD Hydraulic tool holders by ETP Transmission.

* Improved surface finish from the ToughGRIP™ exceeded laboratory testing equipment.

Haimer Safe-Lock™ System

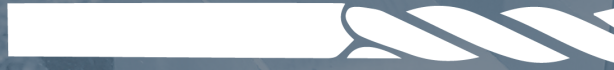
Looking for even more tool holding security? Helical Solutions was the first Haimer Safe-Lock licensee, and have been manufacturing this shank configuration – added groove on the cutting shank that work opposite the cutting direction of the flutes – since 2008.

- + Minimizes runout
- + Up to 5x the tool life
- + No pull-out or spinning



For more information on any Helical Solutions Shank Modifications, including Weldon Flats, ToughGRIP Shanks, or the Haimer Safe-Lock™ System, visit our website at helicaltool.com/resources

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A cutting-edge resource that generates custom running parameters for optimized machining with Helical Solutions end mills.

Optimized for Over 8,800 End Mills

Increase material removal rates and shop productivity with customized running parameters specifically for Helical Solutions end mills.

Customizable Speeds & Feeds

Generate specialized machining parameters by pairing your end mill with your exact tool path, material, and machine setup.

Free to Use

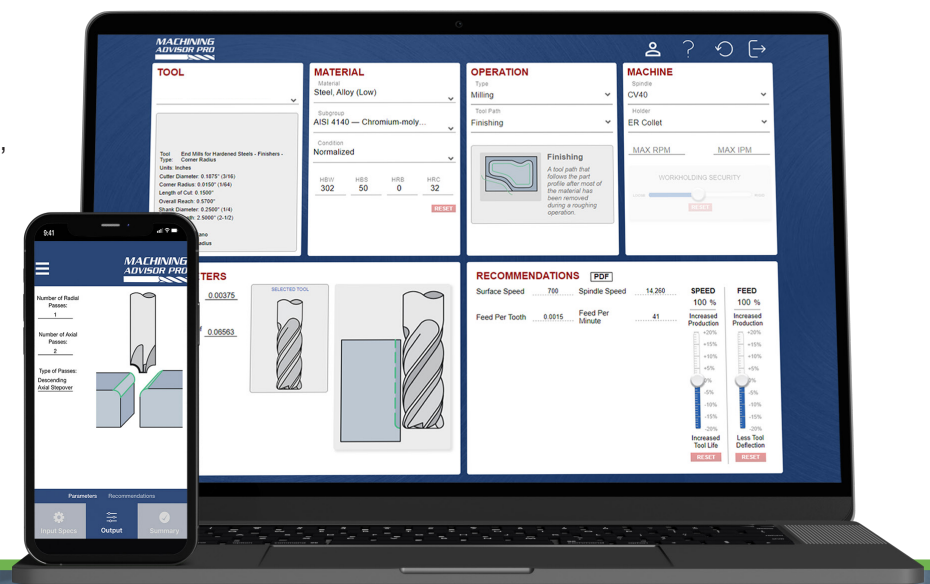
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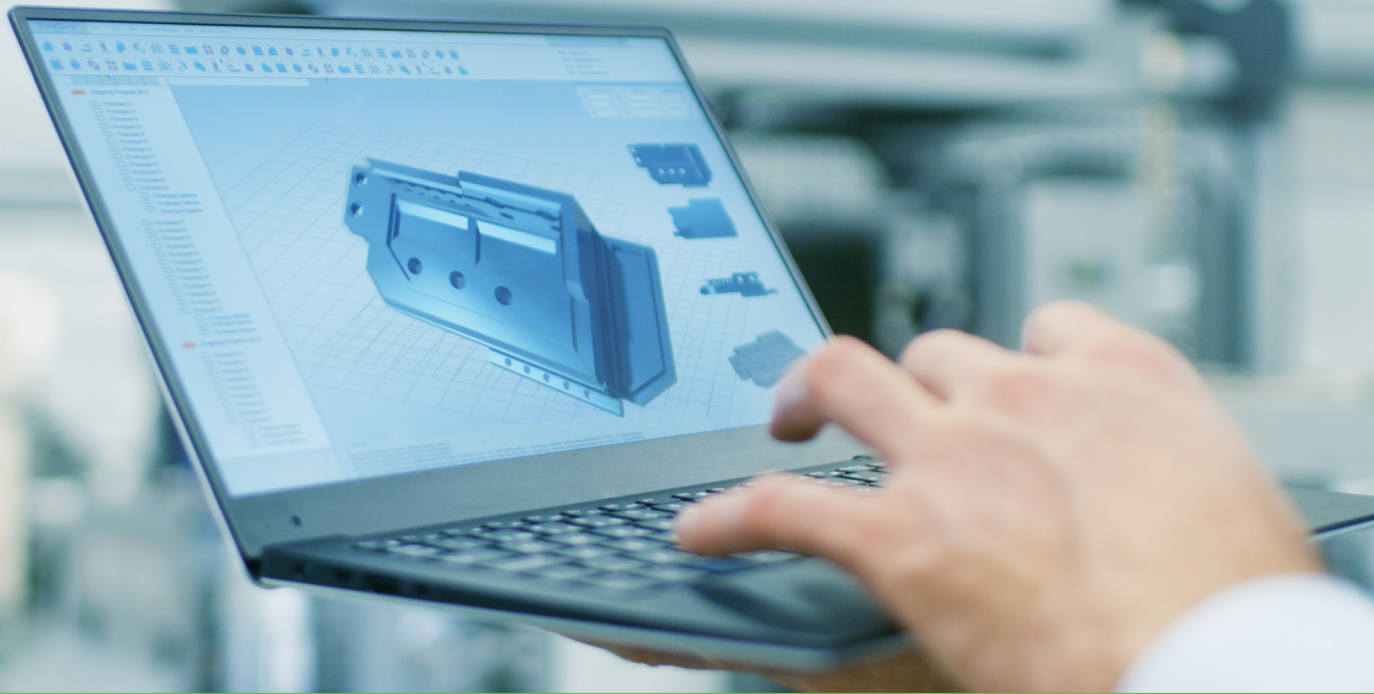


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CAM Tool Libraries

Harvey Performance Company works closely with industry-leading CAM software companies to optimize Helical Solutions and Harvey Tool product libraries for their platforms.



Valuable Time Savings

Import tool libraries directly into CAM software and allow more time to be spent at the machine.

Confident Machining

Program confidently with accurate tool dimensions and CAM-specific tool data.

Growing Libraries & Partnerships

Count on up-to-date product libraries across a roster of leading CAM partners.

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harveyperformance.com/tool-libraries



Let Helical Impress You

Run FASTER.

Helical end mills are meticulously designed for maximum rigidity to support aggressive speeds and feeds. Use Machining Advisor Pro to optimize your running parameters.

Push HARDER.

Engineered for optimal performance in non-ferrous and ferrous materials, our unique geometries ensure extended tool life and significantly higher material removal rates.

Machine SMARTER.

Unlike most of the industry's end mills, Helical's products are specifically built to withstand and take full advantage of high efficiency milling techniques.

Place an order with your distributor on [Helicaltool.com](https://www.helicaltool.com)

Did you know that you can place a Helical Solutions order directly to your distributor from our website? After creating your [Helicaltool.com](https://www.helicaltool.com) account, you're able to build and send "shopping carts" directly to your participating distributor to order.



Shopping Cart

Once logged in, create your own personalized Shopping Carts of Helical tools you're most interested in, then send it directly to a participating distributor, or share it with a colleague or purchasing agent.



Direct MAP Connection

Once you've found a tool, and are ready to run it, open Machining Advisor Pro (MAP) to automatically and seamlessly generate its running parameters.



Build a Tool

Design your perfect custom tool directly on our "Build a Tool" page, and even attach a blueprint or napkin drawing to better explain its key properties.



Expansive Stock Check

Check real-time availability of as many as 50 tools at once to simplify the order planning process and spend more time where it counts: at the spindle.



Product Table Filtering

Find the perfect Helical Solutions tool for your job quickly and easily by using new filtering functionality on each product table, sorting through an expansive and always growing product offering.



"Smart-Search" Feature

Simply and quickly search for a Helical Solutions tool, then receive results for its product page, as well as for every technical resource relevant to that tool, presented in one click to save you valuable time and money.

New Tools for 2023



High Feed End Mills

4 and 5 Flute Combo Feed & HEM - Chipbreaker - Variable Pitch - Coolant Through



Specialty Profiles

Corner Rounding End Mills - Helical Flute - 3 & 5 Flute - High Performance



End Mills for Stainless & High Temp Alloys

Contour Finishers - 4 Flute Ball - Tapered Neck



End Mills for Nickel Alloys

6 flute - Corner Radius - Variable Pitch - Coolant Through



End Mills for Stainless & High Temp Alloys

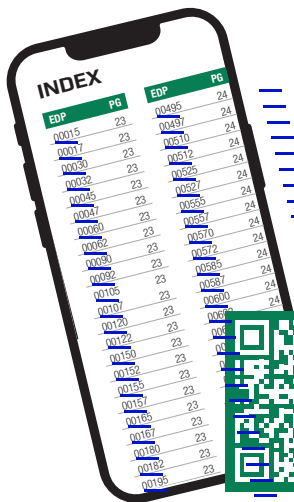
4 Flute - Taper & Oval - Multi-Axis Finishers

End Mills for Aluminum Alloys & Non-Ferrous Materials

3 Flute - Corner Radius - 35° Helix - Reduced Neck

End Mills for Stainless & High Temp Alloys

4, 5 and 6 Flute - Variable Pitch - Reduced Neck



Looking for the Index?

The Helical index has moved! Visit www.helicaltool.com and search by the 5-digit EDP number. Each tool detail page will show the page number of the catalog where you can find that tool.

Additionally, to see a PDF of the index with all EDP numbers from the 2023 catalog, scan the QR code below or visit www.helicaltool.com/catalog-request and download the index document.

Hold your phone's camera app up to the code to scan and follow the link to the Index. Or visit www.helicaltool.com/catalog-request



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