



# **HARVEY TOOL™**

*Your Specials Are Our Standards™*



Unlock CNC Machining Potential  
with the Industry's Best Selection  
of High Precision Miniature  
End Mills & Specialty Cutters

MORE THAN **28,000** TOOLS

# Think Harvey Tool First

## Unique Selection

We offer a comprehensive selection of more than 28,000 miniature and specialty cutting tools that are all fully stocked. The breadth and depth of our products help solve the industry's toughest machining challenges.

## Quality Products

We are committed to designing unique geometries that optimize cutting performance for a variety of materials and applications. We introduce hundreds of new tools into the market every 6 months, offering our customers the solutions they need most.



## Same-Day Shipping

Our fully stocked inventory is ready to ship day of purchase. We offer second day delivery at ground pricing, and any overnight orders ship until 7:00 p.m. EST. For additional shipping information and stock availability, please visit [HarveyTool.com](https://www.harveytool.com).

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 28,000 miniature  
and specialty end mills.  
Ship today, in your  
machine tomorrow.



**HARVEY**  
**PERFORMANCE**  
COMPANY

**Helical** 

Let Helical  
Impress You

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



**MICRO 100**

Make More with  
Micro 100

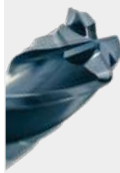
Exceptional quality turning  
tools designed for durability  
and performance in a range of  
difficult-to-machine materials.



**TITAN USA**  
MADE IN THE U.S.A.

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Titan USA

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



**COREHOG**

Innovative Tools for  
Innovative Materials

The industry's most  
innovative and advanced  
Composite and Honeycomb  
Core Cutting Tools.



# What We Offer

## Miniature End Mills pg 9

Select from over **8,800** miniature end mills down to .001" cutter diameter, available in a variety of styles and profiles.



## Material Specific End Mills pg 97

Achieve the best results in high temp alloys, medium alloys, free machining steels, aluminum alloys, graphite, plastics, composites, wood, and more with over **6,000** high performance end mills.



## Undercutting End Mills pg 266

Over **1,000** options, with 3 different wrap angles: 300°, 270°, and 220°.



## Drill/End Mills pg 281

Over **600** options, with cutter diameters from 1/64" to 1".



## Chamfer Cutters pg 293

Over **1,200** options, with diameters from 1/32" to 1" and 21 different angles per side.



## Engraving Cutters pg 321

Over **1,000** options, available with 17 included angles and a variety of styles.



## Double Angle Shank Cutters pg 343

Over **700** options in multiple styles and reach lengths and 14 included angles.



## Keyseat Cutters pg 354

Over **2,200** options, with cutter diameters from 1/16" to 1-1/2".



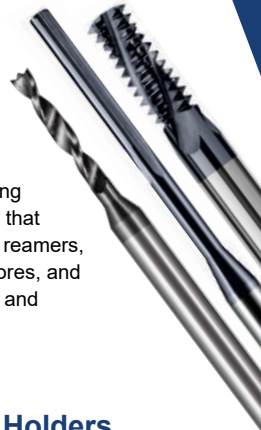
## Slitting Saws pg 385

Over **150** coated and uncoated options, with thicknesses from .0100" to .2500".



## Holemaking & Threading pg 415

Solve a variety of holemaking challenges from spotting to threading with over **5,200** options that include miniature drills, reamers, countersinks, counterbores, and single-form, multi-form, and tri-form thread mills.



## Corner Rounding End Mills pg 389

Over **600** options, with over 100 radii from .003" to 5/8".



## Dovetail Cutters pg 404

Over **600** options, with 17 included angles.



## Tool Holders pg 501


Pair our exceptional tooling with different styles and reaches of tool holders. Choices range from Extended Reach Tool Holders, Solid ER Integrated Tool Holders, Saw Arbors, ER Collets, and ER Performance Collets.



# 28,000+ Tools





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## FEATURED SOLUTIONS

### Mold Tool & Die Solutions

Building complex cavities requires **high performance tooling** that can mill **precise contours** while leaving **superior part finish**. Harvey Tool offers a selection of **tapered end mills** with unique geometries that are perfect for tackling the tough machining requirements of the **die and mold making** industries.



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### Corner Conditioning Solutions

Whether prepping a corner for functional or aesthetic reasons, Harvey Tool has a variety of unique and **hard-to-find profiles** for machining **corner requirements** and features. With multiple **angle options, reaches, and styles**, we are confident that our tools can solve any corner conditioning challenge.



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# FEATURED SOLUTIONS

## Finishing Solutions

Achieving **optimal surface finish** is a critical goal for any machinist, but not all tools are designed with finish requirements in mind. Harvey Tool has a wide selection of finishing tools with **material-specific geometries** designed to ensure **tight part tolerances** and **reduce witness marks**.



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## Deburring Solutions

Deburring parts can be tiresome, expensive, and time-consuming, especially if done by hand. Harvey Tool's engineers have created a variety of **CNC-toleranced** deburring tools that allow you to deburr **in your CNC machine**, providing better finish, **reduced part and labor costs**, and increased capacity.



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# MACHINING ADVISOR PRO

NEW for Harvey Tool

Machining Advisor Pro generates customized running parameters for your specific setup and material to take your Harvey Tool products further at the spindle.

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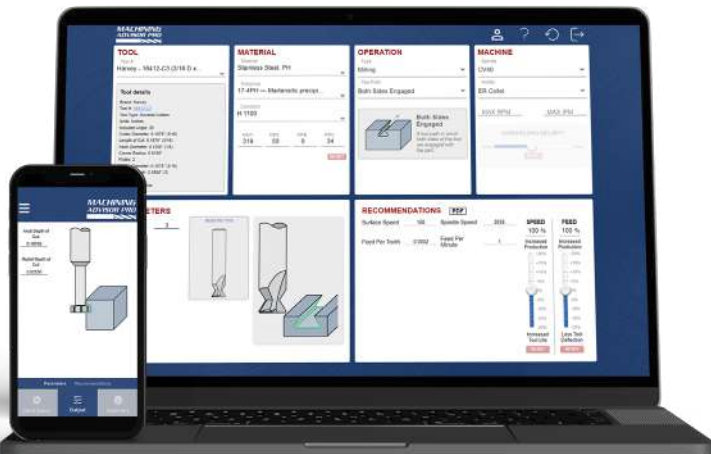
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## A Machinest Favorite

With Machining Advisor Pro I've become much more efficient at programming. The software takes the guess work and the headache out of feed, speed, step over, and step down to ensure it's going to work the first time.

Ryan S.













Shop Owner, Avella, PA






## MINIATURE END MILLS

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### TAPERED

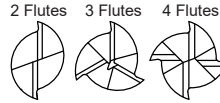
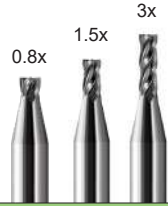
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# MINIATURE END MILLS

## Square – Stub & Standard



Stub Flute & Standard Length



SQUARE

- Cutter diameter down to **.001**
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIA.	LOC	SHANK DIA.		UNCOATED				AISI COATED				AMORPHOUS DIAMOND			
		D <sub>2</sub>	OAL	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>												
.001	.001 (1.5x)	1/8	1-1/2	13901			57.10								
.001	.003 (3x)	1/8	1-1/2	72001			57.10								
.002	.003 (1.5x)	1/8	1-1/2	13902			49.70								
.002	.006 (3x)	1/8	1-1/2	72002			49.70								
.003	.004 (1.5x)	1/8	1-1/2	13903			42.90								
.003	.009 (3x)	1/8	1-1/2	72003			42.90								
.004 (.1 mm)	.006 (1.5x)	1/8	1-1/2	13904			36.80								
.004 (.1 mm)	.012 (3x)	1/8	1-1/2	72004			36.80								
.005	.007 (1.5x)	1/8	1-1/2	13905	823005	14005*	33.30	13905-C3	823005-C3	14005-C3*	38.50				
.005	.015 (3x)	1/8	1-1/2	72005	836305	73005*	33.30	72005-C3	836305-C3	73005-C3*	38.50	72005-C4		73005-C4*	46.40
.006	.009 (1.5x)	1/8	1-1/2	13906		14006*	34.10	13906-C3		14006-C3*	39.30				
.006	.018 (3x)	1/8	1-1/2	72006	836306	73006*	34.10	72006-C3	836306-C3	73006-C3*	39.30	72006-C4		73006-C4*	47.20
.007	.010 (1.5x)	1/8	1-1/2	13907		14007*	33.40	13907-C3		14007-C3*	38.60				
.007	.021 (3x)	1/8	1-1/2	72007	836307	73007*	34.10	72007-C3	836307-C3	73007-C3*	39.30	72007-C4		73007-C4*	47.20
.008 (.2 mm)	.012 (1.5x)	1/8	1-1/2	13908		14008*	33.40	13908-C3		14008-C3*	38.60				
.008 (.2 mm)	.024 (3x)	1/8	1-1/2	72008	836308	73008*	34.10	72008-C3	836308-C3	73008-C3*	39.30	72008-C4			47.20
.009	.013 (1.5x)	1/8	1-1/2	13909		14009*	33.40	13909-C3		14009-C3*	38.60			14009-C4*	46.50
.009	.027 (3x)	1/8	1-1/2	72009	836309	73009*	38.60	72009-C3	836309-C3	73009-C3*	38.60				
.010	.015 (1.5x)	1/8	1-1/2	13910	823010	14010	26.40	13910-C3	823010-C3	14010-C3	31.60	13910-C4		14010-C4	39.50
.010	.030 (3x)	1/8	1-1/2	72010	836310	73010	26.40	72010-C3	836310-C3	73010-C3	31.60	72010-C4		73010-C4	39.50
.011	.016 (1.5x)	1/8	1-1/2	13911		14011	26.90	13911-C3		14011-C3	32.10				
.011	.033 (3x)	1/8	1-1/2	72011	836311	73011	27.40	72011-C3	836311-C3	73011-C3	32.60			73011-C4	40.50
.012 (.3 mm)	.018 (1.5x)	1/8	1-1/2	13912	823012	14012	26.90	13912-C3	823012-C3	14012-C3	32.10	13912-C4		14012-C4	40.00
.012 (.3 mm)	.036 (3x)	1/8	1-1/2	72012	836312	73012	27.40	72012-C3	836312-C3	73012-C3	32.60	72012-C4		73012-C4	40.50
.013	.019 (1.5x)	1/8	1-1/2	13913		14013	26.90	13913-C3		14013-C3	32.10				
.013	.039 (3x)	1/8	1-1/2	72013	836313	73013	26.90	72013-C3	836313-C3	73013-C3	32.10			73013-C4	40.00
.014	.021 (1.5x)	1/8	1-1/2	13914		14014	26.90	13914-C3		14014-C3	32.10				
.014	.042 (3x)	1/8	1-1/2	72014	836314	73014	26.90	72014-C3	836314-C3	73014-C3	32.10			73014-C4	40.00
.015 (1/64)	.012 (0.8x)	1/8	1-1/2			771315	23.50			771315-C3	28.70				
.015 (1/64)	.022 (1.5x)	1/8	1-1/2	13915	823015	14015	22.30	13915-C3	823015-C3	14015-C3	27.50	13915-C4		14015-C4	35.40
.015 (1/64)	.045 (3x)	1/8	1-1/2	72015	836315	73015	22.30	72015-C3	836315-C3	73015-C3	27.50	72015-C4		73015-C4	35.40
.016 (.4 mm)	.024 (1.5x)	1/8	1-1/2	13916	823016	14016	24.20	13916-C3	823016-C3	14016-C3	29.40	13916-C4			37.30
.016 (.4 mm)	.048 (3x)	1/8	1-1/2	72016	836316	73016	24.20	72016-C3	836316-C3	73016-C3	29.40			73016-C4	37.30
.017	.026 (1.5x)	1/8	1-1/2	13917		14017	24.20	13917-C3		14017-C3	29.40				
.017	.051 (3x)	1/8	1-1/2	72017	836317	73017	24.20	72017-C3	836317-C3	73017-C3	29.40			73017-C4	37.30
.018	.027 (1.5x)	1/8	1-1/2	13918		14018	24.20	13918-C3		14018-C3	29.40				
.018	.054 (3x)	1/8	1-1/2	72018	836318	73018	24.20	72018-C3	836318-C3	73018-C3	29.40	72018-C4		73018-C4	37.30
.019	.029 (1.5x)	1/8	1-1/2	13919		14019	24.20	13919-C3		14019-C3	29.40				
.019	.057 (3x)	1/8	1-1/2	72019	836319	73019	24.20	72019-C3	836319-C3	73019-C3	29.40			73019-C4	37.30



\*End cutting (not center cutting)

continued on next page

MINIATURE END MILLS

Square – Stub & Standard (cont.)

continued from previous page

NEW	CUTTER DIA.	LOC	SHANK DIA.		UNCOATED				A1TIN COATED				AMORPHOUS DIAMOND				SQUARE
			D <sub>2</sub>	OAL	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	
	D <sub>1</sub> <sup>+0.0005"</sup> <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>													
	.020 (.5 mm)	.016 (0.8x)	1/8	1-1/2				771320	22.40			771320-C3	27.60				
	.020 (.5 mm)	.030 (1.5x)	1/8	1-1/2	13920	823020	14020	21.40	13920-C3	823020-C3	14020-C3	26.60	13920-C4		14020-C4	34.50	
	.020 (.5 mm)	.060 (3x)	1/8	1-1/2	72020	836320	73020	21.40	72020-C3	836320-C3	73020-C3	26.60	72020-C4		73020-C4	34.50	
	.021	.031 (1.5x)	1/8	1-1/2	13921		14021	23.00	13921-C3		14021-C3	28.20					
	.021	.063 (3x)	1/8	1-1/2	72021	836321	73021	23.00	72021-C3	836321-C3	73021-C3	28.20			73021-C4	36.10	
	.022	.033 (1.5x)	1/8	1-1/2	13922		14022	23.00	13922-C3		14022-C3	28.20					
	.022	.066 (3x)	1/8	1-1/2	72022	836322	73022	23.00	72022-C3	836322-C3	73022-C3	28.20			73022-C4	36.10	
	.023	.035 (1.5x)	1/8	1-1/2	13923		14023	23.00	13923-C3		14023-C3	28.20					
	.023	.069 (3x)	1/8	1-1/2	72023	836323	73023	23.00	72023-C3	836323-C3	73023-C3	28.20			73023-C4	36.10	
	.024 (.6 mm)	.036 (1.5x)	1/8	1-1/2	13924		14024	23.00	13924-C3		14024-C3	28.20					
	.024 (.6 mm)	.072 (3x)	1/8	1-1/2	72024	836324	73024	23.00	72024-C3	836324-C3	73024-C3	28.20	72024-C4		73024-C4	36.10	
	.025	.037 (1.5x)	1/8	1-1/2	13925	823025	14025	19.70	13925-C3	823025-C3	14025-C3	24.90	13925-C4		14025-C4	32.80	
	.025	.075 (3x)	1/8	1-1/2	72025	836325	73025	19.70	72025-C3	836325-C3	73025-C3	24.90	72025-C4		73025-C4	32.80	
	.026	.039 (1.5x)	1/8	1-1/2	13926		14026	21.40	13926-C3		14026-C3	26.60					
	.026	.078 (3x)	1/8	1-1/2	72026	836326	73026	21.40	72026-C3	836326-C3	73026-C3	26.60			73026-C4	34.50	
	.027	.041 (1.5x)	1/8	1-1/2	13927		14027	21.40	13927-C3		14027-C3	26.60					
	.027	.081 (3x)	1/8	1-1/2	72027	836327	73027	21.40	72027-C3	836327-C3	73027-C3	26.60			73027-C4	34.50	
	.028 (.7 mm)	.042 (1.5x)	1/8	1-1/2	13928		14028	21.40	13928-C3		14028-C3	26.60					
	.028 (.7 mm)	.084 (3x)	1/8	1-1/2	72028	836328	73028	21.40	72028-C3	836328-C3	73028-C3	26.60			73028-C4	34.50	
	.029	.043 (1.5x)	1/8	1-1/2	13929		14029	21.40	13929-C3		14029-C3	26.60					
	.029	.087 (3x)	1/8	1-1/2	72029	836329	73029	21.40	72029-C3	836329-C3	73029-C3	26.60			73029-C4	34.50	
	.030	.045 (1.5x)	1/8	1-1/2	13930	823030	14030	19.70	13930-C3	823030-C3	14030-C3	24.90	13930-C4		14030-C4	32.80	
	.030	.090 (3x)	1/8	1-1/2	72030	836330	73030	19.70	72030-C3	836330-C3	73030-C3	24.90	72030-C4		73030-C4	32.80	
	.031 (1/32)	.025 (0.8x)	1/8	1-1/2				771331	21.10			771331-C3	26.30				
	.031 (1/32)	.046 (1.5x)	1/8	1-1/2	13931	823031	14031	19.70	13931-C3	823031-C3	14031-C3	24.90	13931-C4		14031-C4	32.80	
	.031 (1/32)	.093 (3x)	1/8	1-1/2	72031	836331	73031	19.70	72031-C3	836331-C3	73031-C3	24.90	72031-C4	836331-C4	73031-C4	32.80	
	.032	.048 (1.5x)	1/8	1-1/2	13932		14032	21.40	13932-C3		14032-C3	26.60					
	.032	.096 (3x)	1/8	1-1/2	72032		73032	21.40	72032-C3		73032-C3	26.60					
	.033	.049 (1.5x)	1/8	1-1/2	13933		14033	21.40	13933-C3		14033-C3	26.60					
	.033	.099 (3x)	1/8	1-1/2	72033		73033	21.40	72033-C3		73033-C3	26.60					
	.034	.051 (1.5x)	1/8	1-1/2	13934		14034	21.40	13934-C3		14034-C3	26.60					
	.034	.102 (3x)	1/8	1-1/2	72034		73034	21.40	72034-C3		73034-C3	26.60					
	.035 (.9 mm)	.052 (1.5x)	1/8	1-1/2	13935	823035	14035	17.20	13935-C3	823035-C3	14035-C3	22.40			14035-C4	30.30	
	.035 (.9 mm)	.105 (3x)	1/8	1-1/2	72035	836335	73035	17.20	72035-C3	836335-C3	73035-C3	22.40	72035-C4		73035-C4	30.30	
	.036	.054 (1.5x)	1/8	1-1/2	13936		14036	18.40	13936-C3		14036-C3	23.60					
	.036	.108 (3x)	1/8	1-1/2	72036		73036	18.40	72036-C3		73036-C3	23.60					
	.037	.055 (1.5x)	1/8	1-1/2	13937		14037	18.40	13937-C3		14037-C3	23.60					
	.037	.111 (3x)	1/8	1-1/2	72037		73037	18.40	72037-C3		73037-C3	23.60					
	.038	.057 (1.5x)	1/8	1-1/2	13938		14038	18.40	13938-C3		14038-C3	23.60					
	.038	.114 (3x)	1/8	1-1/2	72038	836338	73038	18.40	72038-C3	836338-C3	73038-C3	23.60			73038-C4	31.50	
	.039 (1 mm)	.058 (1.5x)	1/8	1-1/2	13939	823039	14039	18.20	13939-C3	823039-C3	14039-C3	23.40					
	.039 (1 mm)	.117 (3x)	1/8	1-1/2	72039	836339	73039	18.20	72039-C3	836339-C3	73039-C3	23.40	72039-C4		73039-C4	31.30	
	.040	.060 (1.5x)	1/8	1-1/2	13940	823040	14040	17.20	13940-C3	823040-C3	14040-C3	22.40	13940-C4		14040-C4	30.30	
	.040	.120 (3x)	1/8	1-1/2	72040	836340	73040	17.20	72040-C3	836340-C3	73040-C3	22.40	72040-C4		73040-C4	30.30	
	.041	.062 (1.5x)	1/8	1-1/2	13941		14041	18.40	13941-C3		14041-C3	23.60					
	.041	.123 (3x)	1/8	1-1/2	72041		73041	18.40	72041-C3		73041-C3	23.60					

\*End cutting (not center cutting)

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# MINIATURE END MILLS

Square – Stub & Standard (cont.)

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CUTTER DIA.	LOC	SHANK DIA.		UNCOATED				AIIIN COATED				AMORPHOUS DIAMOND			
		OAL	OAL	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE
.042	<b>.063</b> (1.5x)	1/8	1-1/2	13942	14042	18.40		13942-C3	14042-C3	23.60					
.042	<b>.126</b> (3x)	1/8	1-1/2	72042	73042	18.40		72042-C3	73042-C3	23.60					
.043 (1.1 mm)	<b>.065</b> (1.5x)	1/8	1-1/2	13943	14043	18.40		13943-C3	14043-C3	23.60					
.043 (1.1 mm)	<b>.129</b> (3x)	1/8	1-1/2	72043	836343	73043	18.40	72043-C3	836343-C3	73043-C3	23.60				
.044	<b>.066</b> (1.5x)	1/8	1-1/2	13944	14044	18.40		13944-C3	14044-C3	23.60					
.044	<b>.132</b> (3x)	1/8	1-1/2	72044	836344	73044	18.40	72044-C3	836344-C3	73044-C3	23.60			73044-C4	31.50
.045	<b>.067</b> (1.5x)	1/8	1-1/2	13945	823045	14045	17.30	13945-C3	823045-C3	14045-C3	22.50			14045-C4	30.40
.045	<b>.135</b> (3x)	1/8	1-1/2	72045	836345	73045	17.20	72045-C3	836345-C3	73045-C3	22.40	72045-C4		73045-C4	30.30
.046	<b>.069</b> (1.5x)	1/8	1-1/2			14046	18.40			14046-C3	23.60				
.046	<b>.138</b> (3x)	1/8	1-1/2	72046	836346	73046	18.40	72046-C3	836346-C3	73046-C3	23.60				
.047 (3/64)	<b>.038</b> (0.8x)	1/8	1-1/2			771347	18.40			771347-C3	23.60				NEW
.047 (3/64)	<b>.070</b> (1.5x)	1/8	1-1/2	13947	823047	14047	17.20	13947-C3	823047-C3	14047-C3	22.40	13947-C4		14047-C4	30.30
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	72047	836347	73047	17.20	72047-C3	836347-C3	73047-C3	22.40	72047-C4		73047-C4	30.30
.048	<b>.144</b> (3x)	1/8	1-1/2	72048	73048	18.40		72048-C3	73048-C3	23.60					
.049	<b>.147</b> (3x)	1/8	1-1/2	72049	73049	18.40		72049-C3	73049-C3	23.60					
.050	<b>.075</b> (1.5x)	1/8	1-1/2	13950	823050	14050	17.20	13950-C3	823050-C3	14050-C3	22.40	13950-C4		14050-C4	30.30
.050	<b>.150</b> (3x)	1/8	1-1/2	72050	836350	73050	17.20	72050-C3	836350-C3	73050-C3	22.40	72050-C4		73050-C4	30.30
.051 (1.3 mm)	<b>.077</b> (1.5x)	1/8	1-1/2			14051	18.70			14051-C3	23.90				
.051 (1.3 mm)	<b>.153</b> (3x)	1/8	1-1/2	72051	73051	18.40		72051-C3	73051-C3	23.60					
.052	<b>.078</b> (1.5x)	1/8	1-1/2	13952	14052	18.40		13952-C3	14052-C3	23.60					
.052	<b>.156</b> (3x)	1/8	1-1/2	72052	836352	73052	18.40	72052-C3	836352-C3	73052-C3	23.60	72052-C4			31.50
.053	<b>.080</b> (1.5x)	1/8	1-1/2			14053	18.40			14053-C3	23.60				
.053	<b>.159</b> (3x)	1/8	1-1/2	72053	836353	73053	18.40	72053-C3	836353-C3	73053-C3	23.60			73053-C4	31.50
.054	<b>.162</b> (3x)	1/8	1-1/2	72054	73054	18.40		72054-C3	73054-C3	23.60					
.055 (1.4 mm)	<b>.082</b> (1.5x)	1/8	1-1/2	13955	823055	14055	17.20	13955-C3	823055-C3	14055-C3	22.40	13955-C4		14055-C4	30.30
.055 (1.4 mm)	<b>.165</b> (3x)	1/8	1-1/2	72055	836355	73055	17.20	72055-C3	836355-C3	73055-C3	22.40	72055-C4		73055-C4	30.30
.056	<b>.168</b> (3x)	1/8	1-1/2	72056	73056	18.40		72056-C3	73056-C3	23.60					
.057	<b>.086</b> (1.5x)	1/8	1-1/2			14057	18.40			14057-C3	23.60				
.057	<b>.171</b> (3x)	1/8	1-1/2	72057	836357	73057	18.40	72057-C3	836357-C3	73057-C3	23.60				
.058	<b>.087</b> (1.5x)	1/8	1-1/2			14058	18.40			14058-C3	23.60				
.058	<b>.174</b> (3x)	1/8	1-1/2	72058	73058	18.40		72058-C3	73058-C3	23.60					
.059 (1.5 mm)	<b>.089</b> (1.5x)	1/8	1-1/2	13959	823059	14059	18.40	13959-C3	823059-C3	14059-C3	23.60				
.059 (1.5 mm)	<b>.177</b> (3x)	1/8	1-1/2	72059	836359	73059	18.40	72059-C3	836359-C3	73059-C3	23.60			73059-C4	31.50
.060	<b>.090</b> (1.5x)	1/8	1-1/2	13960	823060	14060	17.20	13960-C3	823060-C3	14060-C3	22.40			14060-C4	30.30
.060	<b>.180</b> (3x)	1/8	1-1/2	72060	836360	73060	17.20	72060-C3	836360-C3	73060-C3	22.40	72060-C4		73060-C4	30.30
.061	<b>.183</b> (3x)	1/8	1-1/2			73061	18.50			73061-C3	23.70				
.062 (1/16)	<b>.050</b> (0.8x)	1/8	1-1/2			771362	19.30			771362-C3	24.50				
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	13962	823062	14062	15.50	13962-C3	823062-C3	14062-C3	20.70	13962-C4		14062-C4	28.60
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	72062	836362	73062	15.50	72062-C3	836362-C3	73062-C3	20.70	72062-C4	836362-C4	73062-C4	28.60
.063 (1.6 mm)	<b>.189</b> (3x)	1/8	1-1/2			73063	18.50			73063-C3	23.70				
.064	<b>.096</b> (1.5x)	1/8	1-1/2			14064	16.00			14064-C3	21.20				
.064	<b>.192</b> (3x)	1/8	1-1/2	72064	73064	18.50		72064-C3	73064-C3	23.70					
.065	<b>.097</b> (1.5x)	1/8	1-1/2	13965	823065	14065	15.70	13965-C3	823065-C3	14065-C3	20.90			14065-C4	28.80
.065	<b>.195</b> (3x)	1/8	1-1/2	72065	836365	73065	15.70	72065-C3	836365-C3	73065-C3	20.90	72065-C4		73065-C4	28.80
.066	<b>.198</b> (3x)	1/8	1-1/2			73066	18.50			73066-C3	23.70				
.067 (1.7 mm)	<b>.201</b> (3x)	1/8	1-1/2			73067	18.50			73067-C3	23.70				

\*End cutting (not center cutting)

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# MINIATURE END MILLS

## Square – Stub & Standard (cont.)

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CUTTER DIA.	LOC	SHANK DIA.		UNCOATED				AITIN COATED				AMORPHOUS DIAMOND			
		D <sub>2</sub>	OAL	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE
.068	<b>.204</b> (3x)	1/8	1-1/2			73068	18.50			73068-C3	23.70				
.069	<b>.207</b> (3x)	1/8	1-1/2			73069	18.50			73069-C3	23.70				
.070	<b>.105</b> (1.5x)	1/8	1-1/2	13970	823070	14070	15.70	13970-C3	823070-C3	14070-C3	20.90			14070-C4	28.80
.070	<b>.210</b> (3x)	1/8	1-1/2	72070	836370	73070	15.70	72070-C3	836370-C3	73070-C3	20.90	72070-C4		73070-C4	28.80
<b>NEW</b> .071 (1.8 mm)	<b>.107</b> (1.5x)	1/8	1-1/2							<b>14071-C3</b>	23.70				
.071 (1.8 mm)	<b>.213</b> (3x)	1/8	1-1/2	72071		73071	18.50	72071-C3		73071-C3	23.70				
.072	<b>.216</b> (3x)	1/8	1-1/2			73072	18.50			73072-C3	23.70				
.073	<b>.219</b> (3x)	1/8	1-1/2			73073	18.50			73073-C3	23.70				
.074	<b>.222</b> (3x)	1/8	1-1/2			73074	18.50			73074-C3	23.70				
.075 (1.9 mm)	<b>.112</b> (1.5x)	1/8	1-1/2	13975	823075	14075	15.70	13975-C3	823075-C3	14075-C3	20.90				
.075 (1.9 mm)	<b>.225</b> (3x)	1/8	1-1/2	72075	836375	73075	15.70	72075-C3	836375-C3	73075-C3	20.90			73075-C4	28.80
.076	<b>.228</b> (3x)	1/8	1-1/2			73076	18.50			73076-C3	23.70				
.077	<b>.231</b> (3x)	1/8	1-1/2			73077	18.50			73077-C3	23.70				
<b>NEW</b> .078 (5/64)	<b>.062</b> (0.8x)	1/8	1-1/2							<b>771378-C3</b>	21.80				
.078 (5/64)	<b>.117</b> (1.5x)	1/8	1-1/2	13978	823078	14078	15.50	13978-C3	823078-C3	14078-C3	20.70	13978-C4		14078-C4	28.60
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	72078	836378	73078	15.50	72078-C3	836378-C3	73078-C3	20.70	72078-C4	836378-C4	73078-C4	28.60
.079	<b>.237</b> (3x)	1/8	1-1/2			73079	18.50			73079-C3	23.70				
.080	<b>.120</b> (1.5x)	1/8	1-1/2	13980	823080	14080	15.70	13980-C3	823080-C3	14080-C3	20.90				
.080	<b>.240</b> (3x)	1/8	1-1/2	72080	836380	73080	15.50	72080-C3	836380-C3	73080-C3	20.70	72080-C4		73080-C4	28.60
.081	<b>.243</b> (3x)	1/8	1-1/2			73081	18.50			73081-C3	23.70				
.082	<b>.246</b> (3x)	1/8	1-1/2			73082	18.50			73082-C3	23.70				
.083 (2.1 mm)	<b>.249</b> (3x)	1/8	1-1/2			73083	18.50			73083-C3	23.70				
.084	<b>.252</b> (3x)	1/8	1-1/2			73084	18.50			73084-C3	23.70				
.085	<b>.127</b> (1.5x)	1/8	1-1/2	13985	823085	14085	15.70	13985-C3	823085-C3	14085-C3	20.90				
.085	<b>.255</b> (3x)	1/8	1-1/2	72085	836385	73085	15.70	72085-C3	836385-C3	73085-C3	20.90			73085-C4	28.80
.086	<b>.258</b> (3x)	1/8	1-1/2			73086	18.50			73086-C3	23.70				
.087 (2.2 mm)	<b>.261</b> (3x)	1/8	1-1/2			73087	18.50			73087-C3	23.70				
.088	<b>.132</b> (1.5x)	1/8	1-1/2			14088	16.00			14088-C3	21.20				
.088	<b>.264</b> (3x)	1/8	1-1/2			73088	18.50			73088-C3	23.70				
.089	<b>.267</b> (3x)	1/8	1-1/2			73089	18.50			73089-C3	23.70				
.090	<b>.135</b> (1.5x)	1/8	1-1/2	13990	823090	14090	15.50	13990-C3	823090-C3	14090-C3	20.70			14090-C4	28.60
.090	<b>.270</b> (3x)	1/8	1-1/2	72090	836390	73090	15.50	72090-C3	836390-C3	73090-C3	20.70	72090-C4		73090-C4	28.60
.091 (2.3 mm)	<b>.273</b> (3x)	1/8	1-1/2			73091	18.50			73091-C3	23.70				
.092	<b>.276</b> (3x)	1/8	1-1/2			73092	18.50			73092-C3	23.70				
.093 (3/32)	<b>.074</b> (0.8x)	1/8	1-1/2			771393	17.00			771393-C3	22.20				
.093 (3/32)	<b>.139</b> (1.5x)	1/8	1-1/2	13993	823093	14093	15.50	13993-C3	823093-C3	14093-C3	20.70	13993-C4		14093-C4	28.60
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	72093	836393	73093	15.50	72093-C3	836393-C3	73093-C3	20.70	72093-C4	836393-C4	73093-C4	28.60
.094 (2.4 mm)	<b>.141</b> (1.5x)	1/8	1-1/2			14094	18.80			14094-C3	24.00				
.094 (2.4 mm)	<b>.282</b> (3x)	1/8	1-1/2	72094		73094	18.50	72094-C3		73094-C3	23.70				
.095	<b>.142</b> (1.5x)	1/8	1-1/2	13995	823095	14095	15.70	13995-C3	823095-C3	14095-C3	20.90				
.095	<b>.285</b> (3x)	1/8	1-1/2	72095	836395	73095	15.70	72095-C3	836395-C3	73095-C3	20.90			73095-C4	28.80
.096	<b>.288</b> (3x)	1/8	1-1/2			73096	18.50			73096-C3	23.70				
.097	<b>.291</b> (3x)	1/8	1-1/2			73097	18.50			73097-C3	23.70				
.098 (2.5 mm)	<b>.147</b> (1.5x)	1/8	1-1/2			14098	18.50			14098-C3	23.70				
.098 (2.5 mm)	<b>.294</b> (3x)	1/8	1-1/2	72098		73098	18.50	72098-C3		73098-C3	23.70				
.099	<b>.297</b> (3x)	1/8	1-1/2			73099	18.50			73099-C3	23.70				

SQUARE

\*End cutting (not center cutting)

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# MINIATURE END MILLS

## Square – Stub & Standard (cont.)

continued from previous page

CUTTER DIA.	LOC	SHANK DIA.		UNCOATED				AITIN COATED				AMORPHOUS DIAMOND			
		D <sub>2</sub>	OAL	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE
.100	<b>.150</b> (1.5x)	1/8	1-1/2	13999	823100	14099	15.70	13999-C3	823100-C3	14099-C3	20.90			14099-C4	28.80
.100	<b>.300</b> (3x)	1/8	1-1/2	72100	836400	73100	15.50	72100-C3	836400-C3	73100-C3	20.70	72100-C4		73100-C4	28.60
.101	<b>.303</b> (3x)	1/8	1-1/2			73101	18.50			73101-C3	23.70				
.102 (2.6 mm)	<b>.306</b> (3x)	1/8	1-1/2			73102	18.50			73102-C3	23.70				
.103	<b>.309</b> (3x)	1/8	1-1/2			73103	18.50			73103-C3	23.70				
.104	<b>.312</b> (3x)	1/8	1-1/2			73104	18.50			73104-C3	23.70				
.105	<b>.158</b> (1.5x)	1/8	1-1/2	50200		50300	15.70	50200-C3		50300-C3	20.90				
.105	<b>.315</b> (3x)	1/8	1-1/2	72105		73105	15.50	72105-C3		73105-C3	20.70			73105-C4	28.60
.106 (2.7 mm)	<b>.318</b> (3x)	1/8	1-1/2			73106	18.50			73106-C3	23.70				
.107	<b>.321</b> (3x)	1/8	1-1/2			73107	18.50			73107-C3	23.70				
.108	<b>.324</b> (3x)	1/8	1-1/2			73108	18.50			73108-C3	23.70				
.109 (7/64)	<b>.164</b> (1.5x)	1/8	1-1/2	50201	823102	50301	15.50	50201-C3	823102-C3	50301-C3	20.70				
.109 (7/64)	<b>.327</b> (3x)	1/8	1-1/2	72109	836402	73109	15.50	72109-C3	836402-C3	73109-C3	20.70			73109-C4	28.60
.110	<b>.165</b> (1.5x)	1/8	1-1/2	50202		50302	15.50	50202-C3		50302-C3	20.70				
.110	<b>.330</b> (3x)	1/8	1-1/2	72110		73110	15.50	72110-C3		73110-C3	20.70			73110-C4	28.60
.111 (2.8 mm)	<b>.333</b> (3x)	1/8	1-1/2			73111	18.50			73111-C3	23.70				
.112	<b>.336</b> (3x)	1/8	1-1/2			73112	18.50			73112-C3	23.70				
.113	<b>.339</b> (3x)	1/8	1-1/2			73113	18.50			73113-C3	23.70				
.114 (2.9 mm)	<b>.341</b> (3x)	1/8	1-1/2			73114	18.50			73114-C3	23.70				
.115	<b>.173</b> (1.5x)	1/8	1-1/2	50203		50303	15.50	50203-C3		50303-C3	20.70				
.115	<b>.345</b> (3x)	1/8	1-1/2	72115		73115	15.50	72115-C3		73115-C3	20.70			73115-C4	28.60
.116	<b>.348</b> (3x)	1/8	1-1/2			73116	18.50			73116-C3	23.70				
.117	<b>.351</b> (3x)	1/8	1-1/2			73117	18.50			73117-C3	23.70				
.118 (3 mm)	<b>.177</b> (1.5x)	1/8	1-1/2	50204	823105	50304	16.00	50204-C3	823105-C3	50304-C3	21.20				
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	72118	836405	73118	15.80	72118-C3	836405-C3	73118-C3	21.00	72118-C4		73118-C4	28.90
.119	<b>.357</b> (3x)	1/8	1-1/2			73119	18.50			73119-C3	23.70				
.120	<b>.180</b> (1.5x)	1/8	1-1/2	50205		50305	15.50	50205-C3		50305-C3	20.70				
.120	<b>.360</b> (3x)	1/8	1-1/2	72120	836406	73120	15.50	72120-C3	836406-C3	73120-C3	20.70			73120-C4	28.60
.121	<b>.363</b> (3x)	1/8	1-1/2			73121	18.50			73121-C3	23.70				
.122	<b>.366</b> (3x)	1/8	1-1/2			73189	18.50			73189-C3	23.70				
.123	<b>.369</b> (3x)	1/8	1-1/2			73123	18.50			73123-C3	23.70				
.124	<b>.372</b> (3x)	1/8	1-1/2			73124	18.50			73124-C3	23.70				

D <sub>1</sub>	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE
.125 (1/8)	<b>.100</b> (0.8x)	1/8	1-1/2			771408	16.40			771408-C3	21.60				
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	50208	823108	50308	15.00	50208-C3	823108-C3	50308-C3	20.20	50208-C4		50308-C4	28.10
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	72125	836408	73125	15.00	72125-C3	836408-C3	73125-C3	20.20	72125-C4	836408-C4	73125-C4	28.10
.140 (9/64)	<b>.220</b> (1.5x)	3/16	2	50209	823109	50309	16.30	50209-C3	823109-C3	50309-C3	21.90				
.140 (9/64)	<b>.562</b> (4x)	3/16	2	72140	836409	73140	16.30	72140-C3	836409-C3	73140-C3	21.90			73140-C4	34.40
.156 (5/32)	<b>.281</b> (1.5x)	3/16	2	50210	823110	50310	16.30	50210-C3	823110-C3	50310-C3	21.90			50310-C4	34.40
.156 (5/32)	<b>.562</b> (3x)	3/16	2	72156	836410	73156	16.30	72156-C3	836410-C3	73156-C3	21.90	72156-C4		73156-C4	34.40
.172 (11/64)	<b>.312</b> (1.5x)	3/16	2			50311	16.50			50311-C3	22.10				
.172 (11/64)	<b>.625</b> (3x)	3/16	2	72172	836411	73172	16.30	72172-C3	836411-C3	73172-C3	21.90				
.187 (3/16)	<b>.150</b> (0.8x)	3/16	2			771412	17.40			771412-C3	23.00				
.187 (3/16)	<b>.312</b> (1.5x)	3/16	2	50212	823112	50312	16.30	50212-C3	823112-C3	50312-C3	21.90	50212-C4		50312-C4	34.40
.187 (3/16)	<b>.625</b> (3x)	3/16	2	72187	836412	73187	16.30	72187-C3	836412-C3	73187-C3	21.90	72187-C4		73187-C4	34.40

\*End cutting (not center cutting)

continued on next page

NEW

# MINIATURE END MILLS

Square – Stub & Standard (cont.)

continued from previous page

	CUTTER DIA.	LOC	SHANK DIA.		UNCOATED				AITIN COATED				AMORPHOUS DIAMOND			
			D <sub>2</sub>	OAL	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>												
	.203 (13/64)	<b>.312</b> (1.5x)	1/4	2-1/2			50313	17.90			50313-C3	25.50				
<b>NEW</b>	.203 (13/64)	<b>.625</b> (3x)	1/4	2-1/2	72190	<b>836413</b>	73190	17.90	72190-C3	<b>836413-C3</b>	73190-C3	25.50				
	.218 (7/32)	<b>.330</b> (1.5x)	1/4	2-1/2	50214	823114	50314	17.90	50214-C3	823114-C3	50314-C3	25.50				
	.218 (7/32)	<b>.625</b> (3x)	1/4	2-1/2	72193	836414	73193	17.90	72193-C3	836414-C3	73193-C3	25.50				
	.234 (15/64)	<b>.750</b> (3x)	1/4	2-1/2	72195		73195	17.90	72195-C3		73195-C3	25.50				
<b>NEW</b>	.250 (1/4)	<b>.200</b> (0.8x)	1/4	2-1/2				<b>19.00</b>				<b>26.60</b>				
	.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2	50216	823116	50316	17.90	50216-C3	823116-C3	50316-C3	25.50	50216-C4		50316-C4	38.50
	.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	72199	836416	73199	17.90	72199-C3	836416-C3	73199-C3	25.50	72199-C4		73199-C4	38.50
	.281 (9/32)	<b>.750</b> (3x)	5/16	2-1/2			73122	24.40			73122-C3	33.30				
	.312 (5/16)	<b>.470</b> (1.5x)	5/16	2-1/2	50220		50320	24.60	50220-C3		50320-C3	33.50				
	.312 (5/16)	<b>.812</b> (3x)	5/16	2-1/2	15120		15220	24.40	15120-C3		15220-C3	33.30			15220-C4	49.20
	.343 (11/32)	<b>1.000</b> (3x)	3/8	2-1/2			15222	34.90			15222-C3	45.00				
	.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2	50224		50324	32.80	50224-C3		50324-C3	42.90	50224-C4		50324-C4	57.60
	.375 (3/8)	<b>1.000</b> (3x)	3/8	2-1/2	15124	836424	15224	32.50	15124-C3	836424-C3	15224-C3	42.60			15224-C4	57.30
	.437 (7/16)	<b>1.312</b> (3x)	7/16	3			15228	51.80			15228-C3	63.70				
	.500 (1/2)	<b>.500</b> (1x)	1/2	3			50332	53.40			50332-C3	68.50				
	.500 (1/2)	<b>1.000</b> (2x)	1/2	3	15132	836432	15232	56.50	15132-C3	836432-C3	15232-C3	71.60	15132-C4		15232-C4	86.40

SQUARE

\*End cutting (not center cutting)



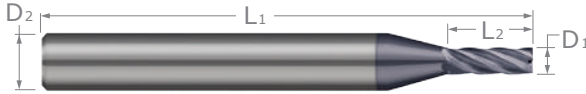
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# MINIATURE END MILLS

## Square – Stub & Standard – 5 Flute



SQUARE

- Cutter diameter down to .020"
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					TOOL #	PRICE	4 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_4 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
.020 (.5 mm)	.030 (1.5x)	5	1/8	1-1/2	739420	24.30	739420-C3	29.50
.020 (.5 mm)	.060 (3x)	5	1/8	1-1/2	742020	25.80	742020-C3	31.00
.031 (1/32)	.047 (1.5x)	5	1/8	1-1/2	739431	22.60	739431-C3	27.80
.031 (1/32)	.093 (3x)	5	1/8	1-1/2	742031	24.60	742031-C3	29.80
.047 (3/64)	.071 (1.5x)	5	1/8	1-1/2	739447	22.60	739447-C3	27.80
.047 (3/64)	.141 (3x)	5	1/8	1-1/2	742047	23.80	742047-C3	29.00
.062 (1/16)	.093 (1.5x)	5	1/8	1-1/2	739462	22.60	739462-C3	27.80
.062 (1/16)	.186 (3x)	5	1/8	1-1/2	742062	23.80	742062-C3	29.00
.078 (5/64)	.117 (1.5x)	5	1/8	1-1/2	739478	22.60	739478-C3	27.80
.078 (5/64)	.234 (3x)	5	1/8	1-1/2	742078	23.80	742078-C3	29.00
.093 (3/32)	.140 (1.5x)	5	1/8	1-1/2	739493	22.60	739493-C3	27.80
.093 (3/32)	.279 (3x)	5	1/8	1-1/2	742093	23.80	742093-C3	29.00
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_4 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
.125 (1/8)	.187 (1.5x)	5	1/8	1-1/2	739508	21.10	739508-C3	26.30
.125 (1/8)	.375 (3x)	5	1/8	1-1/2	742108	22.20	742108-C3	27.40
.187 (3/16)	.312 (1.5x)	5	3/16	2	739512	24.40	739512-C3	30.00
.187 (3/16)	.625 (3x)	5	3/16	2	742112	25.60	742112-C3	31.20
.250 (1/4)	.375 (1.5x)	5	1/4	2-1/2	739516	28.90	739516-C3	36.50
.250 (1/4)	.750 (3x)	5	1/4	2-1/2	742116	30.30	742116-C3	37.90



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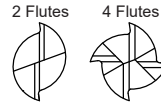
**NEW!**

# MINIATURE END MILLS

## Square – Stub & Standard – Metric



- All dimensions and tolerances in metric values
- Cutter diameter down to 0.5mm
- Center cutting
- Solid carbide
- CNC ground in the USA



Stub Flute & Standard Length



SQUARE

	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			A1TiN COATED		
					2 FL	4 FL	PRICE	2 FL	4 FL	PRICE
	$D_1 \begin{smallmatrix} +.00\text{mm} \\ -.02\text{mm} \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$	$D_2$	$L_1$						
NEW	.500 mm	.75 (1.5x)	3 mm	38 mm	740811	740711	22.10	740811-C3	740711-C3	27.30
NEW	.500 mm	1.50 (3x)	3 mm	38 mm	741411	743411	22.10	741411-C3	743411-C3	27.30
NEW	1.00 mm	1.50 (1.5x)	3 mm	38 mm	740822	740722	18.60	740822-C3	740722-C3	23.80
NEW	1.00 mm	3.00 (3x)	3 mm	38 mm	741422	743422	18.60	741422-C3	743422-C3	23.80
NEW	1.50 mm	2.20 (1.5x)	3 mm	38 mm	740833	740733	18.80	740833-C3	740733-C3	24.00
NEW	1.50 mm	4.50 (3x)	3 mm	38 mm	741433	743433	18.80	741433-C3	743433-C3	24.00
NEW	2.00 mm	3.00 (1.5x)	3 mm	38 mm	740845	740745	18.60	740845-C3	740745-C3	23.80
NEW	2.00 mm	6.00 (3x)	3 mm	38 mm	741445	743445	18.60	741445-C3	743445-C3	23.80
NEW	3.00 mm	4.50 (1.5x)	3 mm	38 mm	740857	740757	17.50	740857-C3	740757-C3	22.70
NEW	3.00 mm	9.00 (3x)	3 mm	38 mm	741457	743457	17.50	741457-C3	743457-C3	22.70
	$D_1 \begin{smallmatrix} +.00\text{mm} \\ -.04\text{mm} \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.750\text{mm} \\ -.000\text{mm} \end{smallmatrix}$	$D_2$	$L_1$						
NEW	4.00 mm	6.00 (1.5x)	4 mm	50 mm	740861	740761	19.40	740861-C3	740761-C3	25.00
NEW	4.00 mm	12.00 (3x)	4 mm	50 mm	741461	743461	19.40	741461-C3	743461-C3	25.00
NEW	5.00 mm	7.50 (1.5x)	5 mm	50 mm	740864	740764	23.80	740864-C3	740764-C3	30.10
NEW	5.00 mm	15.00 (3x)	5 mm	50 mm	741464	743464	23.80	741464-C3	743464-C3	30.10
NEW	6.00 mm	9.00 (1.5x)	6 mm	50 mm	740866	740766	24.90	740866-C3	740766-C3	32.50
NEW	6.00 mm	18.00 (3x)	6 mm	50 mm	741466	743466	24.90	741466-C3	743466-C3	32.50
NEW	8.00 mm	12.00 (1.5x)	8 mm	63 mm	740870	740770	30.50	740870-C3	740770-C3	39.40
NEW	8.00 mm	24.00 (3x)	8 mm	63 mm	741470	743470	30.50	741470-C3	743470-C3	39.40
NEW	10.0 mm	15.00 (1.5x)	10 mm	75 mm	740873	740773	52.10	740873-C3	740773-C3	67.20
NEW	10.0 mm	30.00 (3x)	10 mm	75 mm	741473	743473	52.10	741473-C3	743473-C3	67.20
NEW	12.0 mm	18.00 (1.5x)	12 mm	75 mm	740876	740776	59.60	740876-C3	740776-C3	74.70
NEW	12.0 mm	36.00 (3x)	12 mm	75 mm	741476	743476	59.60	741476-C3	743476-C3	74.70

# MINIATURE END MILLS

## Square – Long Flute



Stocked in 9 Lengths of Cut!

- Long flute and long shank design for deep cavities
- Mills deep pockets • Center cutting • Solid carbide • CNC ground in the USA

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.004	<b>.020</b> (5x)	3	1/8	2-1/2	31804	48.40				
.005	<b>.025</b> (5x)	3	1/8	2-1/2	31805	47.50				
.005	<b>.040</b> (8x)	3	1/8	2-1/2	33605	50.50				
.006	<b>.030</b> (5x)	3	1/8	2-1/2	31806	47.50				
.006	<b>.048</b> (8x)	3	1/8	2-1/2	33606	50.50				
.008	<b>.040</b> (5x)	3	1/8	2-1/2	31808	47.50				
.008	<b>.064</b> (8x)	3	1/8	2-1/2	33608	50.50				
.010	<b>.040</b> (4x)	3	1/8	2-1/2	888410	40.20	888410-C3	45.40		
.010	<b>.050</b> (5x)	3	1/8	2-1/2	12710	40.40	12710-C3	45.60	12710-C4	53.50
.010	<b>.050</b> (5x)	4	1/8	2-1/2	834110	42.20	834110-C3	47.40		
.010	<b>.060</b> (6x)	3	1/8	2-1/2	894210	48.50	894210-C3	53.70		
.010	<b>.070</b> (7x)	3	1/8	2-1/2	897910	56.50	897910-C3	61.70		
.010	<b>.080</b> (8x)	3	1/8	2-1/2	33610	71.70	33610-C3	76.90		
.010	<b>.100</b> (10x)	3	1/8	2-1/2	951310	76.10	951310-C3	81.30		
.012	<b>.060</b> (5x)	3	1/8	2-1/2	31812	40.80	31812-C3	46.00		
.012	<b>.096</b> (8x)	3	1/8	2-1/2	33612	71.70	33612-C3	76.90		
.015 (1/64)	<b>.062</b> (4x)	3	1/8	2-1/2	888415	37.10	888415-C3	42.30		
.015 (1/64)	<b>.062</b> (4x)	4	1/8	2-1/2	836915	38.70	836915-C3	43.90		
.015 (1/64)	<b>.078</b> (5x)	3	1/8	2-1/2	31815	37.10	31815-C3	42.30	31815-C4	50.20
.015 (1/64)	<b>.078</b> (5x)	4	1/8	2-1/2	834115	38.70	834115-C3	43.90		
.015 (1/64)	<b>.093</b> (6x)	3	1/8	2-1/2	894215	44.30	894215-C3	49.50		
.015 (1/64)	<b>.109</b> (7x)	3	1/8	2-1/2	897915	51.60	897915-C3	56.80		
.015 (1/64)	<b>.125</b> (8x)	3	1/8	2-1/2	33615	65.00	33615-C3	70.20	33615-C4	78.10
.015 (1/64)	<b>.125</b> (8x)	4	1/8	2-1/2	826815	66.40	826815-C3	71.60		
.015 (1/64)	<b>.156</b> (10x)	3	1/8	2-1/2	951315	72.60	951315-C3	77.80		
.015 (1/64)	<b>.187</b> (12x)	3	1/8	2-1/2	34915	80.00	34915-C3	85.20		
.017	<b>.085</b> (5x)	3	1/8	2-1/2	31817	40.80	31817-C3	46.00		
.017	<b>.136</b> (8x)	3	1/8	2-1/2	33617	71.00	33617-C3	76.20		
.020 (.5 mm)	<b>.080</b> (4x)	3	1/8	2-1/2	888420	31.70	888420-C3	36.90		
.020 (.5 mm)	<b>.080</b> (4x)	4	1/8	2-1/2	836920	33.80	836920-C3	39.00		
.020 (.5 mm)	<b>.100</b> (5x)	3	1/8	2-1/2	12720	31.70	12720-C3	36.90	12720-C4	44.80
.020 (.5 mm)	<b>.100</b> (5x)	4	1/8	2-1/2	834120	33.80	834120-C3	39.00		
.020 (.5 mm)	<b>.120</b> (6x)	3	1/8	2-1/2	894220	38.10	894220-C3	43.30		
.020 (.5 mm)	<b>.120</b> (6x)	4	1/8	2-1/2	758020	41.00	758020-C3	46.20		
.020 (.5 mm)	<b>.140</b> (7x)	3	1/8	2-1/2	897920	44.30	897920-C3	49.50		
.020 (.5 mm)	<b>.160</b> (8x)	3	1/8	2-1/2	33620	62.10	33620-C3	67.30	33620-C4	75.20
.020 (.5 mm)	<b>.160</b> (8x)	4	1/8	2-1/2	826820	65.50	826820-C3	70.70		
.020 (.5 mm)	<b>.200</b> (10x)	3	1/8	2-1/2	951320	69.60	951320-C3	74.80		
.020 (.5 mm)	<b>.250</b> (12x)	3	1/8	2-1/2	34920	77.00	34920-C3	82.20		
.020 (.5 mm)	<b>.300</b> (15x)	3	1/8	2-1/2	35820	93.20	35820-C3	98.40		

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**MINIATURE END MILLS**

**Square – Long Flute (cont.)**

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CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND		
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>							
.024	<b>.120</b> (5x)	3	1/8	2-1/2	31824	30.20	31824-C3	35.40			
.024	<b>.192</b> (8x)	3	1/8	2-1/2	33624	61.60	33624-C3	66.80			
.025	<b>.100</b> (4x)	3	1/8	2-1/2	888425	30.20	888425-C3	35.40			
.025	<b>.125</b> (5x)	3	1/8	2-1/2	12725	30.20	12725-C3	35.40	12725-C4	43.30	
.025	<b>.125</b> (5x)	4	1/8	2-1/2	834125	32.00	834125-C3	37.20			
.025	<b>.150</b> (6x)	3	1/8	2-1/2	894225	36.40	894225-C3	41.60			
.025	<b>.175</b> (7x)	3	1/8	2-1/2	897925	42.40	897925-C3	47.60			
.025	<b>.203</b> (8x)	3	1/8	2-1/2	33625	60.50	33625-C3	65.70	33625-C4	73.60	
.025	<b>.203</b> (8x)	4	1/8	2-1/2	826825	62.20	826825-C3	67.40			
.025	<b>.250</b> (10x)	3	1/8	2-1/2	951325	64.30	951325-C3	69.50			
.025	<b>.312</b> (12x)	3	1/8	2-1/2	34925	68.30	34925-C3	73.50			
.030	<b>.125</b> (4x)	3	1/8	2-1/2	888430	29.20	888430-C3	34.40			
.030	<b>.150</b> (5x)	3	1/8	2-1/2	12730	29.20	12730-C3	34.40	12730-C4	42.30	
.030	<b>.156</b> (5x)	4	1/8	2-1/2	834130	30.90	834130-C3	36.10			
.030	<b>.187</b> (6x)	3	1/8	2-1/2	894230	34.90	894230-C3	40.10			
.030	<b>.218</b> (7x)	3	1/8	2-1/2	897930	40.70	897930-C3	45.90			
.030	<b>.250</b> (8x)	3	1/8	2-1/2	33630	57.40	33630-C3	62.60	33630-C4	70.50	
.030	<b>.312</b> (10x)	3	1/8	2-1/2	951330	61.50	951330-C3	66.70			
.030	<b>.375</b> (12x)	3	1/8	2-1/2	34930	64.60	34930-C3	69.80			
.031 (1/32)	<b>.125</b> (4x)	3	1/8	2-1/2	888431	29.20	888431-C3	34.40	888431-C4	42.30	
.031 (1/32)	<b>.125</b> (4x)	4	1/8	2-1/2	836931	30.90	836931-C3	36.10			
.031 (1/32)	<b>.156</b> (5x)	3	1/8	2-1/2	31831	29.20	31831-C3	34.40	31831-C4	42.30	
<b>NEW</b>	.031 (1/32)	<b>.156</b> (5x)	4	1/8	2-1/2	834131	30.60	834131-C3	35.80	<b>834131-C4</b>	43.70
.031 (1/32)	<b>.187</b> (6x)	3	1/8	2-1/2	894231	34.90	894231-C3	40.10	894231-C4	48.00	
.031 (1/32)	<b>.187</b> (6x)	4	1/8	2-1/2	12531	36.60	12531-C3	41.80			
<b>NEW</b>	.031 (1/32)	<b>.218</b> (7x)	3	1/8	2-1/2	897931	40.70	897931-C3	45.90		
.031 (1/32)	<b>.218</b> (7x)	4	1/8	2-1/2	<b>810331</b>	42.40	<b>810331-C3</b>	47.60			
.031 (1/32)	<b>.250</b> (8x)	3	1/8	2-1/2	33631	57.40	33631-C3	62.60	33631-C4	70.50	
.031 (1/32)	<b>.250</b> (8x)	4	1/8	2-1/2	826831	59.10	826831-C3	64.30			
.031 (1/32)	<b>.281</b> (9x)	3	1/8	2-1/2	837831	60.20	837831-C3	65.40			
<b>NEW</b>	.031 (1/32)	<b>.312</b> (10x)	3	1/8	2-1/2	951331	60.90	951331-C3	66.10	<b>951331-C4</b>	74.00
.031 (1/32)	<b>.375</b> (12x)	3	1/8	2-1/2	34931	64.60	34931-C3	69.80	34931-C4	77.70	
.031 (1/32)	<b>.470</b> (15x)	3	1/8	2-1/2	35831	87.00	35831-C3	92.20			
.035 (.9 mm)	<b>.140</b> (4x)	3	1/8	2-1/2	888435	29.20	888435-C3	34.40			
.035 (.9 mm)	<b>.175</b> (5x)	3	1/8	2-1/2	12735	29.20	12735-C3	34.40	12735-C4	42.30	
.035 (.9 mm)	<b>.187</b> (5x)	4	1/8	2-1/2	834135	31.30	834135-C3	36.50			
.035 (.9 mm)	<b>.218</b> (6x)	3	1/8	2-1/2	894235	34.90	894235-C3	40.10			
.035 (.9 mm)	<b>.250</b> (7x)	3	1/8	2-1/2	897935	40.70	897935-C3	45.90			
.035 (.9 mm)	<b>.280</b> (8x)	3	1/8	2-1/2	33635	57.40	33635-C3	62.60	33635-C4	70.50	
.035 (.9 mm)	<b>.350</b> (10x)	3	1/8	2-1/2	951335	60.90	951335-C3	66.10			
.035 (.9 mm)	<b>.425</b> (12x)	3	1/8	2-1/2	34935	65.60	34935-C3	70.80			

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SQUARE

# MINIATURE END MILLS

## Square – Long Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.005"</sup> / <sub>-.0005"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>		D2	L1						
.039 (1 mm)	<b>.156</b> (4x)	3	1/8	2-1/2	888439	29.60	888439-C3	34.80		
.039 (1 mm)	<b>.156</b> (4x)	4	1/8	2-1/2	836939	31.70	836939-C3	36.90		
.039 (1 mm)	<b>.203</b> (5x)	3	1/8	2-1/2	31839	29.60	31839-C3	34.80	31839-C4	42.70
.039 (1 mm)	<b>.203</b> (5x)	4	1/8	2-1/2	834139	31.70	834139-C3	36.90		
.039 (1 mm)	<b>.240</b> (6x)	3	1/8	2-1/2	894239	46.60	894239-C3	51.80		
.039 (1 mm)	<b>.281</b> (7x)	3	1/8	2-1/2	897939	52.60	897939-C3	57.80		
.039 (1 mm)	<b>.325</b> (8x)	3	1/8	2-1/2	33639	57.90	33639-C3	63.10		
.039 (1 mm)	<b>.400</b> (10x)	3	1/8	2-1/2	951339	61.50	951339-C3	66.70		
.039 (1 mm)	<b>.480</b> (12x)	3	1/8	2-1/2	34939	65.90	34939-C3	71.10		
.040	<b>.160</b> (4x)	3	1/8	2-1/2	888440	29.20	888440-C3	34.40		
.040	<b>.160</b> (4x)	4	1/8	2-1/2	836940	31.90	836940-C3	37.10		
.040	<b>.200</b> (5x)	3	1/8	2-1/2	12740	29.20	12740-C3	34.40	12740-C4	42.30
.040	<b>.203</b> (5x)	4	1/8	2-1/2	834140	30.90	834140-C3	36.10		
.040	<b>.240</b> (6x)	3	1/8	2-1/2	894240	34.90	894240-C3	40.10		
.040	<b>.281</b> (7x)	3	1/8	2-1/2	897940	40.70	897940-C3	45.90		
.040	<b>.325</b> (8x)	3	1/8	2-1/2	33640	57.40	33640-C3	62.60	33640-C4	70.50
.040	<b>.325</b> (8x)	4	1/8	2-1/2	826840	59.10	826840-C3	64.30		
.040	<b>.400</b> (10x)	3	1/8	2-1/2	951340	60.90	951340-C3	66.10		
.040	<b>.480</b> (12x)	3	1/8	2-1/2	34940	65.60	34940-C3	70.80		
.045	<b>.187</b> (4x)	3	1/8	2-1/2	888445	29.20	888445-C3	34.40		
.045	<b>.225</b> (5x)	3	1/8	2-1/2	12745	29.20	12745-C3	34.40	12745-C4	42.30
.045	<b>.225</b> (5x)	4	1/8	2-1/2	834145	30.90	834145-C3	36.10		
.045	<b>.281</b> (6x)	3	1/8	2-1/2	894245	34.90	894245-C3	40.10		
.045	<b>.325</b> (7x)	3	1/8	2-1/2	897945	40.70	897945-C3	45.90		
.045	<b>.375</b> (8x)	3	1/8	2-1/2	33645	57.40	33645-C3	62.60		
.045	<b>.450</b> (10x)	3	1/8	2-1/2	951345	60.90	951345-C3	66.10		
.045	<b>.550</b> (12x)	3	1/8	2-1/2	34945	65.60	34945-C3	70.80		
.047 (3/64)	<b>.187</b> (4x)	3	1/8	2-1/2	888447	29.20	888447-C3	34.40	888447-C4	42.30
.047 (3/64)	<b>.187</b> (4x)	4	1/8	2-1/2	836947	30.90	836947-C3	36.10		
.047 (3/64)	<b>.250</b> (5x)	3	1/8	2-1/2	31847	29.20	31847-C3	34.40	31847-C4	42.30
.047 (3/64)	<b>.250</b> (5x)	4	1/8	2-1/2	834147	30.60	834147-C3	35.80	834147-C4	43.70
.047 (3/64)	<b>.281</b> (6x)	3	1/8	2-1/2	894247	34.90	894247-C3	40.10		
.047 (3/64)	<b>.328</b> (7x)	3	1/8	2-1/2	897947	40.70	897947-C3	45.90		
.047 (3/64)	<b>.375</b> (8x)	3	1/8	2-1/2	33647	56.30	33647-C3	61.50	33647-C4	69.40
.047 (3/64)	<b>.375</b> (8x)	4	1/8	2-1/2	826847	57.90	826847-C3	63.10		
.047 (3/64)	<b>.480</b> (10x)	3	1/8	2-1/2	951347	60.90	951347-C3	66.10		
.047 (3/64)	<b>.570</b> (12x)	3	1/8	2-1/2	34947	64.60	34947-C3	69.80	34947-C4	77.70
.047 (3/64)	<b>.710</b> (15x)	3	1/8	2-1/2	35847	81.90	35847-C3	87.10		
.050	<b>.203</b> (4x)	3	1/8	2-1/2	888450	29.20	888450-C3	34.40		
.050	<b>.203</b> (4x)	4	1/8	2-1/2	836950	31.30	836950-C3	36.50		
.050	<b>.250</b> (5x)	3	1/8	2-1/2	31850	29.20	31850-C3	34.40		
.050	<b>.250</b> (5x)	4	1/8	2-1/2	834150	30.90	834150-C3	36.10		
.050	<b>.300</b> (6x)	3	1/8	2-1/2	12750	29.20	12750-C3	34.40	12750-C4	42.30
.050	<b>.300</b> (6x)	4	1/8	2-1/2	12550	30.90	12550-C3	36.10		
.050	<b>.350</b> (7x)	3	1/8	2-1/2	897950	40.70	897950-C3	45.90		
.050	<b>.400</b> (8x)	3	1/8	2-1/2	33650	57.40	33650-C3	62.60	33650-C4	70.50
.050	<b>.500</b> (10x)	3	1/8	2-1/2	951350	61.50	951350-C3	66.70		
.050	<b>.600</b> (12x)	3	1/8	2-1/2	34950	64.60	34950-C3	69.80		

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**MINIATURE END MILLS**

**Square – Long Flute (cont.)**

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CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND		
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>							
.055 (1.4 mm)	<b>.220</b> (4x)	3	1/8	2-1/2	888455	26.00	888455-C3	31.20			
.055 (1.4 mm)	<b>.275</b> (5x)	3	1/8	2-1/2	31855	26.00	31855-C3	31.20	31855-C4	39.10	
.055 (1.4 mm)	<b>.275</b> (5x)	4	1/8	2-1/2	834155	28.00	834155-C3	33.20			
.055 (1.4 mm)	<b>.330</b> (6x)	3	1/8	2-1/2	894255	28.30	894255-C3	33.50			
.055 (1.4 mm)	<b>.385</b> (7x)	3	1/8	2-1/2	12755	29.20	12755-C3	34.40	12755-C4	42.30	
.055 (1.4 mm)	<b>.385</b> (7x)	4	1/8	2-1/2	810355	30.90	810355-C3	36.10			
.055 (1.4 mm)	<b>.560</b> (10x)	3	1/8	2-1/2	951355	45.40	951355-C3	50.60			
.055 (1.4 mm)	<b>.660</b> (12x)	3	1/8	2-1/2	34955	65.60	34955-C3	70.80			
.059 (1.5 mm)	<b>.295</b> (5x)	3	1/8	2-1/2	31859	27.20	31859-C3	32.40			
.059 (1.5 mm)	<b>.472</b> (8x)	3	1/8	2-1/2	12759	27.20	12759-C3	32.40			
.060	<b>.250</b> (4x)	3	1/8	2-1/2	888460	26.00	888460-C3	31.20			
.060	<b>.250</b> (4x)	4	1/8	2-1/2	836960	28.60	836960-C3	33.80			
.060	<b>.312</b> (5x)	3	1/8	2-1/2	31860	26.00	31860-C3	31.20			
.060	<b>.312</b> (5x)	4	1/8	2-1/2	834160	27.50	834160-C3	32.70			
.060	<b>.375</b> (6x)	3	1/8	2-1/2	894260	27.10	894260-C3	32.30			
.060	<b>.437</b> (7x)	3	1/8	2-1/2	897960	28.30	897960-C3	33.50			
.060	<b>.500</b> (8x)	3	1/8	2-1/2	12760	29.60	12760-C3	34.80	12760-C4	42.70	
.060	<b>.500</b> (8x)	4	1/8	2-1/2	826860	31.70	826860-C3	36.90			
.060	<b>.625</b> (10x)	3	1/8	2-1/2	951360	51.40	951360-C3	56.60			
.060	<b>.720</b> (12x)	3	1/8	2-1/2	34960	65.60	34960-C3	70.80			
.062 (1/16)	<b>.250</b> (4x)	3	1/8	2-1/2	888462	26.00	888462-C3	31.20	888462-C4	39.10	
.062 (1/16)	<b>.250</b> (4x)	4	1/8	2-1/2	836962	28.00	836962-C3	33.20	836962-C4	41.10	
.062 (1/16)	<b>.312</b> (5x)	3	1/8	2-1/2	31862	26.00	31862-C3	31.20	31862-C4	39.10	
.062 (1/16)	<b>.312</b> (5x)	4	1/8	2-1/2	834162	28.00	834162-C3	33.20	834162-C4	41.10	
.062 (1/16)	<b>.375</b> (6x)	3	1/8	2-1/2	894262	27.10	894262-C3	32.30	894262-C4	40.20	
.062 (1/16)	<b>.375</b> (6x)	4	1/8	2-1/2	12562	27.80	12562-C3	33.00	12562-C4	40.90	
.062 (1/16)	<b>.437</b> (7x)	3	1/8	2-1/2	897962	28.30	897962-C3	33.50	897962-C4	41.40	
.062 (1/16)	<b>.437</b> (7x)	4	1/8	2-1/2	810362	29.30	810362-C3	34.50			
.062 (1/16)	<b>.500</b> (8x)	3	1/8	2-1/2	33662	29.60	33662-C3	34.80	33662-C4	42.70	
.062 (1/16)	<b>.500</b> (8x)	4	1/8	2-1/2	826862	31.20	826862-C3	36.40	826862-C4	44.30	
.062 (1/16)	<b>.562</b> (9x)	3	1/8	2-1/2	837862	34.30	837862-C3	39.50			
.062 (1/16)	<b>.562</b> (9x)	4	1/8	2-1/2	770862	35.80	770862-C3	41.00			
.062 (1/16)	<b>.625</b> (10x)	3	1/8	2-1/2	951362	37.30	951362-C3	42.50	951362-C4	50.40	
.062 (1/16)	<b>.625</b> (10x)	4	1/8	2-1/2	802662	40.10	802662-C3	45.30			
.062 (1/16)	<b>.750</b> (12x)	3	1/8	2-1/2	34962	50.60	34962-C3	55.80	34962-C4	63.70	
.062 (1/16)	<b>.750</b> (12x)	4	1/8	2-1/2	818062	52.70	818062-C3	57.90			
.062 (1/16)	<b>.950</b> (15x)	3	1/8	2-1/2	35862	72.20	35862-C3	77.40	35862-C4	85.30	
<b>NEW</b>	.062 (1/16)	<b>.950</b> (15x)	4	1/8	2-1/2	<b>740362</b>	<b>74.30</b>	<b>740362-C3</b>	<b>79.50</b>		
	.065	<b>.325</b> (5x)	3	1/8	2-1/2	31865	26.00	31865-C3	31.20		
	.065	<b>.500</b> (8x)	3	1/8	2-1/2	12765	29.20	12765-C3	34.40	12765-C4	42.30
	.065	<b>.650</b> (10x)	3	1/8	2-1/2	951365	45.40	951365-C3	50.60		
<b>NEW</b>	.070	<b>.281</b> (4x)	3	1/8	2-1/2	888470	28.00	888470-C3	33.20		
	.070	<b>.375</b> (5x)	3	1/8	2-1/2	31870	26.00	31870-C3	31.20	<b>31870-C4</b>	39.10
	.070	<b>.375</b> (5x)	4	1/8	2-1/2	834170	28.60	834170-C3	33.80		
	.070	<b>.500</b> (7x)	3	1/8	2-1/2	12770	29.20	12770-C3	34.40	12770-C4	42.30
	.070	<b>.700</b> (10x)	3	1/8	2-1/2	951370	45.40	951370-C3	50.60		
	.070	<b>.850</b> (12x)	3	1/8	2-1/2	34970	51.20	34970-C3	56.40		

SQUARE

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# MINIATURE END MILLS

## Square – Long Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.075	<b>.300</b> (4x)	3	1/8	2-1/2	888475	28.60	888475-C3	33.80		
.075	<b>.375</b> (5x)	3	1/8	2-1/2	31875	26.00	31875-C3	31.20		
.075	<b>.500</b> (7x)	3	1/8	2-1/2	12775	29.20	12775-C3	34.40	12775-C4	42.30
.075	<b>.750</b> (10x)	3	1/8	2-1/2	951375	45.40	951375-C3	50.60		
.075	<b>.900</b> (12x)	3	1/8	2-1/2	34975	51.20	34975-C3	56.40		
.078 (5/64)	<b>.312</b> (4x)	3	1/8	2-1/2	888478	26.00	888478-C3	31.20	888478-C4	39.10
.078 (5/64)	<b>.312</b> (4x)	4	1/8	2-1/2	836978	28.00	836978-C3	33.20		
.078 (5/64)	<b>.406</b> (5x)	3	1/8	2-1/2	31878	26.00	31878-C3	31.20	31878-C4	39.10
.078 (5/64)	<b>.406</b> (5x)	4	1/8	2-1/2	834178	28.00	834178-C3	33.20	834178-C4	41.10
.078 (5/64)	<b>.475</b> (6x)	3	1/8	2-1/2	894278	27.10	894278-C3	32.30		
.078 (5/64)	<b>.475</b> (6x)	4	1/8	2-1/2	12578	29.20	12578-C3	34.40		
.078 (5/64)	<b>.550</b> (7x)	3	1/8	2-1/2	897978	28.30	897978-C3	33.50		
.078 (5/64)	<b>.550</b> (7x)	4	1/8	2-1/2	810378	30.00	810378-C3	35.20		
.078 (5/64)	<b>.625</b> (8x)	3	1/8	2-1/2	33678	29.60	33678-C3	34.80	33678-C4	42.70
.078 (5/64)	<b>.625</b> (8x)	4	1/8	2-1/2	826878	32.30	826878-C3	37.50		
.078 (5/64)	<b>.800</b> (10x)	3	1/8	2-1/2	951378	36.60	951378-C3	41.80		
.078 (5/64)	<b>.940</b> (12x)	3	1/8	2-1/2	34978	50.60	34978-C3	55.80	34978-C4	63.70
.078 (5/64)	<b>1.187</b> (15x)	3	1/8	2-1/2	35878	72.20	35878-C3	77.40	35878-C4	85.30
.080	<b>.320</b> (4x)	3	1/8	2-1/2	888480	26.50	888480-C3	31.70		
.080	<b>.406</b> (5x)	3	1/8	2-1/2	31880	26.00	31880-C3	31.20		
.080	<b>.406</b> (5x)	4	1/8	2-1/2	834180	28.60	834180-C3	33.80		
.080	<b>.750</b> (9x)	3	1/8	2-1/2	12780	29.70	12780-C3	34.90	12780-C4	42.80
.080	<b>.960</b> (12x)	3	1/8	2-1/2	34980	51.20	34980-C3	56.40		
.085	<b>.425</b> (5x)	3	1/8	2-1/2	31885	26.00	31885-C3	31.20		
.085	<b>.750</b> (9x)	3	1/8	2-1/2	12785	29.70	12785-C3	34.90	12785-C4	42.80
.090	<b>.450</b> (5x)	3	1/8	2-1/2	31890	26.00	31890-C3	31.20		
.090	<b>.450</b> (5x)	4	1/8	2-1/2	834190	28.60	834190-C3	33.80		
.090	<b>.750</b> (8x)	3	1/8	2-1/2	12790	29.60	12790-C3	34.80	12790-C4	42.70
.090	<b>.900</b> (10x)	3	1/8	2-1/2	951390	45.40	951390-C3	50.60		
.090	<b>1.080</b> (12x)	3	1/8	2-1/2	34990	52.20	34990-C3	57.40		
.093 (3/32)	<b>.375</b> (4x)	3	1/8	2-1/2	888493	26.00	888493-C3	31.20	888493-C4	39.10
.093 (3/32)	<b>.375</b> (4x)	4	1/8	2-1/2	836993	28.00	836993-C3	33.20		
.093 (3/32)	<b>.500</b> (5x)	3	1/8	2-1/2	31893	26.00	31893-C3	31.20	31893-C4	39.10
.093 (3/32)	<b>.500</b> (5x)	4	1/8	2-1/2	834193	28.00	834193-C3	33.20	834193-C4	41.10
.093 (3/32)	<b>.585</b> (6x)	3	1/8	2-1/2	894293	27.10	894293-C3	32.30	894293-C4	40.20
.093 (3/32)	<b>.585</b> (6x)	4	1/8	2-1/2	12593	27.60	12593-C3	32.80		
.093 (3/32)	<b>.670</b> (7x)	3	1/8	2-1/2	897993	28.30	897993-C3	33.50	897993-C4	41.40
.093 (3/32)	<b>.670</b> (7x)	4	1/8	2-1/2	810393	29.80	810393-C3	35.00		
.093 (3/32)	<b>.750</b> (8x)	3	1/8	2-1/2	33693	29.60	33693-C3	34.80	33693-C4	42.70
.093 (3/32)	<b>.750</b> (8x)	4	1/8	2-1/2	826893	32.30	826893-C3	37.50		
.093 (3/32)	<b>.850</b> (9x)	3	1/8	2-1/2	837893	34.60	837893-C3	39.80		
.093 (3/32)	<b>.950</b> (10x)	3	1/8	2-1/2	951393	36.60	951393-C3	41.80		
.093 (3/32)	<b>1.125</b> (12x)	3	1/8	2-1/2	34993	50.60	34993-C3	55.80	34993-C4	63.70
.093 (3/32)	<b>1.400</b> (15x)	3	1/8	3	35893	75.00	35893-C3	80.20	35893-C4	88.10

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**MINIATURE END MILLS**

Square – Long Flute (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.095	<b>.500</b> (5x)	3	1/8	2-1/2	31895	26.00	31895-C3	31.20		
.095	<b>.750</b> (8x)	3	1/8	2-1/2	12795	29.20	12795-C3	34.40	12795-C4	42.30
.095	<b>.950</b> (10x)	3	1/8	2-1/2	951395	45.40	951395-C3	50.60		
.100	<b>.400</b> (4x)	3	1/8	2-1/2	888500	26.00	888500-C3	31.20		
.100	<b>.500</b> (5x)	3	1/8	2-1/2	31899	26.00	31899-C3	31.20	31899-C4	39.10
.100	<b>.500</b> (5x)	4	1/8	2-1/2	834200	28.00	834200-C3	33.20		
.100	<b>.600</b> (6x)	3	1/8	2-1/2	894300	27.10	894300-C3	32.30		
.100	<b>.700</b> (7x)	4	1/8	2-1/2	810400	29.50	810400-C3	34.70		
.100	<b>.750</b> (7.5x)	3	1/8	2-1/2	12799	29.20	12799-C3	34.40	12799-C4	42.30
.100	<b>1.000</b> (10x)	3	1/8	2-1/2	951600	45.40	951600-C3	50.60		
.100	<b>1.200</b> (12x)	3	1/8	2-1/2	34999	51.20	34999-C3	56.40		
.105	<b>.530</b> (5x)	3	1/8	2-1/2	31901	26.90	31901-C3	32.10		
.109 (7/64)	<b>.437</b> (4x)	3	1/8	2-1/2	888502	26.00	888502-C3	31.20		
.109 (7/64)	<b>.570</b> (5x)	3	1/8	2-1/2	31902	26.00	31902-C3	31.20	31902-C4	39.10
.109 (7/64)	<b>.570</b> (5x)	4	1/8	2-1/2	834202	28.00	834202-C3	33.20		
.109 (7/64)	<b>.900</b> (8x)	3	1/8	2-1/2	33702	29.50	33702-C3	34.70		
.109 (7/64)	<b>1.125</b> (10x)	3	1/8	2-1/2	951602	51.40	951602-C3	56.60		
.110	<b>.570</b> (5x)	3	1/8	2-1/2	31903	26.90	31903-C3	32.10		
.115	<b>.600</b> (5x)	3	1/8	2-1/2	31904	26.90	31904-C3	32.10		
.118 (3 mm)	<b>.475</b> (4x)	3	1/8	2-1/2	888505	26.40	888505-C3	31.60		
.118 (3 mm)	<b>.625</b> (5x)	3	1/8	2-1/2	31905	26.40	31905-C3	31.60	31905-C4	39.50
.118 (3 mm)	<b>.625</b> (5x)	4	1/8	2-1/2	834205	27.90	834205-C3	33.10		
.118 (3 mm)	<b>.950</b> (8x)	3	1/8	2-1/2	33705	29.80	33705-C3	35.00		
.118 (3 mm)	<b>.950</b> (8x)	4	1/8	2-1/2	<b>826905</b>	31.50	<b>826905-C3</b>	36.70		
.118 (3 mm)	<b>1.187</b> (10x)	3	1/8	2-1/2	951605	51.70	951605-C3	56.90		
.120	<b>.625</b> (5x)	3	1/8	2-1/2	31906	27.20	31906-C3	32.40		

NEW

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.125 (1/8)	<b>.500</b> (4x)	3	1/8	2-1/2	888508	25.50	888508-C3	30.70	888508-C4	38.60
.125 (1/8)	<b>.500</b> (4x)	4	1/8	2-1/2	837008	28.10	837008-C3	33.30		
.125 (1/8)	<b>.625</b> (5x)	3	1/8	2-1/2	31908	25.50	31908-C3	30.70	31908-C4	38.60
.125 (1/8)	<b>.625</b> (5x)	4	1/8	2-1/2	834208	28.10	834208-C3	33.30	834208-C4	41.20
.125 (1/8)	<b>.750</b> (6x)	3	1/8	2-1/2	894308	26.50	894308-C3	31.70	894308-C4	39.60
.125 (1/8)	<b>.750</b> (6x)	4	1/8	2-1/2	12508	28.10	12508-C3	33.30		
.125 (1/8)	<b>.875</b> (7x)	3	1/8	2-1/2	898008	27.00	898008-C3	32.20		
.125 (1/8)	<b>1.000</b> (8x)	3	1/8	2-1/2	33708	27.50	33708-C3	32.70	33708-C4	40.60
.125 (1/8)	<b>1.000</b> (8x)	4	1/8	2-1/2	826908	30.30	826908-C3	35.50		
.125 (1/8)	<b>1.125</b> (9x)	3	1/8	2-1/2	837908	38.70	837908-C3	43.90		
.125 (1/8)	<b>1.250</b> (10x)	3	1/8	2-1/2	951608	47.00	951608-C3	52.20		
.125 (1/8)	<b>1.250</b> (10x)	4	1/8	2-1/2	802708	49.00	802708-C3	54.20		
.125 (1/8)	<b>1.500</b> (12x)	3	1/8	3	35008	53.80	35008-C3	59.00	35008-C4	66.90
.125 (1/8)	<b>1.500</b> (12x)	4	1/8	3	818108	55.90	818108-C3	61.10		
.125 (1/8)	<b>1.875</b> (15x)	3	1/8	3	35908	75.00	35908-C3	80.20	35908-C4	88.10

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# MINIATURE END MILLS

## Square – Long Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.140 (9/64)	<b>.562</b> (4x)	4	3/16	3	837009	28.10	837009-C3	33.70		
.140 (9/64)	<b>.750</b> (5x)	4	3/16	3	31909	28.10	31909-C3	33.70		
.140 (9/64)	<b>1.125</b> (8x)	4	3/16	3	33709	49.80	33709-C3	55.40		
.140 (9/64)	<b>1.450</b> (10x)	4	3/16	3	951609	58.90	951609-C3	64.50		
.156 (5/32)	<b>.625</b> (4x)	4	3/16	3	888510	26.20	888510-C3	31.80		
.156 (5/32)	<b>.750</b> (5x)	4	3/16	3	834210	26.20	834210-C3	31.80		
.156 (5/32)	<b>.937</b> (6x)	3	3/16	3	894310	26.90	894310-C3	32.50		
.156 (5/32)	<b>1.000</b> (6x)	4	3/16	3	12510	28.40	12510-C3	34.00	12510-C4	46.50
.156 (5/32)	<b>1.093</b> (7x)	4	3/16	3	898010	33.60	898010-C3	39.20		
.156 (5/32)	<b>1.250</b> (8x)	4	3/16	3	33710	49.80	33710-C3	55.40		
.156 (5/32)	<b>1.570</b> (10x)	4	3/16	3	951610	58.90	951610-C3	64.50		
.156 (5/32)	<b>1.875</b> (12x)	4	3/16	4	35010	69.90	35010-C3	77.50	35010-C4	89.20
.172 (11/64)	<b>.875</b> (5x)	4	3/16	3	834211	28.70	834211-C3	34.30		
.187 (3/16)	<b>.750</b> (4x)	4	3/16	3	888512	26.20	888512-C3	31.80	888512-C4	44.30
.187 (3/16)	<b>1.000</b> (5x)	4	3/16	3	834212	26.20	834212-C3	31.80		
.187 (3/16)	<b>1.156</b> (6x)	3	3/16	3	894312	26.90	894312-C3	32.50		
.187 (3/16)	<b>1.125</b> (6x)	4	3/16	3	12512	28.40	12512-C3	34.00	77012	46.50
.187 (3/16)	<b>1.312</b> (7x)	4	3/16	3	898012	33.60	898012-C3	39.20		
.187 (3/16)	<b>1.500</b> (8x)	4	3/16	3	33712	49.80	33712-C3	55.40	33712-C4	67.90
.187 (3/16)	<b>1.875</b> (10x)	4	3/16	4	951612	59.10	951612-C3	66.70		
.187 (3/16)	<b>2.250</b> (12x)	4	3/16	4	35012	69.90	35012-C3	77.50		
.218 (7/32)	<b>1.125</b> (5x)	4	1/4	4	834214	30.50	834214-C3	39.40		
.218 (7/32)	<b>1.750</b> (8x)	4	1/4	4	33714	38.30	33714-C3	47.20		
.250 (1/4)	<b>1.000</b> (4x)	4	1/4	4	888516	29.90	888516-C3	38.80		
.250 (1/4)	<b>1.250</b> (5x)	4	1/4	4	834216	29.90	834216-C3	38.80	834216-C4	50.50
.250 (1/4)	<b>1.500</b> (6x)	3	1/4	4	894316	30.70	894316-C3	39.60		
.250 (1/4)	<b>1.500</b> (6x)	4	1/4	4	12516	32.20	12516-C3	41.10	77016	52.80
.250 (1/4)	<b>1.750</b> (7x)	4	1/4	4	898016	38.30	898016-C3	47.20		
.250 (1/4)	<b>2.000</b> (8x)	4	1/4	4	33716	53.30	33716-C3	62.20	33716-C4	73.90
.250 (1/4)	<b>2.500</b> (10x)	4	1/4	4	951616	64.00	951616-C3	72.90		
.250 (1/4)	<b>3.000</b> (12x)	4	1/4	6	35016	76.70	35016-C3	86.80		
.312 (5/16)	<b>1.625</b> (5x)	4	5/16	4	12520	46.30	12520-C3	57.00		
.375 (3/8)	<b>1.750</b> (5x)	4	3/8	4	12524	49.20	12524-C3	63.00	12524-C4	74.00
.375 (3/8)	<b>3.000</b> (8x)	4	3/8	6	33724	98.30	33724-C3	113.90		
.500 (1/2)	<b>2.000</b> (4x)	4	1/2	4	12532	69.30	12532-C3	84.40	12532-C4	99.10

NEW



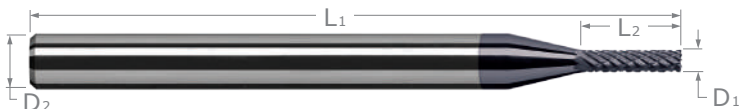
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# MINIATURE END MILLS

## Square – Deburring End Mill



End Mill Tolerances with Bur-Style Geometry!

- Deburr in your CNC machine with these high-precision burs held to end mill tolerances
- Stop scrapping expensive parts due to handheld operator errors
- High flute count allows for increased feeds which reduces cycle times
- Achieve better finish than with milling type cutters
- Bur geometry is optimized for removing burrs and/or adding a small controlled edge break with superior finish
- Double cut style flute pattern
- Bur-style end allows for shallow ramping, not suited for plunge cutting
- Solid carbide
- CNC ground in the USA

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
						TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.015 (1/64)	<b>.045</b> (3x)	6	3	1/8	2-1/2	60715	35.50	60715-C3	40.70
.031 (1/32)	<b>.093</b> (3x)	6	3	1/8	2-1/2	60731	27.20	60731-C3	32.40
.047 (3/64)	<b>.141</b> (3x)	8	4	1/8	2-1/2	60747	26.30	60747-C3	31.50
.062 (1/16)	<b>.186</b> (3x)	8	4	1/8	2-1/2	60762	26.30	60762-C3	31.50
.078 (5/64)	<b>.234</b> (3x)	10	5	1/8	2-1/2	60778	26.80	60778-C3	32.00
.093 (3/32)	<b>.279</b> (3x)	12	6	1/8	2-1/2	60793	26.80	60793-C3	32.00
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.125 (1/8)	<b>.375</b> (3x)	14	7	1/8	2-1/2	60808	24.80	60808-C3	30.00
.187 (3/16)	<b>.562</b> (3x)	16	8	3/16	2-1/2	60812	45.20	60812-C3	50.80
.250 (1/4)	<b>.750</b> (3x)	18	9	1/4	2-1/2	60816	52.70	60816-C3	60.30



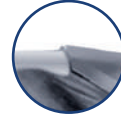
### Tips for Maintaining Tight Tolerances

Tolerances are very important for machining operations, but do you know what they mean? Do you know how to maintain tight tolerances even in difficult operations, such as machining thin walls? Our "In the Loupe" blog post **Tips for Maintaining Tight Tolerances** is a must-read before beginning any job.

Read more on [harveyperformance.com/in-the-loupe/](https://harveyperformance.com/in-the-loupe/)

# MINIATURE END MILLS

## Square – Long Reach, Standard Flute



Reduced Neck Diameter to Avoid Heeling

- Length of cut = 3x diameter
- Center cutting
- Solid carbide
- CNC ground in the USA

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIA.	OAL	UNCOATED			A1TIN COATED			AMORPHOUS DIAMOND	
					2 FL	4FL	PRICE	2FL	4FL	PRICE	4 FL	PRICE
D1 <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L2 <sup>+0.010"</sup> / <sub>-0.000"</sub>	L3 <sup>+0.010"</sup> / <sub>-0.000"</sub>	D2	L1								
.005	.015	<b>.025</b> (5x)	1/8	1-1/2	944505	956805	51.80					
.005	.015	<b>.040</b> (8x)	1/8	1-1/2	76205	76405	51.80					
.008	.024	<b>.040</b> (5x)	1/8	1-1/2	944508	956808	51.80					
.008	.024	<b>.065</b> (8x)	1/8	1-1/2	76208	76408	51.80					
.010	.030	<b>.050</b> (5x)	1/8	1-1/2	944510	956810	49.80	944510-C3	956810-C3	55.00		
.010	.030	<b>.080</b> (8x)	1/8	1-1/2	76210	76410	49.80	76210-C3	76410-C3	55.00		
.010	.030	<b>.125</b> (12x)	1/8	1-1/2	952010	992510	52.70	952010-C3	992510-C3	57.90		
.015 (1/64)	.045	<b>.078</b> (5x)	1/8	1-1/2	944515	956815	40.20	944515-C3	956815-C3	45.40		
.015 (1/64)	.045	<b>.128</b> (8x)	1/8	1-1/2	76215	76415	40.20	76215-C3	76415-C3	45.40		
.015 (1/64)	.045	<b>.156</b> (10x)	1/8	1-1/2	849615	846115	41.90		846115-C3	47.10		
.015 (1/64)	.045	<b>.187</b> (12x)	1/8	1-1/2	952015	992515	41.90	952015-C3	992515-C3	47.10		
.020 (.5 mm)	.060	<b>.100</b> (5x)	1/8	1-1/2	944520	956820	38.40	944520-C3	956820-C3	43.60	956820-C4	51.50
.020 (.5 mm)	.060	<b>.120</b> (6x)	1/8	1-1/2		802420	38.40		802420-C3	43.60		
.020 (.5 mm)	.060	<b>.140</b> (7x)	1/8	1-1/2		896820	38.40		896820-C3	43.60		
.020 (.5 mm)	.060	<b>.170</b> (8x)	1/8	1-1/2	76220	76420	38.40	76220-C3	76420-C3	43.60	76420-C4	51.50
.020 (.5 mm)	.060	<b>.200</b> (10x)	1/8	1-1/2	849620	846120	40.40		846120-C3	45.60		
.020 (.5 mm)	.060	<b>.250</b> (12x)	1/8	1-1/2	952020	992520	40.40	952020-C3	992520-C3	45.60		
.025	.075	<b>.125</b> (5x)	1/8	1-1/2	944525	956825	37.10	944525-C3	956825-C3	42.30		
.025	.075	<b>.213</b> (8x)	1/8	1-1/2	76225	76425	37.10	76225-C3	76425-C3	42.30		
.025	.075	<b>.312</b> (12x)	1/8	1-1/2	952025	992525	38.30	952025-C3	992525-C3	43.50		
.030	.090	<b>.156</b> (5x)	1/8	1-1/2	944530	956830	37.10	944530-C3	956830-C3	42.30		
.030	.090	<b>.270</b> (9x)	1/8	1-1/2	76230	76430	37.10	76230-C3	76430-C3	42.30		
.030	.090	<b>.375</b> (12x)	1/8	1-1/2	952030	992530	38.30	952030-C3	992530-C3	43.50		
.031 (1/32)	.093	<b>.156</b> (5x)	1/8	1-1/2	944531	956831	37.10	944531-C3	956831-C3	42.30	956831-C4	50.20
.031 (1/32)	.093	<b>.187</b> (6x)	1/8	1-1/2		802431	37.10		802431-C3	42.30		
.031 (1/32)	.093	<b>.218</b> (7x)	1/8	1-1/2		896831	37.10		896831-C3	42.30		
.031 (1/32)	.093	<b>.250</b> (8x)	1/8	1-1/2		972231	37.10		972231-C3	42.30		
.031 (1/32)	.093	<b>.279</b> (9x)	1/8	1-1/2	76231	76431	37.10	76231-C3	76431-C3	42.30	76431-C4	50.20
.031 (1/32)	.093	<b>.312</b> (10x)	1/8	1-1/2		846131	38.30		846131-C3	43.50		
.031 (1/32)	.093	<b>.375</b> (12x)	1/8	1-1/2	952031	992531	38.30	952031-C3	992531-C3	43.50		
.031 (1/32)	.093	<b>.470</b> (15x)	1/8	1-1/2	829131	838631	40.50	829131-C3	838631-C3	45.70		
.035 (.9 mm)	.105	<b>.187</b> (5x)	1/8	1-1/2	944535	956835	37.10	944535-C3	956835-C3	42.30		
.035 (.9 mm)	.105	<b>.315</b> (9x)	1/8	1-1/2	76235	76435	37.10	76235-C3	76435-C3	42.30		
.035 (.9 mm)	.105	<b>.425</b> (12x)	1/8	1-1/2	952035	992535	38.30	952035-C3	992535-C3	43.50		
.039 (1 mm)	.117	<b>.203</b> (5x)	1/8	1-1/2	944539	956839	37.10	944539-C3	956839-C3	42.30		
.039 (1 mm)	.117	<b>.325</b> (8x)	1/8	1-1/2	960839	972239	37.10	960839-C3	972239-C3	42.30		
.039 (1 mm)	.117	<b>.400</b> (10x)	1/8	1-1/2		846139	38.30		846139-C3	43.50		NEW
.039 (1 mm)	.117	<b>.480</b> (12x)	1/8	1-1/2	952039	992539	38.30		992539-C3	43.50		
.040	.120	<b>.203</b> (5x)	1/8	1-1/2	944540	956840	37.10	944540-C3	956840-C3	42.30		
.040	.120	<b>.281</b> (7x)	1/8	1-1/2		896840	37.10		896840-C3	42.30		NEW
.040	.120	<b>.360</b> (9x)	1/8	1-1/2	76240	76440	37.10	76240-C3	76440-C3	42.30		
.040	.120	<b>.480</b> (12x)	1/8	1-1/2	952040	992540	38.30	952040-C3	992540-C3	43.50		

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## MINIATURE END MILLS

Square – Long Reach, Standard Flute (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIA.	OAL	UNCOATED			AITIN COATED			AMORPHOUS DIAMOND	
					D1 $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	L2 $\begin{smallmatrix} +.010" \\ -.000" \end{smallmatrix}$	L3 $\begin{smallmatrix} +.010" \\ -.000" \end{smallmatrix}$	D2	L1	2 FL	4FL	PRICE
.045	.135	<b>.225</b> (5x)	1/8	1-1/2	944545	956845	36.40	944545-C3	956845-C3	41.60		
.045	.135	<b>.405</b> (9x)	1/8	1-1/2	76245	76445	36.40	76245-C3	76445-C3	41.60		
.047 (3/64)	.141	<b>.250</b> (5x)	1/8	1-1/2	944547	956847	36.40	944547-C3	956847-C3	41.60		
.047 (3/64)	.141	<b>.281</b> (6x)	1/8	1-1/2		802447	37.10		802447-C3	42.30		
.047 (3/64)	.141	<b>.328</b> (7x)	1/8	1-1/2	898747	896847	36.40		896847-C3	41.60		
.047 (3/64)	.141	<b>.423</b> (9x)	1/8	1-1/2	76247	76447	36.40	76247-C3	76447-C3	41.60		
NEW .047 (3/64)	.141	<b>.480</b> (10x)	1/8	1-1/2		<b>846147</b>	37.50		<b>846147-C3</b>	42.70		
.047 (3/64)	.141	<b>.570</b> (12x)	1/8	1-1/2	952047	992547	37.50	952047-C3	992547-C3	42.70		
.047 (3/64)	.141	<b>.710</b> (15x)	1/8	2-1/2		838647	40.70		838647-C3	45.90		
.050	.150	<b>.250</b> (5x)	1/8	1-1/2	944550	956850	36.40	944550-C3	956850-C3	41.60		
.050	.150	<b>.400</b> (8x)	1/8	1-1/2	960850	972250	36.40	960850-C3	972250-C3	41.60		
.050	.150	<b>.500</b> (10x)	1/8	1-1/2	76250	76450	37.50	76250-C3	76450-C3	42.70		
.050	.150	<b>.600</b> (12x)	1/8	2	952050	992550	39.90	952050-C3	992550-C3	45.10		
.055 (1.4 mm)	.165	<b>.275</b> (5x)	1/8	1-1/2	944555	956855	37.30	944555-C3	956855-C3	42.50		
.055 (1.4 mm)	.165	<b>.500</b> (9x)	1/8	1-1/2	76255	76455	37.30	76255-C3	76455-C3	42.50		
.055 (1.4 mm)	.165	<b>.660</b> (12x)	1/8	2	952055	992555	39.70		992555-C3	44.90		
NEW .060	.180	.312 (5x)	1/8	1-1/2	944560	956860	36.40	944560-C3	956860-C3	41.60		
NEW .060	.180	<b>.375</b> (6x)	1/8	1-1/2		<b>802460</b>	36.40		<b>802460-C3</b>	41.60		
.060	.180	<b>.500</b> (8x)	1/8	1-1/2	76260	76460	36.40	76260-C3	76460-C3	41.60		
.060	.180	<b>.720</b> (12x)	1/8	2	952060	992560	37.50	952060-C3	992560-C3	42.70		
NEW .062 (1/16)	.186	<b>.312</b> (5x)	1/8	1-1/2	944562	956862	36.40	944562-C3	956862-C3	41.60	956862-C4	49.50
NEW .062 (1/16)	.186	<b>.375</b> (6x)	1/8	1-1/2		<b>736662</b>	36.40		802462-C3	41.60		
.062 (1/16)	.186	<b>.437</b> (7x)	1/8	1-1/2		896862	36.40		896862-C3	41.60		
.062 (1/16)	.186	<b>.500</b> (8x)	1/8	1-1/2	76262	76462	36.40	76262-C3	76462-C3	41.60	76462-C4	49.50
.062 (1/16)	.186	<b>.625</b> (10x)	1/8	2	849662	846162	37.50	849662-C3	846162-C3	42.70		
.062 (1/16)	.186	<b>.750</b> (12x)	1/8	2	952062	992562	37.50	952062-C3	992562-C3	42.70		
.062 (1/16)	.186	<b>.950</b> (15x)	1/8	2	829162	838662	39.90	829162-C3	838662-C3	45.10		
NEW .065	.195	<b>.500</b> (8x)	1/8	1-1/2	76265	76465	36.40	76265-C3	76465-C3	41.60		
NEW .070	.210	<b>.375</b> (5x)	1/8	1-1/2		<b>956770</b>	36.40		<b>956770-C3</b>	41.60		
.070	.210	<b>.500</b> (7x)	1/8	1-1/2	76270	76470	36.40	76270-C3	76470-C3	41.60		
.070	.210	<b>.850</b> (12x)	1/8	2	952070	992570	37.50	952070-C3	992570-C3	42.70		
.075	.225	<b>.500</b> (7x)	1/8	1-1/2	76275	76475	36.40	76275-C3	76475-C3	41.60		
.075	.225	<b>.750</b> (10x)	1/8	2		846175	38.20		846175-C3	43.40		
.078 (5/64)	.234	<b>.406</b> (5x)	1/8	1-1/2		956878	36.40		956878-C3	41.60		
.078 (5/64)	.234	<b>.500</b> (6x)	1/8	1-1/2	76278	76478	36.40	76278-C3	76478-C3	41.60		
.078 (5/64)	.234	<b>.550</b> (7x)	1/8	1-1/2		896878	36.40		896878-C3	41.60		
.078 (5/64)	.234	<b>.625</b> (8x)	1/8	2	960878	972278	36.50		972278-C3	41.70		
.078 (5/64)	.234	<b>.800</b> (10x)	1/8	2	849678	846178	37.50		846178-C3	42.70		
.078 (5/64)	.234	<b>.940</b> (12x)	1/8	2	952078	992578	37.50	952078-C3	992578-C3	42.70		
.078 (5/64)	.234	<b>1.187</b> (15x)	1/8	2-1/2		838678	40.70		838678-C3	45.90		
.080	.240	<b>.500</b> (6x)	1/8	1-1/2	76280	76480	36.40	76280-C3	76480-C3	41.60		
.080	.240	<b>.960</b> (12x)	1/8	2	952080	992580	37.50	952080-C3	992580-C3	42.70		
.085	.255	<b>.500</b> (6x)	1/8	1-1/2	76285	76485	36.40	76285-C3	76485-C3	41.60		
NEW .085	.255	<b>.875</b> (10x)	1/8	2		<b>846185</b>	37.50		<b>846185-C3</b>	42.70		
.090	.270	<b>.625</b> (7x)	1/8	1-1/2	76290	76490	36.40	76290-C3	76490-C3	41.60		
.090	.270	<b>1.080</b> (12x)	1/8	2	952090	992590	37.50	952090-C3	992590-C3	42.70		

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SQUARE

# MINIATURE END MILLS

## Square – Long Reach, Standard Flute (cont.)

continued from previous page

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIA.	OAL	UNCOATED			AITIN COATED			AMORPHOUS DIAMOND	
					2 FL	4FL	PRICE	2FL	4FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>								
.093 (3/32)	.279	<b>.500</b> (5x)	1/8	1-1/2	944593	956893	36.40	944593-C3	956893-C3	41.60	956893-C4	49.50
.093 (3/32)	.279	<b>.585</b> (6x)	1/8	1-1/2		802493	36.40		802493-C3	41.60		
.093 (3/32)	.279	<b>.625</b> (7x)	1/8	1-1/2	76293	76493	36.40	76293-C3	76493-C3	41.60	76493-C4	49.50
.093 (3/32)	.279	<b>.750</b> (8x)	1/8	2		960893	37.50		960893-C3	42.70		
.093 (3/32)	.279	<b>.950</b> (10x)	1/8	2	849693	846193	37.50	849693-C3	846193-C3	42.70		
.093 (3/32)	.279	<b>1.125</b> (12x)	1/8	2	952093	992593	37.50	952093-C3	992593-C3	42.70		
.093 (3/32)	.279	<b>1.400</b> (15x)	1/8	2-1/2	829193	838693	39.90	829193-C3	838693-C3	45.10		
.095	.285	<b>.625</b> (6x)	1/8	1-1/2	76295	76495	36.40	76295-C3	76495-C3	41.60		
.100	.300	<b>.625</b> (6x)	1/8	1-1/2	76300	76500	36.40	76300-C3	76500-C3	41.60		
.100	.300	<b>.800</b> (8x)	1/8	2		972300	37.50		972300-C3	42.70		
.100	.300	<b>1.200</b> (12x)	1/8	2-1/2	952100	992600	37.50	952100-C3	992600-C3	42.70		
.109 (7/64)	.327	<b>.570</b> (5x)	1/8	1-1/2	944602	956902	36.40		956902-C3	41.60		
.109 (7/64)	.327	<b>.900</b> (8x)	1/8	2	960902	972302	36.40		972302-C3	41.60		
.109 (7/64)	.327	<b>1.125</b> (10x)	1/8	2		846202	37.50		846202-C3	42.70		NEW
.118 (3 mm)	.354	<b>.625</b> (5x)	1/8	1-1/2	944605	956905	36.40	944605-C3	956905-C3	41.60		
.118 (3 mm)	.354	<b>.950</b> (8x)	1/8	2	960905	972305	36.40	960905-C3	972305-C3	41.60		
.118 (3 mm)	.354	<b>1.187</b> (10x)	1/8	2-1/2		846205	38.20		846205-C3	43.40		

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	4FL	PRICE	2FL	4FL	PRICE	4 FL	PRICE
.125 (1/8)	.375	<b>.625</b> (5x)	1/8	1-1/2	944608	956908	36.40	944608-C3	956908-C3	41.60	956908-C4	49.50
.125 (1/8)	.375	<b>.750</b> (6x)	1/8	2	76308	802508	36.40		802508-C3	41.60		NEW
.125 (1/8)	.375	<b>.875</b> (7x)	1/8	2-1/2		802308	39.50		802308-C3	44.70		
.125 (1/8)	.375	<b>1.000</b> (8x)	1/8	2	960908	972308	36.40	960908-C3	972308-C3	41.60	972308-C4	55.70
.125 (1/8)	.375	<b>1.250</b> (10x)	1/8	2-1/2	849708	846208	39.50	849708-C3	846208-C3	44.70		
.125 (1/8)	.375	<b>1.500</b> (12x)	1/8	2-1/2	952108	992608	39.50	952108-C3	992608-C3	44.70		
.125 (1/8)	.375	<b>1.875</b> (15x)	1/8	3	829208	838708	42.10	829208-C3	838708-C3	47.30		
.140 (9/64)	.422	<b>.750</b> (5x)	3/16	2	944609	956909	43.00		956909-C3	48.60		
.140 (9/64)	.422	<b>1.125</b> (8x)	3/16	2-1/2	960909	972309	43.00		972309-C3	48.60		
.140 (9/64)	.425	<b>1.450</b> (10x)	3/16	3		846209	45.00		846209-C3	50.60		NEW
.156 (5/32)	.469	<b>.750</b> (5x)	3/16	2	944610	956910	43.00		956910-C3	48.60		
.156 (5/32)	.469	<b>1.250</b> (8x)	3/16	2-1/2	960910	972310	43.00		972310-C3	48.60		
.156 (5/32)	.470	<b>1.570</b> (10x)	3/16	3		846210	45.00		846210-C3	50.60		NEW
.187 (3/16)	.562	<b>1.000</b> (5x)	3/16	2	944612	956912	43.00	944612-C3	956912-C3	48.60		
.187 (3/16)	.562	<b>1.500</b> (8x)	3/16	2-1/2	960912	972312	43.00	960912-C3	972312-C3	48.60		
.187 (3/16)	.562	<b>1.875</b> (10x)	3/16	3	849712	846212	45.00	849712-C3	846212-C3	50.60		
.250 (1/4)	.750	<b>1.250</b> (5x)	1/4	2-1/2	944616	956916	48.10	944616-C3	956916-C3	55.70		
.250 (1/4)	.750	<b>2.000</b> (8x)	1/4	4	960916	972316	48.10	960916-C3	972316-C3	57.00		
.250 (1/4)	.750	<b>3.000</b> (12x)	1/4	6	952116	992616	55.70		992616-C3	65.80		
.375 (3/8)	1.125	<b>3.000</b> (8x)	3/8	4		972324	50.40		972324-C3	64.20		

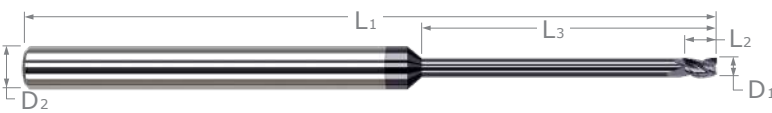


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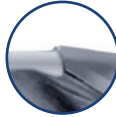
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# MINIATURE END MILLS

## Square – Long Reach, Stub Flute

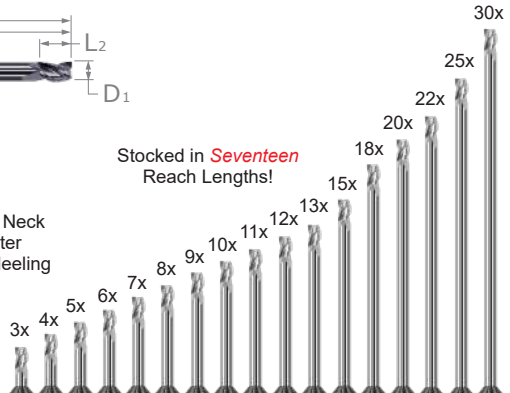


- Long length design for deep cavities
- Stub flutes for maximum rigidity
- Length of cut = 1/2 x diameter
- Center cutting
- Solid carbide • CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling

Stocked in **Seventeen** Reach Lengths!



SQUARE

NEW  
NEW

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.005	.007	<b>.025</b> (5x)	3	1/8	2-1/2	33205	50.70				
.005	.007	<b>.040</b> (8x)	3	1/8	2-1/2	34605	50.70				
.008	.012	<b>.040</b> (5x)	3	1/8	2-1/2	33208	50.70				
.008	.012	<b>.065</b> (8x)	3	1/8	2-1/2	34608	50.70				
.010	.015	<b>.030</b> (3x)	3	1/8	2-1/2	47810	48.70	47810-C3	53.90		
.010	.015	<b>.050</b> (5x)	3	1/8	2-1/2	33210	48.70	33210-C3	53.90	33210-C4	61.80
.010	.015	<b>.060</b> (6x)	3	1/8	2-1/2	<b>937010</b>	49.70	<b>937010-C3</b>	54.90		
.010	.015	<b>.070</b> (7x)	3	1/8	2-1/2	<b>934810</b>	49.70	<b>934810-C3</b>	54.90		
.010	.015	<b>.080</b> (8x)	3	1/8	2-1/2	34610	51.20	34610-C3	56.40	34610-C4	64.30
.010	.015	<b>.100</b> (10x)	3	1/8	2-1/2	982110	53.80	982110-C3	59.00		
.010	.015	<b>.125</b> (12x)	3	1/8	2-1/2	35410	54.30	35410-C3	59.50	35410-C4	67.40
.010	.015	<b>.150</b> (15x)	3	1/8	2-1/2	48910	62.50	48910-C3	67.70		
.010	.015	<b>.180</b> (18x)	3	1/8	2-1/2	977310	69.60	977310-C3	74.80		
.011	.016	<b>.055</b> (5x)	3	1/8	2-1/2	33211	48.70	33211-C3	53.90		
.011	.016	<b>.088</b> (8x)	3	1/8	2-1/2	34611	51.20	34611-C3	56.40		
.012 (.3 mm)	.018	<b>.060</b> (5x)	3	1/8	2-1/2	33212	48.70	33212-C3	53.90		
.012 (.3 mm)	.018	<b>.096</b> (8x)	3	1/8	2-1/2	34612	51.20	34612-C3	56.40		
.013	.019	<b>.065</b> (5x)	3	1/8	2-1/2	33213	48.70	33213-C3	53.90		
.013	.019	<b>.104</b> (8x)	3	1/8	2-1/2	34613	51.20	34613-C3	56.40		
.014	.021	<b>.070</b> (5x)	3	1/8	2-1/2	33214	48.70	33214-C3	53.90		
.014	.021	<b>.112</b> (8x)	3	1/8	2-1/2	34614	51.20	34614-C3	56.40		
.015 (1/64)	.022	<b>.045</b> (3x)	3	1/8	2-1/2	47815	40.20	47815-C3	45.40	47815-C4	53.30
.015 (1/64)	.022	<b>.062</b> (4x)	3	1/8	2-1/2	945515	40.20	945515-C3	45.40		
.015 (1/64)	.022	<b>.078</b> (5x)	3	1/8	2-1/2	33215	40.20	33215-C3	45.40	33215-C4	53.30
.015 (1/64)	.022	<b>.078</b> (5x)	4	1/8	2-1/2	861615	40.20	861615-C3	45.40		
.015 (1/64)	.022	<b>.093</b> (6x)	3	1/8	2-1/2	937015	40.40	937015-C3	45.60		
.015 (1/64)	.022	<b>.109</b> (7x)	3	1/8	2-1/2	934815	40.40	934815-C3	45.60		
.015 (1/64)	.022	<b>.125</b> (8x)	3	1/8	2-1/2	34615	40.40	34615-C3	45.60	34615-C4	53.50
.015 (1/64)	.022	<b>.125</b> (8x)	4	1/8	2-1/2	874115	40.40	874115-C3	45.60		
.015 (1/64)	.022	<b>.156</b> (10x)	3	1/8	2-1/2	982115	41.90	982115-C3	47.10	982115-C4	55.00
.015 (1/64)	.022	<b>.187</b> (12x)	3	1/8	2-1/2	35415	41.90	35415-C3	47.10	35415-C4	55.00
.015 (1/64)	.022	<b>.225</b> (15x)	3	1/8	2-1/2	48915	47.40	48915-C3	52.60	48915-C4	60.50
.015 (1/64)	.022	<b>.270</b> (18x)	3	1/8	2-1/2	977315	56.20	977315-C3	61.40		
.015 (1/64)	.022	<b>.300</b> (20x)	3	1/8	2-1/2	58315	59.70	58315-C3	64.90		
.015 (1/64)	.022	<b>.375</b> (25x)	3	1/8	2-1/2	38015	76.30	38015-C3	81.50	38015-C4	89.40
.016 (.4 mm)	.024	<b>.080</b> (5x)	3	1/8	2-1/2	33216	41.40	33216-C3	46.60		
.016 (.4 mm)	.024	<b>.128</b> (8x)	3	1/8	2-1/2	34616	41.70	34616-C3	46.90		

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# MINIATURE END MILLS

## Square – Long Reach, Stub Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	TOOL #
.017	.026	<b>.085</b> (5x)	3	1/8	2-1/2	33217	41.40	33217-C3	46.60		
.017	.026	<b>.136</b> (8x)	3	1/8	2-1/2	34617	41.70	34617-C3	46.90		
.018	.027	<b>.090</b> (5x)	3	1/8	2-1/2	33218	41.40	33218-C3	46.60		
.018	.027	<b>.144</b> (8x)	3	1/8	2-1/2	34618	41.70	34618-C3	46.90		
.019	.029	<b>.095</b> (5x)	3	1/8	2-1/2	33219	41.40	33219-C3	46.60		
.019	.029	<b>.152</b> (8x)	3	1/8	2-1/2	34619	41.70	34619-C3	46.90		
.020 (.5 mm)	.030	<b>.060</b> (3x)	3	1/8	2-1/2	47820	38.40	47820-C3	43.60		
.020 (.5 mm)	.030	<b>.080</b> (4x)	3	1/8	2-1/2	945520	38.40	945520-C3	43.60	945520-C4	51.50
.020 (.5 mm)	.030	<b>.080</b> (4x)	4	1/8	2-1/2	752020	38.40	752020-C3	44.00		NEW
.020 (.5 mm)	.030	<b>.100</b> (5x)	3	1/8	2-1/2	33220	38.40	33220-C3	43.60	33220-C4	51.50
.020 (.5 mm)	.030	<b>.100</b> (5x)	4	1/8	2-1/2	861620	40.50	861620-C3	45.70		
.020 (.5 mm)	.030	<b>.120</b> (6x)	3	1/8	2-1/2	937020	38.40	937020-C3	43.60	937020-C4	51.50
.020 (.5 mm)	.030	<b>.140</b> (7x)	3	1/8	2-1/2	934820	38.60	934820-C3	43.80		
.020 (.5 mm)	.030	<b>.160</b> (8x)	3	1/8	2-1/2	34620	38.60	34620-C3	43.80	34620-C4	51.70
.020 (.5 mm)	.030	<b>.160</b> (8x)	4	1/8	2-1/2	874120	39.40	874120-C3	44.60		
.020 (.5 mm)	.030	<b>.180</b> (9x)	3	1/8	2-1/2	846820	40.40	846820-C3	45.60		
.020 (.5 mm)	.030	<b>.200</b> (10x)	3	1/8	2-1/2	982120	40.40	982120-C3	45.60	982120-C4	53.50
.020 (.5 mm)	.030	<b>.250</b> (12x)	3	1/8	2-1/2	35420	40.40	35420-C3	45.60	35420-C4	53.50
.020 (.5 mm)	.030	<b>.300</b> (15x)	3	1/8	2-1/2	48920	45.60	48920-C3	50.80	48920-C4	58.70
.020 (.5 mm)	.030	<b>.360</b> (18x)	3	1/8	2-1/2	977320	52.50	977320-C3	57.70		
.020 (.5 mm)	.030	<b>.400</b> (20x)	3	1/8	2-1/2	58320	57.00	58320-C3	62.20	58320-C4	70.10
.020 (.5 mm)	.030	<b>.440</b> (22x)	3	1/8	2-1/2	969620	63.10	969620-C3	68.30		
.020 (.5 mm)	.030	<b>.500</b> (25x)	3	1/8	2-1/2	38020	73.60	38020-C3	78.80	<b>25x Diameter!</b>	
.020 (.5 mm)	.030	<b>.600</b> (30x)	3	1/8	2-1/2	972020	78.20	972020-C3	83.40	<b>30x Diameter!</b>	
.021	.031	<b>.105</b> (5x)	3	1/8	2-1/2	33221	41.00	33221-C3	46.20		
.021	.031	<b>.168</b> (8x)	3	1/8	2-1/2	34621	41.20	34621-C3	46.40		
.022	.033	<b>.110</b> (5x)	3	1/8	2-1/2	33222	40.20	33222-C3	45.40		
.022	.033	<b>.176</b> (8x)	3	1/8	2-1/2	34622	40.40	34622-C3	45.60		
.023	.035	<b>.115</b> (5x)	3	1/8	2-1/2	33223	40.20	33223-C3	45.40		
.023	.035	<b>.187</b> (8x)	3	1/8	2-1/2	34623	40.40	34623-C3	45.60		
.024 (.6 mm)	.036	<b>.120</b> (5x)	3	1/8	2-1/2	33224	40.20	33224-C3	45.40		
.024 (.6 mm)	.036	<b>.192</b> (8x)	3	1/8	2-1/2	34624	40.40	34624-C3	45.60		
.025	.037	<b>.075</b> (3x)	3	1/8	2-1/2	47825	37.10	47825-C3	42.30		
.025	.037	<b>.100</b> (4x)	3	1/8	2-1/2	945525	37.10	945525-C3	42.30		
.025	.037	<b>.125</b> (5x)	3	1/8	2-1/2	33225	37.10	33225-C3	42.30	33225-C4	50.20
.025	.037	<b>.125</b> (5x)	4	1/8	2-1/2	861625	37.10	861625-C3	42.30		
.025	.037	<b>.150</b> (6x)	3	1/8	2-1/2	937025	37.10	937025-C3	42.30		
.025	.037	<b>.175</b> (7x)	3	1/8	2-1/2	934825	37.10	934825-C3	42.30		
.025	.037	<b>.203</b> (8x)	3	1/8	2-1/2	34625	37.30	34625-C3	42.50	34625-C4	50.40
.025	.037	<b>.250</b> (10x)	3	1/8	2-1/2	982125	38.30	982125-C3	43.50		
.025	.037	<b>.312</b> (12x)	3	1/8	2-1/2	35425	38.30	35425-C3	43.50	35425-C4	51.40
.025	.037	<b>.375</b> (15x)	3	1/8	2-1/2	48925	44.80	48925-C3	50.00	48925-C4	57.90
.025	.037	<b>.450</b> (18x)	3	1/8	2-1/2	977325	52.30	977325-C3	57.50		
.025	.037	<b>.500</b> (20x)	3	1/8	2-1/2	58325	56.20	58325-C3	61.40		
.025	.037	<b>.625</b> (25x)	3	1/8	2-1/2	38025	72.90	38025-C3	78.10	<b>25x Diameter!</b>	
.026	.039	<b>.130</b> (5x)	3	1/8	2-1/2	33226	37.90	33226-C3	43.10		
.026	.039	<b>.208</b> (8x)	3	1/8	2-1/2	34626	38.10	34626-C3	43.30		
.027	.041	<b>.135</b> (5x)	3	1/8	2-1/2	33227	37.90	33227-C3	43.10		
.027	.041	<b>.216</b> (8x)	3	1/8	2-1/2	34627	38.10	34627-C3	43.30		

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**MINIATURE END MILLS**

**Square – Long Reach, Stub Flute (cont.)**

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						D <sub>1</sub> <sup>+0.005"</sup> <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	TOOL #
.028 (.7 mm)	.042	<b>.140</b> (5x)	3	1/8	2-1/2	33228	37.90	33228-C3	43.10		
.028 (.7 mm)	.042	<b>.224</b> (8x)	3	1/8	2-1/2	34628	38.10	34628-C3	43.30		
.029	.043	<b>.145</b> (5x)	3	1/8	2-1/2	33229	37.90	33229-C3	43.10		
.029	.043	<b>.232</b> (8x)	3	1/8	2-1/2	34629	38.10	34629-C3	43.30		
.030	.045	<b>.090</b> (3x)	3	1/8	2-1/2	47830	37.10	47830-C3	42.30		
.030	.045	<b>.125</b> (4x)	3	1/8	2-1/2	945530	37.10	945530-C3	42.30		
.030	.045	<b>.156</b> (5x)	3	1/8	2-1/2	33230	37.10	33230-C3	42.30	33230-C4	50.20
.030	.045	<b>.156</b> (5x)	4	1/8	2-1/2	861630	39.30	861630-C3	44.50		
.030	.045	<b>.187</b> (6x)	3	1/8	2-1/2	937030	37.30	937030-C3	42.50		
.030	.045	<b>.218</b> (7x)	3	1/8	2-1/2	934830	37.30	934830-C3	42.50		
.030	.045	<b>.250</b> (8x)	3	1/8	2-1/2	34630	37.30	34630-C3	42.50	34630-C4	50.40
.030	.045	<b>.270</b> (9x)	3	1/8	2-1/2	846830	38.30	846830-C3	43.50		
.030	.045	<b>.312</b> (10x)	3	1/8	2-1/2	982130	38.30	982130-C3	43.50		
.030	.045	<b>.375</b> (12x)	3	1/8	2-1/2	35430	38.30	35430-C3	43.50	35430-C4	51.40
.030	.045	<b>.450</b> (15x)	3	1/8	2-1/2	48930	44.80	48930-C3	50.00		
.030	.045	<b>.540</b> (18x)	3	1/8	2-1/2	977330	51.80	977330-C3	57.00		
.030	.045	<b>.600</b> (20x)	3	1/8	2-1/2	58330	56.20	58330-C3	61.40		
.031 (1/32)	.046	<b>.093</b> (3x)	3	1/8	2-1/2	47831	37.10	47831-C3	42.30	47831-C4	50.20
.031 (1/32)	.046	<b>.125</b> (4x)	3	1/8	2-1/2	945531	37.10	945531-C3	42.30	945531-C4	50.20
.031 (1/32)	.046	<b>.125</b> (4x)	4	1/8	2-1/2	752031	37.10	752031-C3	42.30		
.031 (1/32)	.046	<b>.156</b> (5x)	3	1/8	2-1/2	33231	37.10	33231-C3	42.30	33231-C4	50.20
.031 (1/32)	.046	<b>.156</b> (5x)	4	1/8	2-1/2	861631	39.30	861631-C3	44.50		
.031 (1/32)	.046	<b>.187</b> (6x)	3	1/8	2-1/2	937031	37.10	937031-C3	42.30	937031-C4	50.20
.031 (1/32)	.046	<b>.218</b> (7x)	3	1/8	2-1/2	934831	37.30	934831-C3	42.50		
.031 (1/32)	.046	<b>.250</b> (8x)	3	1/8	2-1/2	34631	37.30	34631-C3	42.50	34631-C4	50.40
.031 (1/32)	.046	<b>.250</b> (8x)	4	1/8	2-1/2	874131	39.40	874131-C3	44.60		
.031 (1/32)	.046	<b>.281</b> (9x)	3	1/8	2-1/2	846831	38.30	846831-C3	43.50		
.031 (1/32)	.046	<b>.312</b> (10x)	3	1/8	2-1/2	982131	38.30	982131-C3	43.50	982131-C4	51.40
.031 (1/32)	.046	<b>.312</b> (10x)	4	1/8	2-1/2	789131	38.30	789131-C3	43.50		
.031 (1/32)	.046	<b>.343</b> (11x)	3	1/8	2-1/2	850231	39.10	850231-C3	44.30		
.031 (1/32)	.046	<b>.375</b> (12x)	3	1/8	2-1/2	35431	38.30	35431-C3	43.50	35431-C4	51.40
.031 (1/32)	.046	<b>.375</b> (12x)	4	1/8	2-1/2	801731	38.30	801731-C3	43.50		
.031 (1/32)	.046	<b>.470</b> (15x)	3	1/8	2-1/2	48931	44.80	48931-C3	50.00	48931-C4	57.90
.031 (1/32)	.046	<b>.565</b> (18x)	3	1/8	2-1/2	977331	56.20	977331-C3	61.40	977331-C4	69.30
.031 (1/32)	.046	<b>.625</b> (20x)	3	1/8	2-1/2	58331	56.20	58331-C3	61.40		
.031 (1/32)	.046	<b>.687</b> (22x)	3	1/8	2-1/2	969631	62.10	969631-C3	67.30		
.031 (1/32)	.046	<b>.775</b> (25x)	3	1/8	2-1/2	38031	72.90	38031-C3	78.10		<b>25x Diameter!</b>
.031 (1/32)	.046	<b>.937</b> (30x)	3	1/8	2-1/2	972031	86.30	972031-C3	91.50		<b>30x Diameter!</b>
.035 (.9 mm)	.052	<b>.105</b> (3x)	3	1/8	2-1/2	47835	37.10	47835-C3	42.30		
.035 (.9 mm)	.052	<b>.187</b> (5x)	3	1/8	2-1/2	33235	37.10	33235-C3	42.30	33235-C4	50.20
.035 (.9 mm)	.052	<b>.187</b> (5x)	4	1/8	2-1/2	861635	37.80	861635-C3	43.00		
<b>NEW</b> <b>NEW</b> .035 (.9 mm)	.052	<b>.218</b> (6x)	3	1/8	2-1/2	<b>937035</b>	37.30	<b>937035-C3</b>	42.50		
.035 (.9 mm)	.052	<b>.250</b> (7x)	3	1/8	2-1/2	<b>934835</b>	37.30	<b>934835-C3</b>	42.50		
.035 (.9 mm)	.052	<b>.281</b> (8x)	3	1/8	2-1/2	34635	37.30	34635-C3	42.50	34635-C4	50.40
.035 (.9 mm)	.052	<b>.350</b> (10x)	3	1/8	2-1/2	982135	38.30	982135-C3	43.50		
.035 (.9 mm)	.052	<b>.425</b> (12x)	3	1/8	2-1/2	35435	38.30	35435-C3	43.50	35435-C4	51.40
.035 (.9 mm)	.052	<b>.525</b> (15x)	3	1/8	2-1/2	48935	44.80	48935-C3	50.00		
.035 (.9 mm)	.052	<b>.700</b> (20x)	3	1/8	2-1/2	58335	56.20	58335-C3	61.40		

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# MINIATURE END MILLS

## Square – Long Reach, Stub Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	TOOL #
.039 (1 mm)	.059	<b>.117</b> (3x)	3	1/8	2-1/2	47839	37.10	47839-C3	42.30		
.039 (1 mm)	.059	<b>.203</b> (5x)	3	1/8	2-1/2	33239	37.10	33239-C3	42.30	33239-C4	50.20
.039 (1 mm)	.059	<b>.203</b> (5x)	4	1/8	2-1/2	861639	37.10	861639-C3	42.30		
.039 (1 mm)	.059	<b>.240</b> (6x)	3	1/8	2-1/2	937039	37.30	937039-C3	42.50		
.039 (1 mm)	.059	<b>.281</b> (7x)	3	1/8	2-1/2	934839	37.30	934839-C3	42.50		
.039 (1 mm)	.059	<b>.325</b> (8x)	3	1/8	2-1/2	34639	37.30	34639-C3	42.50	34639-C4	50.40
.039 (1 mm)	.059	<b>.400</b> (10x)	3	1/8	2-1/2	982139	38.30	982139-C3	43.50		
.039 (1 mm)	.059	<b>.480</b> (12x)	3	1/8	2-1/2	35439	38.30	35439-C3	43.50		
.039 (1 mm)	.059	<b>.600</b> (15x)	3	1/8	2-1/2	48939	44.80	48939-C3	50.00		
.039 (1 mm)	.059	<b>.700</b> (18x)	3	1/8	2-1/2	977339	48.50	977339-C3	53.00		
.040	.060	<b>.120</b> (3x)	3	1/8	2-1/2	47840	37.10	47840-C3	42.30		
.040	.060	<b>.160</b> (4x)	3	1/8	2-1/2	945540	37.10	945540-C3	42.30	945540-C4	50.20
.040	.060	<b>.203</b> (5x)	3	1/8	2-1/2	33240	37.10	33240-C3	42.30	33240-C4	50.20
.040	.060	<b>.203</b> (5x)	4	1/8	2-1/2	861640	39.30	861640-C3	44.50		
.040	.060	<b>.240</b> (6x)	3	1/8	2-1/2	937040	37.30	937040-C3	42.50		
.040	.060	<b>.281</b> (7x)	3	1/8	2-1/2	934840	37.30	934840-C3	42.50		
.040	.060	<b>.325</b> (8x)	3	1/8	2-1/2	34640	37.30	34640-C3	42.50	34640-C4	50.40
.040	.060	<b>.325</b> (8x)	4	1/8	2-1/2	874140	37.30	874140-C3	42.50		
.040	.060	<b>.400</b> (10x)	3	1/8	2-1/2	982140	38.30	982140-C3	43.50	982140-C4	51.40
.040	.060	<b>.400</b> (10x)	4	1/8	2-1/2	789140	39.10	789140-C3	44.30		
.040	.060	<b>.480</b> (12x)	3	1/8	2-1/2	35440	38.30	35440-C3	43.50	35440-C4	51.40
.040	.060	<b>.600</b> (15x)	3	1/8	2-1/2	48940	44.80	48940-C3	50.00	48940-C4	57.90
.040	.060	<b>.720</b> (18x)	3	1/8	2-1/2	977340	56.20	977340-C3	61.40		
.040	.060	<b>.800</b> (20x)	3	1/8	2-1/2	58340	56.20	58340-C3	61.40		
.040	.060	<b>1.000</b> (25x)	3	1/8	2-1/2	38040	72.90	38040-C3	78.10	<b>25x Diameter!</b>	
.045	.067	<b>.135</b> (3x)	3	1/8	2-1/2	47845	36.40	47845-C3	41.60		
.045	.067	<b>.225</b> (5x)	3	1/8	2-1/2	33245	36.40	33245-C3	41.60	33245-C4	49.50
.045	.067	<b>.375</b> (8x)	3	1/8	2-1/2	34645	36.50	34645-C3	41.70	34645-C4	49.60
.045	.067	<b>.450</b> (10x)	3	1/8	2-1/2	982145	37.80	982145-C3	43.00		
.045	.067	<b>.550</b> (12x)	3	1/8	2-1/2	35445	37.80	35445-C3	43.00	35445-C4	50.90
.045	.067	<b>.680</b> (15x)	3	1/8	2-1/2	48945	42.60	48945-C3	47.80		
.045	.067	<b>.900</b> (20x)	3	1/8	2-1/2	58345	53.00	58345-C3	58.20		
.047 (3/64)	.070	<b>.141</b> (3x)	3	1/8	2-1/2	47847	36.40	47847-C3	41.60		
.047 (3/64)	.070	<b>.187</b> (4x)	3	1/8	2-1/2	945547	36.40	945547-C3	41.60		
.047 (3/64)	.070	<b>.250</b> (5x)	3	1/8	2-1/2	33247	36.40	33247-C3	41.60	33247-C4	49.50
.047 (3/64)	.070	<b>.250</b> (5x)	4	1/8	2-1/2	861647	38.60	861647-C3	43.80		
.047 (3/64)	.070	<b>.281</b> (6x)	3	1/8	2-1/2	937047	36.40	937047-C3	41.60		
.047 (3/64)	.070	<b>.328</b> (7x)	3	1/8	2-1/2	934847	36.50	934847-C3	41.70		
.047 (3/64)	.070	<b>.375</b> (8x)	3	1/8	2-1/2	34647	36.50	34647-C3	41.70	34647-C4	49.60
.047 (3/64)	.070	<b>.375</b> (8x)	4	1/8	2-1/2	874147	38.70	874147-C3	43.90		
.047 (3/64)	.070	<b>.425</b> (9x)	3	1/8	2-1/2	846847	37.80	846847-C3	43.00		
.047 (3/64)	.070	<b>.480</b> (10x)	3	1/8	2-1/2	982147	37.80	982147-C3	43.00	982147-C4	50.90
.047 (3/64)	.070	<b>.570</b> (12x)	3	1/8	2-1/2	35447	37.80	35447-C3	43.00	35447-C4	50.90
.047 (3/64)	.070	<b>.570</b> (12x)	4	1/8	2-1/2	801747	40.10	801747-C3	45.30		
.047 (3/64)	.070	<b>.710</b> (15x)	3	1/8	2-1/2	48947	42.60	48947-C3	47.80	48947-C4	55.70
.047 (3/64)	.070	<b>.850</b> (18x)	3	1/8	2-1/2	977347	53.00	977347-C3	58.20		
.047 (3/64)	.070	<b>.950</b> (20x)	3	1/8	2-1/2	58347	53.00	58347-C3	58.20		
.047 (3/64)	.070	<b>1.187</b> (25x)	3	1/8	2-1/2	38047	64.30	38047-C3	69.50	<b>25x Diameter!</b>	
.047 (3/64)	.070	<b>1.406</b> (30x)	3	1/8	2-1/2	972047	84.60	972047-C3	89.80	<b>30x Diameter!</b>	

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**MINIATURE END MILLS**

Square – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+ .0005"</sup> <sub>-.0005"</sub>	L <sub>2</sub> <sup>+ .010"</sup> <sub>-.000"</sub>	L <sub>3</sub> <sup>+ .010"</sup> <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.050	.075	<b>.150</b> (3x)	3	1/8	2-1/2	47850	36.40	47850-C3	41.60		
.050	.075	<b>.203</b> (4x)	3	1/8	2-1/2	945550	36.40	945550-C3	41.60		
.050	.075	<b>.250</b> (5x)	3	1/8	2-1/2	33250	36.40	33250-C3	41.60	33250-C4	49.50
.050	.075	<b>.250</b> (5x)	4	1/8	2-1/2	861650	38.70	861650-C3	43.90		
.050	.075	<b>.300</b> (6x)	3	1/8	2-1/2	937050	36.50	937050-C3	41.70		
.050	.075	<b>.350</b> (7x)	3	1/8	2-1/2	934850	36.50	934850-C3	41.70		
.050	.075	<b>.400</b> (8x)	3	1/8	2-1/2	34650	36.50	34650-C3	41.70	34650-C4	49.60
.050	.075	<b>.450</b> (9x)	3	1/8	2-1/2	846850	37.80	846850-C3	43.00		
.050	.075	<b>.500</b> (10x)	3	1/8	2-1/2	982150	37.80	982150-C3	43.00		
.050	.075	<b>.600</b> (12x)	3	1/8	2-1/2	35450	37.80	35450-C3	43.00	35450-C4	50.90
.050	.075	<b>.750</b> (15x)	3	1/8	2-1/2	48950	42.60	48950-C3	47.80		
.050	.075	<b>.900</b> (18x)	3	1/8	2-1/2	977350	53.00	977350-C3	58.20		
.055 (1.4 mm)	.082	<b>.165</b> (3x)	3	1/8	2-1/2	47855	36.40	47855-C3	41.60		
.055 (1.4 mm)	.082	<b>.275</b> (5x)	3	1/8	2-1/2	33255	36.40	33255-C3	41.60	33255-C4	49.50
.055 (1.4 mm)	.082	<b>.375</b> (5x)	4	1/8	2-1/2	861655	37.10	861655-C3	42.30		
.055 (1.4 mm)	.082	<b>.330</b> (6x)	3	1/8	2-1/2	937055	36.50	937055-C3	41.70		
.055 (1.4 mm)	.082	<b>.385</b> (7x)	3	1/8	2-1/2	934855	36.50	934855-C3	41.70		
.055 (1.4 mm)	.082	<b>.450</b> (8x)	3	1/8	2-1/2	34655	36.50	34655-C3	41.70	34655-C4	49.60
.055 (1.4 mm)	.082	<b>.560</b> (10x)	3	1/8	2-1/2	982155	37.80	982155-C3	43.00		
.055 (1.4 mm)	.082	<b>.660</b> (12x)	3	1/8	2-1/2	35455	38.50	35455-C3	43.70	35455-C4	51.60
.055 (1.4 mm)	.082	<b>.825</b> (15x)	3	1/8	2-1/2	48955	42.60	48955-C3	47.80		
.055 (1.4 mm)	.082	<b>1.000</b> (18x)	3	1/8	2-1/2	977355	53.00	977355-C3	58.20		
.060	.090	<b>.180</b> (3x)	3	1/8	2-1/2	47860	36.40	47860-C3	41.60		
.060	.090	<b>.250</b> (4x)	3	1/8	2-1/2	945560	36.40	945560-C3	41.60		
.060	.090	<b>.312</b> (5x)	3	1/8	2-1/2	33260	36.40	33260-C3	41.60	33260-C4	49.50
.060	.090	<b>.312</b> (5x)	4	1/8	2-1/2	861660	38.50	861660-C3	43.70		
.060	.090	<b>.375</b> (6x)	3	1/8	2-1/2	937060	36.50	937060-C3	41.70		
.060	.090	<b>.437</b> (7x)	3	1/8	2-1/2	934860	36.50	934860-C3	41.70		
.060	.090	<b>.500</b> (8x)	3	1/8	2-1/2	34660	36.50	34660-C3	41.70	34660-C4	49.60
.060	.090	<b>.500</b> (8x)	4	1/8	2-1/2	874160	37.20	874160-C3	42.40		
.060	.090	<b>.562</b> (9x)	3	1/8	2-1/2	846860	37.80	846860-C3	43.00		
.060	.090	<b>.625</b> (10x)	3	1/8	2-1/2	982160	37.80	982160-C3	43.00		
.060	.090	<b>.720</b> (12x)	3	1/8	2-1/2	35460	37.80	35460-C3	43.00	35460-C4	50.90
.060	.090	<b>.900</b> (15x)	3	1/8	2-1/2	48960	42.60	48960-C3	47.80		
.060	.090	<b>1.062</b> (18x)	3	1/8	2-1/2	977360	53.00	977360-C3	58.20		
.060	.090	<b>1.200</b> (20x)	3	1/8	2-1/2	58360	53.00	58360-C3	58.20		
.062 (1/16)	.093	<b>.186</b> (3x)	3	1/8	2-1/2	47862	36.40	47862-C3	41.60	47862-C4	49.50
.062 (1/16)	.093	<b>.250</b> (4x)	3	1/8	2-1/2	945562	36.40	945562-C3	41.60	945562-C4	49.50
.062 (1/16)	.093	<b>.250</b> (4x)	4	1/8	2-1/2	752062	36.40	752062-C3	41.60		
.062 (1/16)	.093	<b>.312</b> (5x)	3	1/8	2-1/2	33262	36.40	33262-C3	41.60	33262-C4	49.50
.062 (1/16)	.093	<b>.312</b> (5x)	4	1/8	2-1/2	861662	38.60	861662-C3	43.80		
.062 (1/16)	.093	<b>.375</b> (6x)	3	1/8	2-1/2	937062	36.40	937062-C3	41.60	937062-C4	49.50
.062 (1/16)	.093	<b>.375</b> (6x)	4	1/8	2-1/2	753662	36.40	753662-C3	41.60		
.062 (1/16)	.093	<b>.437</b> (7x)	3	1/8	2-1/2	934862	36.50	934862-C3	41.70	934862-C4	49.60
.062 (1/16)	.093	<b>.500</b> (8x)	3	1/8	2-1/2	34662	36.50	34662-C3	41.70	34662-C4	49.60
.062 (1/16)	.093	<b>.500</b> (8x)	4	1/8	2-1/2	874162	39.50	874162-C3	44.70	874162-C4	52.60
.062 (1/16)	.093	<b>.562</b> (9x)	3	1/8	2-1/2	846862	37.80	846862-C3	43.00		
.062 (1/16)	.093	<b>.625</b> (10x)	3	1/8	2-1/2	982162	37.80	982162-C3	43.00	982162-C4	50.90
.062 (1/16)	.093	<b>.625</b> (10x)	4	1/8	2-1/2	789162	38.50	789162-C3	43.70		

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# MINIATURE END MILLS

## Square – Long Reach, Stub Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.062 (1/16)	.093	<b>.687</b> (11x)	3	1/8	2-1/2	850262	37.80	850262-C3	43.00		
.062 (1/16)	.093	<b>.750</b> (12x)	3	1/8	2-1/2	35462	37.80	35462-C3	43.00	35462-C4	50.90
.062 (1/16)	.093	<b>.750</b> (12x)	4	1/8	2-1/2	801762	40.00	801762-C3	45.20		
.062 (1/16)	.093	<b>.800</b> (13x)	3	1/8	2-1/2	839362	40.20	839362-C3	45.40		
.062 (1/16)	.093	<b>.950</b> (15x)	3	1/8	2-1/2	48962	42.60	48962-C3	47.80	48962-C4	55.70
.062 (1/16)	.093	<b>1.125</b> (18x)	3	1/8	2-1/2	977362	53.00	977362-C3	58.20	977362-C4	66.10
.062 (1/16)	.093	<b>1.250</b> (20x)	3	1/8	2-1/2	58362	53.00	58362-C3	58.20	58362-C4	66.10
.062 (1/16)	.093	<b>1.375</b> (22x)	3	1/8	3	969662	59.70	969662-C3	64.90		
.062 (1/16)	.093	<b>1.550</b> (25x)	3	1/8	3	38062	64.30	38062-C3	69.50	<b>25x Diameter!</b>	
.062 (1/16)	.093	<b>1.875</b> (30x)	3	1/8	3	972062	84.60	972062-C3	89.80	<b>30x Diameter!</b>	
.065	.097	<b>.195</b> (3x)	3	1/8	2-1/2	47865	36.40	47865-C3	41.60		
.065	.097	<b>.325</b> (5x)	3	1/8	2-1/2	33265	36.40	33265-C3	41.60		
.065	.097	<b>.530</b> (8x)	3	1/8	2-1/2	34665	36.50	34665-C3	41.70	34665-C4	49.60
.065	.097	<b>.650</b> (10x)	3	1/8	2-1/2	982165	37.80	982165-C3	43.00		
.065	.097	<b>.800</b> (12x)	3	1/8	2-1/2	35465	37.80	35465-C3	43.00		
.070	.105	<b>.210</b> (3x)	3	1/8	2-1/2	47870	36.40	47870-C3	41.60		
.070	.105	<b>.375</b> (5x)	3	1/8	2-1/2	33270	36.40	33270-C3	41.60	33270-C4	49.50
.070	.105	<b>.375</b> (5x)	4	1/8	2-1/2	861670	38.50	861670-C3	43.70		
.070	.105	<b>.570</b> (8x)	3	1/8	2-1/2	34670	36.50	34670-C3	41.70	34670-C4	49.60
.070	.105	<b>.700</b> (10x)	3	1/8	2-1/2	982170	37.80	982170-C3	43.00		
.070	.105	<b>.850</b> (12x)	3	1/8	2-1/2	35470	37.80	35470-C3	43.00		
.070	.105	<b>1.062</b> (15x)	3	1/8	2-1/2	48970	42.60	48970-C3	47.80		
.075	.112	<b>.225</b> (3x)	3	1/8	2-1/2	47875	36.40	47875-C3	41.60		
.075	.112	<b>.375</b> (5x)	3	1/8	2-1/2	33275	36.40	33275-C3	41.60		
.075	.112	<b>.625</b> (8x)	3	1/8	2-1/2	34675	36.50	34675-C3	41.70	34675-C4	49.60
.075	.112	<b>.750</b> (10x)	3	1/8	2-1/2	982175	37.80	982175-C3	43.00		
.075	.112	<b>.900</b> (12x)	3	1/8	2-1/2	35475	37.80	35475-C3	43.00		
.078 (5/64)	.117	<b>.234</b> (3x)	3	1/8	2-1/2	47878	36.40	47878-C3	41.60		
.078 (5/64)	.117	<b>.312</b> (4x)	3	1/8	2-1/2	945578	36.40	945578-C3	41.60		
.078 (5/64)	.117	<b>.406</b> (5x)	3	1/8	2-1/2	33278	36.40	33278-C3	41.60	33278-C4	49.50
.078 (5/64)	.117	<b>.406</b> (5x)	4	1/8	2-1/2	861678	38.60	861678-C3	43.80		
.078 (5/64)	.117	<b>.475</b> (6x)	3	1/8	2-1/2	937078	36.40	937078-C3	41.60		
.078 (5/64)	.117	<b>.550</b> (7x)	3	1/8	2-1/2	934878	36.50	934878-C3	41.70		
.078 (5/64)	.117	<b>.625</b> (8x)	3	1/8	2-1/2	34678	36.50	34678-C3	41.70	34678-C4	49.60
.078 (5/64)	.117	<b>.625</b> (8x)	4	1/8	2-1/2	874178	38.70	874178-C3	43.90		
.078 (5/64)	.117	<b>.700</b> (9x)	3	1/8	2-1/2	846878	37.80	846878-C3	43.00		
.078 (5/64)	.117	<b>.800</b> (10x)	3	1/8	2-1/2	982178	37.80	982178-C3	43.00		
.078 (5/64)	.117	<b>.940</b> (12x)	3	1/8	2-1/2	35478	37.80	35478-C3	43.00	35478-C4	50.90
.078 (5/64)	.117	<b>1.187</b> (15x)	3	1/8	2-1/2	48978	42.60	48978-C3	47.80		
.078 (5/64)	.117	<b>1.400</b> (18x)	3	1/8	3	977378	53.00	977378-C3	58.20		
.078 (5/64)	.117	<b>1.562</b> (20x)	3	1/8	3	58378	53.00	58378-C3	58.20		
.078 (5/64)	.117	<b>1.950</b> (25x)	3	1/8	3	38078	64.30	38078-C3	69.50	<b>25x Diameter!</b>	
.078 (5/64)	.117	<b>2.343</b> (30x)	3	1/8	4	972078	84.60	972078-C3	90.20	<b>30x Diameter!</b>	
.080	.120	<b>.240</b> (3x)	3	1/8	2-1/2	47880	36.40	47880-C3	41.60		
.080	.120	<b>.406</b> (5x)	3	1/8	2-1/2	33280	36.40	33280-C3	41.60		
.080	.120	<b>.650</b> (8x)	3	1/8	2-1/2	34680	36.50	34680-C3	41.70	34680-C4	49.60
.080	.120	<b>.960</b> (12x)	3	1/8	2-1/2	35480	37.80	35480-C3	43.00		
.085	.127	<b>.425</b> (5x)	3	1/8	2-1/2	33285	36.40	33285-C3	41.60		
.085	.127	<b>.700</b> (8x)	3	1/8	2-1/2	34685	36.50	34685-C3	41.70	34685-C4	49.60
.085	.127	<b>1.020</b> (12x)	3	1/8	2-1/2	35485	37.80	35485-C3	43.00		

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**MINIATURE END MILLS**

Square – Long Reach, Stub Flute (cont.)

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NEW

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	TOOL #
.090	.135	<b>.270</b> (3x)	3	1/8	2-1/2	47890	36.40	47890-C3	41.60		
.090	.135	<b>.450</b> (5x)	3	1/8	2-1/2	33290	36.40	33290-C3	41.60		
.090	.135	<b>.750</b> (8x)	3	1/8	2-1/2	34690	36.50	34690-C3	41.70	34690-C4	49.60
.090	.135	<b>1.080</b> (12x)	3	1/8	2-1/2	35490	37.80	35490-C3	43.00		
.093 (3/32)	.139	<b>.279</b> (3x)	3	1/8	2-1/2	47893	36.40	47893-C3	41.60	47893-C4	49.50
.093 (3/32)	.139	<b>.279</b> (3x)	4	1/8	2-1/2	739993	38.60	739993-C3	43.80		
.093 (3/32)	.139	<b>.375</b> (4x)	3	1/8	2-1/2	945593	36.40	945593-C3	41.60	945593-C4	49.50
.093 (3/32)	.139	<b>.375</b> (4x)	4	1/8	2-1/2	752093	36.40	752093-C3	41.60		
.093 (3/32)	.139	<b>.500</b> (5x)	3	1/8	2-1/2	33293	36.40	33293-C3	41.60	33293-C4	49.50
.093 (3/32)	.139	<b>.500</b> (5x)	4	1/8	2-1/2	861693	38.60	861693-C3	43.80		
.093 (3/32)	.139	<b>.585</b> (6x)	3	1/8	2-1/2	937093	36.40	937093-C3	41.60	937093-C4	49.50
.093 (3/32)	.139	<b>.670</b> (7x)	3	1/8	2-1/2	934893	36.50	934893-C3	41.70	934893-C4	49.60
.093 (3/32)	.139	<b>.750</b> (8x)	3	1/8	2-1/2	34693	36.50	34693-C3	41.70	34693-C4	49.60
.093 (3/32)	.139	<b>.750</b> (8x)	4	1/8	2-1/2	874193	38.70	874193-C3	43.90		
.093 (3/32)	.139	<b>.850</b> (9x)	3	1/8	2-1/2	846893	37.80	846893-C3	43.00		
.093 (3/32)	.139	<b>.950</b> (10x)	3	1/8	2-1/2	982193	37.80	982193-C3	43.00		
.093 (3/32)	.139	<b>1.030</b> (11x)	3	1/8	2-1/2	850293	37.80	850293-C3	43.00		
.093 (3/32)	.139	<b>1.125</b> (12x)	3	1/8	2-1/2	35493	37.80	35493-C3	43.00	35493-C4	50.90
.093 (3/32)	.139	<b>1.125</b> (12x)	4	1/8	2-1/2	801793	37.80	801793-C3	43.00		
.093 (3/32)	.139	<b>1.250</b> (13x)	3	1/8	2-1/2	839393	40.60	839393-C3	45.80		
.093 (3/32)	.139	<b>1.400</b> (15x)	3	1/8	3	48993	44.30	48993-C3	49.50	48993-C4	57.40
.093 (3/32)	.139	<b>1.675</b> (18x)	3	1/8	3	977393	53.60	977393-C3	58.20		
.093 (3/32)	.139	<b>1.875</b> (20x)	3	1/8	4	58393	58.40	58393-C3	64.00		
.093 (3/32)	.139	<b>2.062</b> (22x)	3	1/8	4	969693	61.40	969693-C3	67.00		
.093 (3/32)	.139	<b>2.312</b> (25x)	3	1/8	4	38093	66.90	38093-C3	72.50	<b>25x Diameter!</b>	
.093 (3/32)	.139	<b>2.812</b> (30x)	3	1/8	4	972093	93.80	972093-C3	99.40	<b>30x Diameter!</b>	
.095	.142	<b>.500</b> (5x)	3	1/8	2-1/2	33295	36.40	33295-C3	41.60		
.095	.142	<b>.750</b> (8x)	3	1/8	2-1/2	34695	36.50	34695-C3	41.70	34695-C4	49.60
.095	.142	<b>1.150</b> (12x)	3	1/8	2-1/2	35495	37.80	35495-C3	43.00		
.100	.150	<b>.300</b> (3x)	3	1/8	2-1/2	978400	36.40	978400-C3	41.60		
.100	.150	<b>.400</b> (4x)	3	1/8	2-1/2	945600	36.40	945600-C3	41.60		
.100	.150	<b>.500</b> (5x)	3	1/8	2-1/2	33300	36.40	33300-C3	41.60		
.100	.150	<b>.600</b> (6x)	3	1/8	2-1/2	937100	36.40	937100-C3	41.60		
.100	.150	<b>.700</b> (7x)	3	1/8	2-1/2	934900	36.40	934900-C3	41.60		
.100	.150	<b>.800</b> (8x)	3	1/8	2-1/2	34700	36.50	34700-C3	41.70	34700-C4	49.60
.100	.150	<b>1.000</b> (10x)	3	1/8	2-1/2	982200	37.80	982200-C3	43.00		
.100	.150	<b>1.200</b> (12x)	3	1/8	2-1/2	35499	37.80	35499-C3	43.00		
.100	.150	<b>1.500</b> (15x)	3	1/8	3	49000	45.10	49000-C3	50.30		
.100	.150	<b>1.812</b> (18x)	3	1/8	4	977400	56.20	977400-C3	61.80		
.105	.158	<b>.530</b> (5x)	3	1/8	2-1/2	33301	36.40	33301-C3	41.60		
.105	.158	<b>.850</b> (8x)	3	1/8	2-1/2	34701	36.50	34701-C3	41.70		
.109 (7/64)	.163	<b>.570</b> (5x)	3	1/8	2-1/2	33302	36.40	33302-C3	41.60	33302-C4	49.50
.109 (7/64)	.163	<b>.570</b> (5x)	4	1/8	2-1/2	861702	37.10	861702-C3	42.30		
.109 (7/64)	.163	<b>.680</b> (6x)	3	1/8	2-1/2	937102	36.50	937102-C3	41.70		
.109 (7/64)	.163	<b>.790</b> (7x)	3	1/8	2-1/2	934902	36.50	934902-C3	41.70		
.109 (7/64)	.163	<b>.900</b> (8x)	3	1/8	2-1/2	34702	36.50	34702-C3	41.70		
.109 (7/64)	.163	<b>1.125</b> (10x)	3	1/8	2-1/2	982202	37.80	982202-C3	43.00		
.109 (7/64)	.163	<b>1.312</b> (12x)	3	1/8	3	35502	38.30	35502-C3	43.50		

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# MINIATURE END MILLS

## Square – Long Reach, Stub Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.110	.165	<b>.570</b> (5x)	3	1/8	2-1/2	33303	36.40	33303-C3	41.60		
.110	.165	<b>.900</b> (8x)	3	1/8	2-1/2	34703	37.20	34703-C3	42.40		
.115	.173	<b>.600</b> (5x)	3	1/8	2-1/2	33304	36.40	33304-C3	41.60		
.115	.173	<b>.950</b> (8x)	3	1/8	2-1/2	34704	36.50	34704-C3	41.70		
.118 (3 mm)	.177	<b>.475</b> (4x)	3	1/8	2-1/2	945605	36.40	945605-C3	41.60		NEW
.118 (3 mm)	.177	<b>.625</b> (5x)	3	1/8	2-1/2	33305	36.40	33305-C3	41.60		
.118 (3 mm)	.177	<b>.625</b> (5x)	4	1/8	2-1/2	861705	36.40	861705-C3	41.60		
.118 (3 mm)	.177	<b>.735</b> (6x)	3	1/8	2-1/2	937105	36.50	937105-C3	41.70		
.118 (3 mm)	.177	<b>.840</b> (7x)	3	1/8	2-1/2	934905	36.50	934905-C3	41.70		
.118 (3 mm)	.177	<b>.950</b> (8x)	3	1/8	2-1/2	34705	36.50	34705-C3	41.70		
.118 (3 mm)	.177	<b>.950</b> (8x)	4	1/8	2-1/2	874205	37.20	874205-C3	42.40		
.118 (3 mm)	.177	<b>1.187</b> (10x)	3	1/8	2-1/2	982205	37.80	982205-C3	43.00		
.118 (3 mm)	.177	<b>1.420</b> (12x)	3	1/8	3	35505	38.30	35505-C3	43.50		
.118 (3 mm)	.177	<b>1.770</b> (15x)	3	1/8	3	49005	46.00	49005-C3	51.20		
.118 (3 mm)	.177	<b>2.125</b> (18x)	3	1/8	4	977405	56.90	977405-C3	62.50		
.120	.180	<b>.625</b> (5x)	3	1/8	2-1/2	33306	36.40	33306-C3	41.60		
.120	.180	<b>1.000</b> (8x)	3	1/8	2-1/2	34706	36.50	34706-C3	41.70		

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	.187	<b>.375</b> (3x)	3	1/8	2-1/2	978408	36.40	978408-C3	41.60		
.125 (1/8)	.187	<b>.500</b> (4x)	3	1/8	2-1/2	945608	36.40	945608-C3	41.60	945608-C4	49.50
.125 (1/8)	.187	<b>.625</b> (5x)	3	1/8	2-1/2	33308	36.40	33308-C3	41.60	33308-C4	49.50
.125 (1/8)	.187	<b>.625</b> (5x)	4	1/8	2-1/2	861708	38.60	861708-C3	43.80		
.125 (1/8)	.187	<b>.750</b> (6x)	3	1/8	2-1/2	937108	36.40	937108-C3	41.60	937108-C4	49.50
.125 (1/8)	.187	<b>.750</b> (6x)	4	1/8	2-1/2	753708	37.10	753708-C3	42.30		
.125 (1/8)	.187	<b>.875</b> (7x)	3	1/8	2-1/2	934908	36.40	934908-C3	41.60	934908-C4	49.50
.125 (1/8)	.187	<b>.875</b> (7x)	4	1/8	2-1/2	753308	37.10	753308-C3	42.30		
.125 (1/8)	.187	<b>1.000</b> (8x)	3	1/8	2-1/2	34708	36.40	34708-C3	41.60	34708-C4	49.50
.125 (1/8)	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	874208	38.60	874208-C3	43.80		
.125 (1/8)	.187	<b>1.125</b> (9x)	3	1/8	2-1/2	846908	39.40	846908-C3	44.60		
.125 (1/8)	.187	<b>1.250</b> (10x)	3	1/8	2-1/2	982208	39.40	982208-C3	44.60	982208-C4	52.50
.125 (1/8)	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	789208	39.40	789208-C3	44.60		
.125 (1/8)	.187	<b>1.375</b> (11x)	3	1/8	2-1/2	850308	39.50	850308-C3	44.70		
.125 (1/8)	.187	<b>1.500</b> (12x)	3	1/8	3	35508	39.50	35508-C3	44.70	35508-C4	52.60
.125 (1/8)	.187	<b>1.500</b> (12x)	4	1/8	3	801808	39.50	801808-C3	44.70		
.125 (1/8)	.187	<b>1.625</b> (13x)	3	1/8	3	839408	42.30	839408-C3	47.50		
.125 (1/8)	.187	<b>1.875</b> (15x)	3	1/8	3	49008	45.10	49008-C3	50.30	49008-C4	58.20
.125 (1/8)	.187	<b>2.250</b> (18x)	3	1/8	4	977408	54.10	977408-C3	59.70		
.125 (1/8)	.187	<b>2.500</b> (20x)	3	1/8	4	58408	55.70	58408-C3	61.30		
.125 (1/8)	.187	<b>2.750</b> (22x)	3	1/8	4	969708	59.10	969708-C3	64.70		
.125 (1/8)	.187	<b>3.125</b> (25x)	3	1/8	4	38108	65.00	38108-C3	70.60		<b>25x Diameter!</b>
.125 (1/8)	.187	<b>3.750</b> (30x)	3	1/8	6	973608	78.30	973608-C3	85.20		<b>30x Diameter!</b>
.140 (9/64)	.220	<b>.425</b> (3x)	3	3/16	3	978409	43.00	978409-C3	48.60		
.140 (9/64)	.220	<b>.750</b> (5x)	3	3/16	3	33309	43.00	33309-C3	48.60	33309-C4	61.10
.140 (9/64)	.220	<b>.750</b> (5x)	4	3/16	3	861709	43.00	861709-C3	48.60		
.140 (9/64)	.220	<b>1.125</b> (8x)	3	3/16	3	34709	43.00	34709-C3	48.60		
.140 (9/64)	.220	<b>1.450</b> (10x)	3	3/16	3	982209	46.10	982209-C3	51.70		
.140 (9/64)	.220	<b>1.680</b> (12x)	3	3/16	4	35509	49.50	35509-C3	57.10		

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# MINIATURE END MILLS

Square – Long Reach, Stub Flute (cont.)

continued from previous page

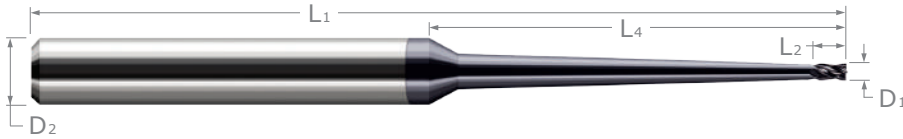
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.156 (5/32)	.234	<b>.470</b> (3x)	3	3/16	3	978410	43.00	978410-C3	48.60		
.156 (5/32)	.234	<b>.625</b> (4x)	3	3/16	3	945610	43.00	945610-C3	48.60		
.156 (5/32)	.234	<b>.750</b> (5x)	3	3/16	3	33310	43.00	33310-C3	48.60	33310-C4	61.10
.156 (5/32)	.234	<b>.750</b> (5x)	4	3/16	3	861710	43.00	861710-C3	48.60		
.156 (5/32)	.234	<b>.937</b> (6x)	3	3/16	3	937110	43.00	937110-C3	48.60		
.156 (5/32)	.234	<b>1.093</b> (7x)	3	3/16	3	934910	43.00	934910-C3	48.60		
.156 (5/32)	.234	<b>1.250</b> (8x)	3	3/16	3	34710	43.00	34710-C3	48.60	34710-C4	61.10
.156 (5/32)	.234	<b>1.375</b> (9x)	3	3/16	3	846910	46.10	846910-C3	51.70		
.156 (5/32)	.234	<b>1.570</b> (10x)	3	3/16	3	982210	46.10	982210-C3	51.70		
.156 (5/32)	.234	<b>1.875</b> (12x)	3	3/16	4	35510	46.30	35510-C3	53.90		
.156 (5/32)	.234	<b>2.375</b> (15x)	3	3/16	4	49010	49.50	49010-C3	57.10		
.156 (5/32)	.234	<b>2.812</b> (18x)	3	3/16	6	977410	68.30	977410-C3	78.40		
.172 (11/64)	.258	<b>.875</b> (5x)	3	3/16	3	33311	43.00	33311-C3	48.60		
.172 (11/64)	.258	<b>1.375</b> (8x)	3	3/16	3	34711	43.00	34711-C3	48.60		
.187 (3/16)	.281	<b>.570</b> (3x)	3	3/16	3	978412	43.00	978412-C3	48.60		
.187 (3/16)	.281	<b>.750</b> (4x)	3	3/16	3	945612	43.00	945612-C3	48.60		
.187 (3/16)	.281	<b>1.000</b> (5x)	3	3/16	3	33312	43.00	33312-C3	48.60	33312-C4	61.10
.187 (3/16)	.281	<b>1.000</b> (5x)	4	3/16	3	861712	43.00	861712-C3	48.60		
.187 (3/16)	.281	<b>1.156</b> (6x)	3	3/16	3	937112	43.00	937112-C3	48.60		
.187 (3/16)	.281	<b>1.312</b> (7x)	3	3/16	3	934912	43.00	934912-C3	48.60		
.187 (3/16)	.281	<b>1.500</b> (8x)	3	3/16	3	34712	43.00	34712-C3	48.60	34712-C4	61.10
.187 (3/16)	.281	<b>1.500</b> (8x)	4	3/16	3	874212	45.00	874212-C3	50.60		
.187 (3/16)	.281	<b>1.680</b> (9x)	3	3/16	3	846912	46.10	846912-C3	51.70		
.187 (3/16)	.281	<b>1.875</b> (10x)	3	3/16	4	982212	46.10	982212-C3	53.70		
.187 (3/16)	.281	<b>2.250</b> (12x)	3	3/16	4	35512	46.30	35512-C3	53.90	35512-C4	65.60
.187 (3/16)	.281	<b>2.812</b> (15x)	3	3/16	4	49012	49.50	49012-C3	57.10		
.187 (3/16)	.281	<b>3.375</b> (18x)	3	3/16	6	977412	70.10	977412-C3	80.20		
.187 (3/16)	.281	<b>3.750</b> (20x)	3	3/16	6	58412	70.10	58412-C3	80.20		
.187 (3/16)	.281	<b>4.125</b> (22x)	3	3/16	6	969712	69.60	969712-C3	79.70		
.203 (13/64)	.312	<b>1.015</b> (5x)	3	1/4	4	33313	54.10	33313-C3	63.00		
.203 (13/64)	.312	<b>1.625</b> (8x)	3	1/4	4	34713	54.10	34713-C3	63.00		
.218 (7/32)	.330	<b>1.125</b> (5x)	3	1/4	4	33314	53.80	33314-C3	62.70		
.218 (7/32)	.330	<b>1.750</b> (8x)	3	1/4	4	34714	53.80	34714-C3	62.70		
.218 (7/32)	.330	<b>2.187</b> (10x)	3	1/4	4	982214	55.40	982214-C3	64.30		
.250 (1/4)	.375	<b>.750</b> (3x)	3	1/4	4	978416	48.10	978416-C3	57.00		
.250 (1/4)	.375	<b>1.000</b> (4x)	3	1/4	4	945616	48.10	945616-C3	57.00		
.250 (1/4)	.375	<b>1.250</b> (5x)	3	1/4	4	33316	48.10	33316-C3	57.00	33316-C4	68.70
.250 (1/4)	.375	<b>1.250</b> (5x)	4	1/4	4	861716	48.10	861716-C3	57.00		
.250 (1/4)	.375	<b>1.500</b> (6x)	3	1/4	4	937116	48.10	937116-C3	57.00		
.250 (1/4)	.375	<b>1.750</b> (7x)	3	1/4	4	934916	48.10	934916-C3	57.00		
.250 (1/4)	.375	<b>2.000</b> (8x)	3	1/4	4	34716	48.10	34716-C3	57.00	34716-C4	68.70
.250 (1/4)	.375	<b>2.000</b> (8x)	4	1/4	4	874216	50.20	874216-C3	59.10		
.250 (1/4)	.375	<b>2.250</b> (9x)	3	1/4	4	846916	54.30	846916-C3	63.20		
.250 (1/4)	.375	<b>2.500</b> (10x)	3	1/4	4	982216	54.30	982216-C3	63.20		
.250 (1/4)	.375	<b>3.000</b> (12x)	3	1/4	6	35516	59.50	35516-C3	69.60	35516-C4	89.30
.250 (1/4)	.375	<b>3.750</b> (15x)	3	1/4	6	49016	60.60	49016-C3	70.70		
.250 (1/4)	.375	<b>5.000</b> (20x)	3	1/4	8	58416	125.60	58416-C3	140.70		
.312 (5/16)	.470	<b>1.625</b> (5x)	3	5/16	4	33320	80.00	33320-C3	90.70		
.312 (5/16)	.470	<b>2.500</b> (8x)	3	5/16	4	34720	80.00	34720-C3	90.70		
.375 (3/8)	.570	<b>2.000</b> (5x)	3	3/8	4	33324	80.00	33324-C3	93.80		
.375 (3/8)	.570	<b>3.000</b> (8x)	3	3/8	6	34724	110.10	34724-C3	125.70		

SQUARE

# MINIATURE END MILLS

## Square – Tapered Reach (Clearance Cutters)

SQUARE



Maximum Reach & Maximum Rigidity!

- Designed for deep cavity profiling
- 2° tapered neck design minimizes deflection and maximizes wall clearance
- Length of cut = 1½x diameter
- Neck behind length of cut is reduced for 1x diameter
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA

CUTTER DIA.	LOC	OVERALL REACH	EFF. WALL ANGLE	SHANK DIA.	OAL	INTERFERENCE DEPTH AT WALL ANGLE*						UNCOATED			AITIN NANO COATED		
						D <sub>1</sub>	L <sub>1</sub>	0°	.5°	1°	2°	3°	4°	2 FL	4 FL	PRICE	2 FL
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	L <sub>4</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>												
.015	.023	1/2	6.4°	1/8	2-1/2	.060	.080	.125	.375	.395	.420		990215	76.90		990215-C6	84.50
.031	.047	1/2	5.4°	1/8	2-1/2	.115	.155	.235	.385	.410	.440		990231	59.30		990231-C6	66.90
.031	.047	1	6.3°	1/4	4	.115	.155	.235	.755	.800	.850	26631	30831	71.40	26631-C6	30831-C6	82.60
.031	.047	1-1/2	4.2°	1/4	4	.115	.155	.235	1.260	1.355	1.470	28331	31231	77.10	28331-C6	31231-C6	88.30
.031	.047	2	3.1°	1/4	4	.115	.155	.235	1.765	1.965	-	17431	913131	82.70	17431-C6	913131-C6	93.90
.047	.071	1/2	4.5°	1/8	2-1/2	.180	.245	.370	.395	.430	.470		990247	59.80		990247-C6	67.40
.047	.071	1	5.9°	1/4	4	.180	.245	.370	.765	.815	.870	26647	30847	71.40	26647-C6	30847-C6	82.60
.047	.071	1-1/2	3.9°	1/4	4	.180	.245	.370	1.275	1.380	-	28347	31247	77.10	28347-C6	31247-C6	88.30
.062	.093	1/2	3.7°	1/8	2-1/2	.220	.295	.375	.410	.460	-		990262	57.60		990262-C6	65.20
.062	.093	1	5.4°	1/4	4	.220	.295	.445	.775	.825	.890	26662	30862	69.40	26662-C6	30862-C6	80.60
.062	.093	1-1/2	3.7°	1/4	4	.220	.295	.445	1.285	1.410	-	28362	31262	75.00	28362-C6	31262-C6	86.20
.062	.093	2	2.6°	1/4	4	.220	.295	.445	1.805	-	-	17462	913162	80.70	17462-C6	913162-C6	91.90
.078	.118	1	5.0°	1/4	4	.305	.405	.610	.785	.845	.915	26678	30878	69.40	26678-C6	30878-C6	80.60
.078	.118	1-1/2	3.4°	1/4	4	.305	.405	.610	1.305	1.445	-	28378	31278	75.00	28378-C6	31278-C6	86.20
.093	.140	1	4.6°	1/4	4	.340	.455	.685	.795	.865	.945	26693	30893	70.20	26693-C6	30893-C6	81.40
.093	.140	1-1/2	3.1°	1/4	4	.340	.455	.685	1.320	-	-	28393	31293	74.40	28393-C6	31293-C6	85.60
.093	.140	2	2.2°	1/4	4	.340	.455	.685	1.890	-	-	17493	913193	78.60	17493-C6	913193-C6	89.80
.125	.188	1	3.7°	1/4	4	.450	.600	.760	.835	.930	-	26708	30908	70.20	26708-C6	30908-C6	81.40
.125	.188	1-1/2	2.5°	1/4	4	.450	.600	.905	1.395	-	-	28408	31308	74.40	28408-C6	31308-C6	85.60
.125	.188	2	1.7°	1/4	4	.450	.600	.905	-	-	-	17508	913208	78.60	17508-C6	913208-C6	89.80
.156	.234	1	2.8°	1/4	4	.525	.705	.780	.895	-	-	26710	30910	70.20	26710-C6	30910-C6	81.40
.156	.234	1-1/2	1.9°	1/4	4	.525	.705	1.060	-	-	-	28410	31310	74.40	28410-C6	31310-C6	85.60
.187	.281	1-1/2	1.3°	1/4	4	.605	.805	1.215	-	-	-	28412	31312	74.40	28412-C6	31312-C6	85.60
.250	.375	1-1/2	2.5°	3/8	4	.760	1.015	1.275	1.425	-	-	28416	31316	96.00	28416-C6	31316-C6	108.60

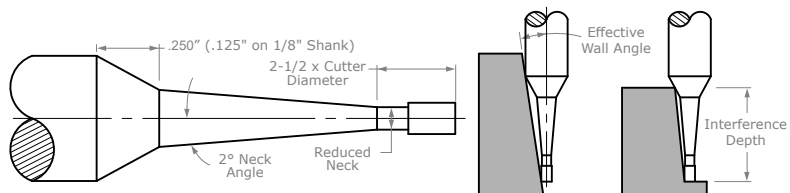
\*Values are approximate and may vary due to tolerancing.



For detailed interference charts with more angles, scan the QR code or visit [harveytool.com/resources](http://harveytool.com/resources)

**Effective Wall Angle:**  
Minimum wall angle (measured from centerline of tool) that can be machined at overall reach.

**Interference Depth:**  
At a given angle, the depth at which the cutter interferes with the workpiece.

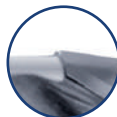


# MINIATURE END MILLS

## Square – Long Reach, Long Flute



- Long length design for deep cavities
- Long flutes for deep pocket milling
- Length of cut is  $\geq 5x$  diameter
- 3 and 4 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.010	.050	<b>.100</b> (10x)	3	1/8	2-1/2	13610	52.70	13610-C3	57.90	10010	65.80
.010	.050	<b>.150</b> (15x)	3	1/8	2-1/2	948210	66.50	948210-C3	71.70		
.012	.060	<b>.120</b> (10x)	3	1/8	2-1/2	13612	52.70	13612-C3	57.90		
.015 (1/64)	.075	<b>.150</b> (10x)	3	1/8	2-1/2	13615	42.10	13615-C3	47.30	10015	55.20
.015 (1/64)	.075	<b>.225</b> (15x)	3	1/8	2-1/2	948215	57.10	948215-C3	62.30		
.020 (.5 mm)	.100	<b>.200</b> (10x)	3	1/8	2-1/2	13620	40.40	13620-C3	45.60	10020	53.50
.020 (.5 mm)	.100	<b>.300</b> (15x)	3	1/8	2-1/2	948220	55.20	948220-C3	60.40		
.025	.125	<b>.250</b> (10x)	3	1/8	2-1/2	13625	38.80	13625-C3	44.00	10025	51.90
.025	.125	<b>.312</b> (12x)	3	1/8	2-1/2	867025	50.60	867025-C3	55.80		
.030	.150	<b>.300</b> (10x)	3	1/8	2-1/2	13630	38.80	13630-C3	44.00	10030	51.90
.030	.150	<b>.450</b> (15x)	3	1/8	2-1/2	948230	53.40	948230-C3	58.60		
.031 (1/32)	.155	<b>.250</b> (8x)	3	1/8	2-1/2	876631	37.70	876631-C3	42.90		
.031 (1/32)	.155	<b>.310</b> (10x)	3	1/8	2-1/2	13631	38.80	13631-C3	44.00	10031	51.90
.031 (1/32)	.155	<b>.312</b> (10x)	4	1/8	2-1/2	776031	38.80	776031-C3	44.00		
.031 (1/32)	.155	<b>.375</b> (12x)	3	1/8	2-1/2	867031	50.10	867031-C3	55.30		
.031 (1/32)	.155	<b>.470</b> (15x)	3	1/8	2-1/2	948231	53.40	948231-C3	58.60		
.035 (.9 mm)	.175	<b>.350</b> (10x)	3	1/8	2-1/2	13635	38.80	13635-C3	44.00	10035	51.90
.040	.200	<b>.400</b> (10x)	3	1/8	2-1/2	13640	38.80	13640-C3	44.00	10040	51.90
.040	.200	<b>.600</b> (15x)	3	1/8	2-1/2	948240	53.40	948240-C3	58.60		
.045	.225	<b>.450</b> (10x)	3	1/8	2-1/2	13645	38.10	13645-C3	43.30	10045	51.20
.047 (3/64)	.250	<b>.375</b> (8x)	3	1/8	2-1/2	876647	36.90	876647-C3	42.10		
.047 (3/64)	.250	<b>.500</b> (10x)	3	1/8	2-1/2	13647	38.10	13647-C3	43.30	10047	51.20
.047 (3/64)	.250	<b>.500</b> (10x)	4	1/8	2-1/2	776047	38.10	776047-C3	43.30		
.047 (3/64)	.250	<b>.570</b> (12x)	3	1/8	2-1/2	867047	47.40	867047-C3	52.60		
.047 (3/64)	.250	<b>.710</b> (15x)	3	1/8	2-1/2	948247	50.70	948247-C3	55.90		
.050	.300	<b>.500</b> (10x)	3	1/8	2-1/2	956350	38.10	956350-C3	43.30		
.050	.300	<b>.600</b> (12x)	3	1/8	2-1/2	13650	38.10	13650-C3	43.30	10050	51.20
.050	.300	<b>.750</b> (15x)	3	1/8	2-1/2	948250	50.70	948250-C3	55.90		
.055 (1.4 mm)	.385	<b>.770</b> (14x)	3	1/8	2-1/2	13655	40.00	13655-C3	45.20	10055	53.10
.060	.312	<b>.625</b> (10x)	3	1/8	2-1/2	956360	38.10	956360-C3	43.30		
.060	.500	<b>1.000</b> (16x)	3	1/8	2-1/2	13660	40.20	13660-C3	45.40	10060	53.30
.062 (1/16)	.312	<b>.500</b> (8x)	3	1/8	2-1/2	876662	36.80	876662-C3	42.00		
.062 (1/16)	.312	<b>.625</b> (10x)	3	1/8	2-1/2	956362	38.10	956362-C3	43.30		
.062 (1/16)	.312	<b>.750</b> (12x)	3	1/8	2-1/2	867062	37.20	867062-C3	42.40		
.062 (1/16)	.500	<b>1.000</b> (16x)	3	1/8	2-1/2	13662	40.20	13662-C3	45.40	10062	53.30
.062 (1/16)	.312	<b>1.000</b> (16x)	4	1/8	2-1/2	776062	40.20	776062-C3	45.40		

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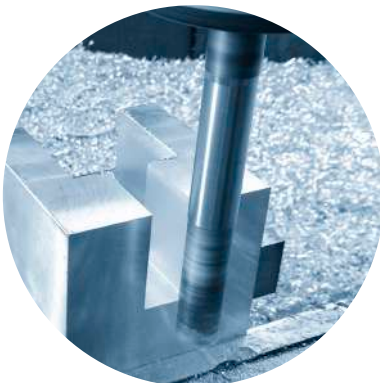
# MINIATURE END MILLS

Square – Long Reach, Long Flute (cont.)

continued from previous page

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AItIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.065	.500	<b>1.000</b> (15x)	3	1/8	2-1/2	13665	40.00	13665-C3	45.20	10065	53.10
.070	.500	<b>1.000</b> (14x)	3	1/8	2-1/2	13670	40.00	13670-C3	45.20	10070	53.10
.075	.500	<b>1.000</b> (13x)	3	1/8	2-1/2	13675	38.10	13675-C3	43.30	10075	51.20
.078 (5/64)	.406	<b>.800</b> (10x)	3	1/8	2-1/2	956378	38.10	956378-C3	43.30		
.078 (5/64)	.500	<b>1.000</b> (12x)	3	1/8	2-1/2	13678	38.10	13678-C3	43.30	10078	51.20
.078 (5/64)	.406	<b>1.000</b> (12x)	4	1/8	2-1/2	776078	38.10	776078-C3	43.30		
.078 (5/64)	.406	<b>1.187</b> (15x)	3	1/8	2-1/2	948278	50.70	948278-C3	55.90		
.080	.750	<b>1.250</b> (15x)	3	1/8	2-1/2	13680	40.20	13680-C3	45.40	10080	53.30
.085	.750	<b>1.250</b> (14x)	3	1/8	2-1/2	13685	40.20	13685-C3	45.40	10085	53.30
.090	.750	<b>1.250</b> (13x)	3	1/8	2-1/2	13690	38.30	13690-C3	43.50	10090	51.40
.093 (3/32)	.500	<b>.750</b> (8x)	3	1/8	2-1/2	876693	36.80	876693-C3	42.00		
.093 (3/32)	.500	<b>.950</b> (10x)	3	1/8	2-1/2	956393	38.10	956393-C3	43.30		
.093 (3/32)	.750	<b>.950</b> (10x)	3	1/8	2-1/2	755693	39.10	755693-C3	44.30		
.093 (3/32)	.750	<b>1.250</b> (13x)	3	1/8	2-1/2	13693	38.30	13693-C3	43.50	10093	51.40
.093 (3/32)	.500	<b>1.250</b> (13x)	4	1/8	2-1/2	776093	38.30	776093-C3	43.50		
.093 (3/32)	.500	<b>1.400</b> (15x)	3	1/8	3	948293	50.70	948293-C3	55.90		
.095	.750	<b>1.250</b> (13x)	3	1/8	2-1/2	13695	38.10	13695-C3	43.30	10095	51.20
.100	.750	<b>1.250</b> (12x)	3	1/8	2-1/2	13700	38.10	13700-C3	43.30	10100	51.20
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	.625	<b>1.000</b> (8x)	3	1/8	2-1/2	876708	36.80	876708-C3	42.00		
.125 (1/8)	.625	<b>1.250</b> (10x)	3	1/8	2-1/2	956408	38.90	956408-C3	44.10		
.125 (1/8)	1.000	<b>1.250</b> (10x)	3	1/8	2-1/2	755708	39.50	755708-C3	44.70		
.125 (1/8)	1.000	<b>1.500</b> (12x)	3	1/8	2-1/2	13708	39.10	13708-C3	44.30	10108	52.20
.125 (1/8)	.625	<b>1.500</b> (12x)	4	1/8	2-1/2	776108	39.10	776108-C3	44.30		
.125 (1/8)	.625	<b>1.875</b> (15x)	3	1/8	3	948308	53.80	948308-C3	59.00		
.156	.750	<b>1.250</b> (8x)	3	3/16	3	876710	47.80	876710-C3	53.40		
.156	.750	<b>1.570</b> (10x)	3	3/16	3	956410	49.60	956410-C3	55.20		
.187 (3/16)	1.125	<b>1.625</b> (8x)	3	3/16	3	13712	45.10	13712-C3	50.70	10112	63.20
.187 (3/16)	1.000	<b>1.875</b> (10x)	3	3/16	4	956412	47.30	956412-C3	54.90		
.250 (1/4)	1.500	<b>2.000</b> (8x)	3	1/4	4	13716	50.30	13716-C3	55.80	10116	70.90
.250 (1/4)	1.250	<b>2.500</b> (10x)	3	1/4	4	956416	54.40	956416-C3	63.30		
.375 (3/8)	2.000	<b>3.000</b> (8x)	3	3/8	6	876724	130.60	876724-C3	146.20		



## Applying HEM to Micromachining

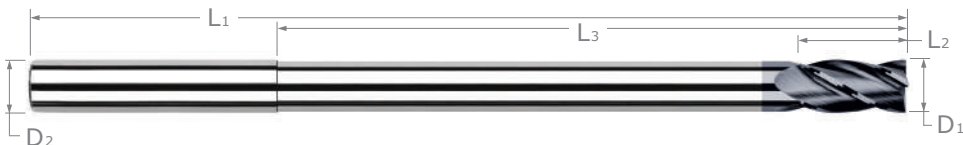
You've heard a great deal about High Efficiency Milling (HEM), but you probably thought it was just for larger diameter tooling. In fact, this popular machining method can be used for tools smaller than .125" in diameter! Our "In the Loupe" blog post [Applying HEM to Micromachining](#) explains how.

[Read more on harveypformance.com/in-the-loupe/](http://harveypformance.com/in-the-loupe/)



## MINIATURE END MILLS

### Square – Extra Long Length



SQUARE

- Up to 10" overall length
- Longest overall length carbide end mill available in stock
- Extended reach • 4 flutes • Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					4 FL	PRICE	4 FL	PRICE
D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	L3 $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	D2	L1	4 FL	PRICE	4 FL	PRICE
.250 (1/4)	.375	4.375 (17.5x)	1/4	6	991916	90.50	991916-C3	100.60
.250 (1/4)	.375	4.375 (17.5x)	1/4	8	960516	124.40	960516-C3	139.50
.312 (5/16)	.470	4.343 (14x)	5/16	6	991920	108.00	991920-C3	123.10
.375 (3/8)	.562	4.312 (11.5x)	3/8	6	991924	121.80	991924-C3	137.40
.375 (3/8)	.562	4.312 (11.5x)	3/8	8	960524	149.10	960524-C3	170.20
.437 (7/16)	.656	5.875 (13.5x)	7/16	8	991928	212.20	991928-C3	243.30
.500 (1/2)	.750	5.750 (11.5x)	1/2	8	991932	221.80	991932-C3	252.90
.500 (1/2)	.750	5.750 (11.5x)	1/2	10	960532	322.40	960532-C3	353.50
.625 (5/8)	.937	5.687 (9x)	5/8	8	991940	373.20	991940-C3	400.50
.750 (3/4)	1.125	5.625 (7.5x)	3/4	8	991948	463.60	991948-C3	495.40

## MINIATURE END MILLS

### Square – Router Style



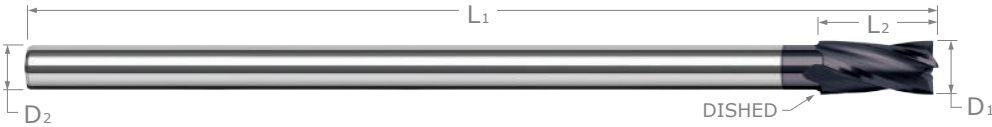
- Router style shank and tight overall length for quick and consistent tool changes
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			AITIN COATED		
				2 FL	4 FL	PRICE	2 FL	4 FL	PRICE
D1 $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	D2	L1 $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	2 FL	4 FL	PRICE	2 FL	4 FL	PRICE
.015 (1/64)	.045 (3x)	1/4	2	760615	761715	34.20	760615-C3	761715-C3	41.80
.031 (1/32)	.093 (3x)	1/4	2	760631	761731	34.20	760631-C3	761731-C3	41.80
.047 (3/64)	.141 (3x)	1/4	2	760647	761747	34.20	760647-C3	761747-C3	41.80
.062 (1/16)	.186 (3x)	1/4	2	760662	761762	34.20	760662-C3	761762-C3	41.80
.078 (5/64)	.234 (3x)	1/4	2	760678	761778	34.20	760678-C3	761778-C3	41.80
.093 (3/32)	.279 (3x)	1/4	2	760693	761793	34.20	760693-C3	761793-C3	41.80
D1 $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	D2	L1 $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	2 FL	4 FL	PRICE	2 FL	4 FL	PRICE
.125 (1/8)	.375 (3x)	1/4	2	760708	761808	34.20	760708-C3	761808-C3	41.80
.187 (3/16)	.625 (3x)	1/4	2	760712	761812	34.20	760712-C3	761812-C3	41.80

# END MILLS

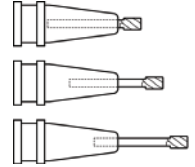
## Square – Reduced Shank

SQUARE



- Reduced straight shank allows any chucking depth
- Solid carbide construction for maximum rigidity
- Long length design for deep cavity machining
- Center cutting
- Solid carbide
- CNC ground in the USA

**Chuck at Any Depth!**



CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITiN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>						
<b>1/8</b>	3/16 (1.5x)	2	<b>3 mm</b>	2-1/2	907808	89.80	907808-C3	95.00	907808-C4	102.90
<b>1/8</b>	3/16 (1.5x)	4	<b>3 mm</b>	2-1/2	943208	92.40	943208-C3	97.60	943208-C4	105.50
<b>1/8</b>	3/8 (3x)	4	<b>3 mm</b>	2-1/2	789308	94.70	789308-C3	99.90		
<b>5/32</b>	15/64 (1.5x)	2	<b>1/8</b>	2-1/2	907810	89.80	907810-C3	95.40		
<b>5/32</b>	15/64 (1.5x)	4	<b>1/8</b>	2-1/2	943210	92.40	943210-C3	98.00		
<b>5/32</b>	15/64 (1.5x)	4	<b>1/8</b>	4	920610	100.60	920610-C3	108.20		
<b>3/16</b>	9/32 (1.5x)	2	<b>1/8</b>	2-1/2	907812	89.80	907812-C3	95.40		
<b>3/16</b>	9/32 (1.5x)	4	<b>1/8</b>	2-1/2	943212	92.40	943212-C3	98.00		
<b>3/16</b>	9/32 (1.5x)	4	<b>5/32</b>	4	920613	100.60	920613-C3	108.20	920613-C4	119.90
<b>3/16</b>	.570 (3x)	4	<b>1/8</b>	2-1/2	789312	94.70	789312-C3	100.30		
<b>1/4</b>	3/8 (1.5x)	2	<b>3/16</b>	3	907816	99.30	907816-C3	106.90		
<b>1/4</b>	3/8 (1.5x)	4	<b>3/16</b>	3	943216	100.10	943216-C3	107.70	943216-C4	120.70
<b>1/4</b>	3/8 (1.5x)	4	<b>3/16</b>	4	920616	135.20	920616-C3	144.10		
<b>1/4</b>	3/4 (3x)	4	<b>3/16</b>	3	789316	104.70	789316-C3	112.30		
<b>5/16</b>	15/32 (1.5x)	4	<b>1/4</b>	4	943220	122.90	943220-C3	133.60		
<b>5/16</b>	15/32 (1.5x)	4	<b>1/4</b>	6	920620	161.70	920620-C3	176.80		
<b>3/8</b>	9/16 (1.5x)	4	<b>5/16</b>	4	943224	145.10	943224-C3	158.90	943224-C4	169.90
<b>3/8</b>	9/16 (1.5x)	4	<b>5/16</b>	6	920624	176.10	920624-C3	191.70		
<b>7/16</b>	21/32 (1.5x)	4	<b>3/8</b>	6	943228	200.00	943228-C3	216.90		
<b>1/2</b>	3/4 (1.5x)	4	<b>7/16</b>	6	943232	227.40	943232-C3	242.50		
<b>5/8</b>	15/16 (1.5x)	4	<b>1/2</b>	6	943240	295.40	943240-C3	317.90		
<b>3/4</b>	1-1/8 (1.5x)	4	<b>5/8</b>	6	943248	364.60	943248-C3	388.20		

For Ball Reduced Shank, please see page 67.

For Corner Radius Reduced Shank, please see page 89.



Access Simulation Files in DXF Format for Every Harvey Tool Product

[harveytool.com/resources/simulation-files](http://harveytool.com/resources/simulation-files)

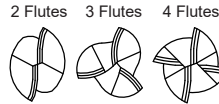
# MINIATURE END MILLS

## Ball – Stub & Standard



Stub Flute & Standard Length

- **Cutter diameter down to .002"**
- Center cutting • Solid carbide
- CNC ground in the USA



BALL

CUTTER DIA.	LOC	SHANK DIA.	OAL	UNCOATED				A1TiN COATED				AMORPHOUS DIAMOND		
				2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
D1 <sup>+0.005"</sup> / <sub>-0.005"</sub>	L2 <sup>+0.10"</sup> / <sub>-0.000"</sub>	D2	L1											
.002	<b>.003</b> (1.5x)	1/8	1-1/2	24502			69.40							
.002	<b>.006</b> (3x)	1/8	1-1/2	74002			69.40							
.003	<b>.004</b> (1.5x)	1/8	1-1/2	24503			61.40							
.003	<b>.009</b> (3x)	1/8	1-1/2	74003			62.00							
.004 (.1 mm)	<b>.006</b> (1.5x)	1/8	1-1/2	24504			55.20							
.004 (.1 mm)	<b>.012</b> (3x)	1/8	1-1/2	74004			55.20							
.005	<b>.007</b> (1.5x)	1/8	1-1/2	24505		24605	49.80	24505-C3		24605-C3	55.00		24605-C4	62.90
.005	<b>.015</b> (3x)	1/8	1-1/2	74005		74305	49.80	74005-C3		74305-C3	55.00	74005-C4	74305-C4	62.90
.006	<b>.009</b> (1.5x)	1/8	1-1/2	24506		24606	51.20			24606-C3	56.40			
.006	<b>.018</b> (3x)	1/8	1-1/2	74006		74306	51.20	74006-C3		74306-C3	56.40			
.007	<b>.010</b> (1.5x)	1/8	1-1/2	24507		24607	51.20			24607-C3	56.40			
.007	<b>.021</b> (3x)	1/8	1-1/2	74007		74307	51.20	74007-C3		74307-C3	56.40			
.008 (.2 mm)	<b>.012</b> (1.5x)	1/8	1-1/2	24508		24608	51.20	24508-C3		24608-C3	56.40			
.008 (.2 mm)	<b>.024</b> (3x)	1/8	1-1/2	74008	835908	74308	51.20	74008-C3	835908-C3	74308-C3	56.40	74008-C4		64.30
.009	<b>.013</b> (1.5x)	1/8	1-1/2	24509		24609	51.20			24609-C3	56.40			
.009	<b>.027</b> (3x)	1/8	1-1/2	74009		74309	51.20			74309-C3	56.40			
.010	<b>.015</b> (1.5x)	1/8	1-1/2	24510	823410	24610	39.90	24510-C3	823410-C3	24610-C3	45.10		24610-C4	53.00
.010	<b>.030</b> (3x)	1/8	1-1/2	74010	835910	74310	39.90	74010-C3	835910-C3	74310-C3	45.10	74010-C4	74310-C4	53.00
.011	<b>.016</b> (1.5x)	1/8	1-1/2	24511		24611	41.50			24611-C3	46.70			
.011	<b>.033</b> (3x)	1/8	1-1/2	74011		74311	41.50			74311-C3	46.70			
.012 (.3 mm)	<b>.018</b> (1.5x)	1/8	1-1/2	24512		24612	41.50	24512-C3		24612-C3	46.70			
.012 (.3 mm)	<b>.036</b> (3x)	1/8	1-1/2	74012	835912	74312	41.50	74012-C3	835912-C3	74312-C3	46.70	74012-C4		54.60
.013	<b>.019</b> (1.5x)	1/8	1-1/2	24513		24613	41.50			24613-C3	46.70			
.013	<b>.039</b> (3x)	1/8	1-1/2	74013		74313	41.50			74313-C3	46.70			
.014	<b>.021</b> (1.5x)	1/8	1-1/2	24514		24614	41.50			24614-C3	46.70			
.014	<b>.042</b> (3x)	1/8	1-1/2	74014		74314	41.50			74314-C3	46.70			
.015 (1/64)	<b>.022</b> (1.5x)	1/8	1-1/2	24515	823415	24615	30.90	24515-C3	823415-C3	24615-C3	36.10	24515-C4	24615-C4	44.00
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	74015	835915	74315	30.90	74015-C3	835915-C3	74315-C3	36.10	74015-C4	74315-C4	44.00
.016 (.4 mm)	<b>.024</b> (1.5x)	1/8	1-1/2	24516		24616	32.40			24616-C3	37.60			
.016 (.4 mm)	<b>.048</b> (3x)	1/8	1-1/2	74016		74316	32.40			74316-C3	37.60			
.017	<b>.026</b> (1.5x)	1/8	1-1/2	24517		24617	32.40			24617-C3	37.60			
.017	<b>.051</b> (3x)	1/8	1-1/2	74017		74317	32.40			74317-C3	37.60			
.018	<b>.027</b> (1.5x)	1/8	1-1/2	24518		24618	32.40			24618-C3	37.60			
.018	<b>.054</b> (3x)	1/8	1-1/2	74018		74318	32.40	74018-C3		74318-C3	37.60			
.019	<b>.029</b> (1.5x)	1/8	1-1/2	24519		24619	32.40			24619-C3	37.60			
.019	<b>.057</b> (3x)	1/8	1-1/2	74019		74319	32.40			74319-C3	37.60	74019-C4		45.50
.020 (.5 mm)	<b>.030</b> (1.5x)	1/8	1-1/2	24520	823420	24620	29.80	24520-C3	823420-C3	24620-C3	35.00	24520-C4	24620-C4	42.90
.020 (.5 mm)	<b>.060</b> (3x)	1/8	1-1/2	74020	835920	74320	29.80	74020-C3	835920-C3	74320-C3	35.00	74020-C4	74320-C4	42.90



continued on next page

# MINIATURE END MILLS

## Ball – Stub & Standard (cont.)

continued from previous page

BALL

CUTTER DIA.	LOC	SHANK DIA.	OAL	UNCOATED				AITIN COATED				AMORPHOUS DIAMOND					
				D <sub>1</sub>	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	4 FL
.021	<b>.031</b> (1.5x)	1/8	1-1/2	24521		24621	31.20				24621-C3	36.40					
.021	<b>.063</b> (3x)	1/8	1-1/2	74021		74321	31.20	74021-C3			74321-C3	36.40					
.022	<b>.033</b> (1.5x)	1/8	1-1/2	24522		24622	31.20				24622-C3	36.40					
.022	<b>.066</b> (3x)	1/8	1-1/2	74022		74322	31.20				74322-C3	36.40					
.023	<b>.035</b> (1.5x)	1/8	1-1/2	24523		24623	31.20				24623-C3	36.40					
.023	<b>.069</b> (3x)	1/8	1-1/2	74023		74323	31.20	74023-C3			74323-C3	36.40					
.024 (.6 mm)	<b>.036</b> (1.5x)	1/8	1-1/2	24524		24624	31.20				24624-C3	36.40					
.024 (.6 mm)	<b>.072</b> (3x)	1/8	1-1/2	74024		74324	31.20				74324-C3	36.40					
.025	<b>.037</b> (1.5x)	1/8	1-1/2	24525	823425	24625	26.90	24525-C3	823425-C3	24625-C3	32.10			24625-C4	40.00		
.025	<b>.075</b> (3x)	1/8	1-1/2	74025	835925	74325	26.90	74025-C3	835925-C3	74325-C3	32.10	74025-C4	74325-C4	40.00			
.026	<b>.039</b> (1.5x)	1/8	1-1/2	24526		24626	28.00				24626-C3	33.20					
.026	<b>.078</b> (3x)	1/8	1-1/2	74026		74326	28.00				74326-C3	33.20					
.027	<b>.041</b> (1.5x)	1/8	1-1/2	24527		24627	28.00				24627-C3	33.20					
.027	<b>.081</b> (3x)	1/8	1-1/2	74027		74327	28.00				74327-C3	33.20					
.028 (.7 mm)	<b>.042</b> (1.5x)	1/8	1-1/2	24528		24628	28.00				24628-C3	33.20					
.028 (.7 mm)	<b>.084</b> (3x)	1/8	1-1/2	74028		74328	28.00				74328-C3	33.20					
.029	<b>.043</b> (1.5x)	1/8	1-1/2	24529		24629	28.00				24629-C3	33.20					
.029	<b>.087</b> (3x)	1/8	1-1/2	74029		74329	28.00				74329-C3	33.20					
.030	<b>.045</b> (1.5x)	1/8	1-1/2	24530	823430	24630	24.50	24530-C3	823430-C3	24630-C3	29.70			24630-C4	37.60		
.030	<b>.090</b> (3x)	1/8	1-1/2	74030	835930	74330	24.50	74030-C3	835930-C3	74330-C3	29.70	74030-C4	74330-C4	37.60			
.031 (1/32)	<b>.025</b> (0.8x)	1/8	1-1/2			<b>758231</b>	24.50				<b>758231-C3</b>	29.70					NEW
.031 (1/32)	<b>.046</b> (1.5x)	1/8	1-1/2	24531	823431	24631	24.50	24531-C3	823431-C3	24631-C3	29.70	24531-C4	24631-C4	37.60			
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	74031	835931	74331	24.50	74031-C3	835931-C3	74331-C3	29.70	74031-C4	74331-C4	37.60			
.032	<b>.048</b> (1.5x)	1/8	1-1/2	24532		24632	25.70				24632-C3	30.90					
.032	<b>.096</b> (3x)	1/8	1-1/2	74032		74332	25.70	74032-C3			74332-C3	30.90					
.033	<b>.049</b> (1.5x)	1/8	1-1/2	24533		24633	25.70				24633-C3	30.90					
.033	<b>.099</b> (3x)	1/8	1-1/2	74033		74333	25.70	74033-C3			74333-C3	30.90					
.034	<b>.051</b> (1.5x)	1/8	1-1/2	24534		24634	25.70				24634-C3	30.90					
.034	<b>.102</b> (3x)	1/8	1-1/2	74034		74334	25.70				74334-C3	30.90					
.035 (.9 mm)	<b>.052</b> (1.5x)	1/8	1-1/2	24535	823435	24635	23.20	24535-C3	823435-C3	24635-C3	28.40			24635-C4	36.30		
.035 (.9 mm)	<b>.105</b> (3x)	1/8	1-1/2	74035	835935	74335	23.20	74035-C3	835935-C3	74335-C3	28.40	74035-C4	74335-C4	36.30			
.036	<b>.054</b> (1.5x)	1/8	1-1/2	24536		24636	24.30				24636-C3	29.50					
.036	<b>.108</b> (3x)	1/8	1-1/2	74036		74336	24.30				74336-C3	29.50					
.037	<b>.055</b> (1.5x)	1/8	1-1/2	24537		24637	24.30				24637-C3	29.50					
.037	<b>.111</b> (3x)	1/8	1-1/2	74037		74337	24.30				74337-C3	29.50					
.038	<b>.057</b> (1.5x)	1/8	1-1/2	24538		24638	24.30				24638-C3	29.50					
.038	<b>.114</b> (3x)	1/8	1-1/2	74038		74338	24.30				74338-C3	29.50					
.039 (1 mm)	<b>.058</b> (1.5x)	1/8	1-1/2	24539	823439	24639	23.80	24539-C3	823439-C3	24639-C3	29.00						
.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2	74039	835939	74339	23.80	74039-C3	835939-C3	74339-C3	29.00	74039-C4	74339-C4	36.90			
.040	<b>.060</b> (1.5x)	1/8	1-1/2	24540	823440	24640	23.20	24540-C3	823440-C3	24640-C3	28.40	24540-C4	24640-C4	36.30			
.040	<b>.120</b> (3x)	1/8	1-1/2	74040	835940	74340	23.20	74040-C3	835940-C3	74340-C3	28.40	74040-C4	74340-C4	36.30			
.041	<b>.123</b> (3x)	1/8	1-1/2	74041		74341	24.30				74341-C3	29.50					
.042	<b>.126</b> (3x)	1/8	1-1/2	74042		74342	24.30				74342-C3	29.50					
.043 (1.1 mm)	<b>.129</b> (3x)	1/8	1-1/2	74043		74343	24.30				74343-C3	29.50					
.044	<b>.132</b> (3x)	1/8	1-1/2	74044		74344	24.30				74344-C3	29.50					
.045	<b>.067</b> (1.5x)	1/8	1-1/2	24545	823445	24645	23.20			823445-C3	24645-C3	28.40			24645-C4	36.30	
.045	<b>.135</b> (3x)	1/8	1-1/2	74045	835945	74345	23.20	74045-C3	835945-C3	74345-C3	28.40	74045-C4	74345-C4	36.30			

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**MINIATURE END MILLS**

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CUTTER DIA.	LOC	SHANK DIA.	OAL	UNCOATED				AITIN COATED				AMORPHOUS DIAMOND		
				2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
.046	<b>.138</b> (3x)	1/8	1-1/2	74046		74346	24.30			74346-C3	29.50			
.047 (3/64)	<b>.070</b> (1.5x)	1/8	1-1/2	24547	823447	24647	23.20	24547-C3	823447-C3	24647-C3	28.40	24547-C4	24647-C4	36.30
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	74047	835947	74347	23.20	74047-C3	835947-C3	74347-C3	28.40	74047-C4	74347-C4	36.30
.048	<b>.144</b> (3x)	1/8	1-1/2	74048		74348	24.30			74348-C3	29.50			
.049	<b>.147</b> (3x)	1/8	1-1/2	74049		74349	24.30			74349-C3	29.50			
.050	<b>.075</b> (1.5x)	1/8	1-1/2	24550	823450	24650	23.20	24550-C3	823450-C3	24650-C3	28.40		24650-C4	36.30
.050	<b>.150</b> (3x)	1/8	1-1/2	74050	835950	74350	23.20	74050-C3	835950-C3	74350-C3	28.40	74050-C4	74350-C4	36.30
.051 (1.3 mm)	<b>.153</b> (3x)	1/8	1-1/2	74051		74351	24.30			74351-C3	29.50			
.052	<b>.156</b> (3x)	1/8	1-1/2	74052		74352	24.30			74352-C3	29.50			
.053	<b>.159</b> (3x)	1/8	1-1/2	74053		74353	24.30			74353-C3	29.50			
.054	<b>.162</b> (3x)	1/8	1-1/2	74054		74354	24.30			74354-C3	29.50			
.055 (1.4 mm)	<b>.082</b> (1.5x)	1/8	1-1/2	24555	823455	24655	23.20	24555-C3	823455-C3	24655-C3	28.40		24655-C4	36.30
.055 (1.4 mm)	<b>.165</b> (3x)	1/8	1-1/2	74055	835955	74355	23.20	74055-C3	835955-C3	74355-C3	28.40	74055-C4	74355-C4	36.30
.056	<b>.168</b> (3x)	1/8	1-1/2	74056		74356	24.30			74356-C3	29.50			
.057	<b>.171</b> (3x)	1/8	1-1/2	74057		74357	24.30			74357-C3	29.50			
.058	<b>.174</b> (3x)	1/8	1-1/2	74058		74358	24.30			74358-C3	29.50			
.059 (1.5 mm)	<b>.089</b> (1.5x)	1/8	1-1/2	24559		24659	24.30			24659-C3	29.50			
.059 (1.5 mm)	<b>.177</b> (3x)	1/8	1-1/2	74059		74359	24.30			74359-C3	29.50			
.060	<b>.090</b> (1.5x)	1/8	1-1/2	24560	823460	24660	23.20	24560-C3	823460-C3	24660-C3	28.40		24660-C4	36.30
.060	<b>.180</b> (3x)	1/8	1-1/2	74060	835960	74360	23.20	74060-C3	835960-C3	74360-C3	28.40	74060-C4	74360-C4	36.30
.061	<b>.183</b> (3x)	1/8	1-1/2			74361	23.20			74361-C3	28.40			
<b>NEW</b> .062 (1/16)	<b>.050</b> (0.8x)	1/8	1-1/2			<b>758262</b>	22.80			<b>758262-C3</b>	28.00			
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	24562	823462	24662	22.80	24562-C3	823462-C3	24662-C3	28.00	24562-C4	24662-C4	35.90
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	74062	835962	74362	22.80	74062-C3	835962-C3	74362-C3	28.00	74062-C4	74362-C4	35.90
.063	<b>.189</b> (3x)	1/8	1-1/2			74363	23.20			74363-C3	28.40			
.064	<b>.192</b> (3x)	1/8	1-1/2			74364	23.20			74364-C3	28.40			
.065	<b>.097</b> (1.5x)	1/8	1-1/2	24565		24665	22.80			24665-C3	28.00			
.065	<b>.195</b> (3x)	1/8	1-1/2	74065		74365	22.80	74065-C3		74365-C3	28.00	74065-C4	74365-C4	35.90
.066	<b>.198</b> (3x)	1/8	1-1/2			74366	23.20			74366-C3	28.40			
.067	<b>.201</b> (3x)	1/8	1-1/2			74367	23.20			74367-C3	28.40			
.068	<b>.204</b> (3x)	1/8	1-1/2			74368	23.20			74368-C3	28.40			
.069	<b>.207</b> (3x)	1/8	1-1/2			74369	23.20			74369-C3	28.40			
.070	<b>.105</b> (1.5x)	1/8	1-1/2	24570	823470	24670	22.80	24570-C3	823470-C3	24670-C3	28.00			
.070	<b>.210</b> (3x)	1/8	1-1/2	74070	835970	74370	22.80	74070-C3	835970-C3	74370-C3	28.00	74070-C4	74370-C4	35.90
<b>NEW</b> .071	<b>.213</b> (3x)	1/8	1-1/2			<b>74371</b>	22.80			<b>74371-C3</b>	28.00			
.075	<b>.112</b> (1.5x)	1/8	1-1/2	24575		24675	22.80			24675-C3	28.00			
.075	<b>.225</b> (3x)	1/8	1-1/2	74075	835975	74375	22.80	74075-C3	835975-C3	74375-C3	28.00	74075-C4		35.90
.078 (5/64)	<b>.117</b> (1.5x)	1/8	1-1/2	24578	823478	24678	22.80	24578-C3	823478-C3	24678-C3	28.00		24678-C4	35.90
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	74078	835978	74378	22.80	74078-C3	835978-C3	74378-C3	28.00	74078-C4	74378-C4	35.90
.080	<b>.120</b> (1.5x)	1/8	1-1/2	24580	823480	24680	22.80		823480-C3	24680-C3	28.00			
.080	<b>.240</b> (3x)	1/8	1-1/2	74080	835980	74380	22.80	74080-C3	835980-C3	74380-C3	28.00	74080-C4	74380-C4	35.90
.085	<b>.127</b> (1.5x)	1/8	1-1/2	24585		24685	22.80			24685-C3	28.00			
.085	<b>.255</b> (3x)	1/8	1-1/2	74085		74385	22.80			74385-C3	28.00			
.090	<b>.135</b> (1.5x)	1/8	1-1/2	24590	823490	24690	22.80		823490-C3	24690-C3	28.00			
.090	<b>.270</b> (3x)	1/8	1-1/2	74090	835990	74390	22.80	74090-C3	835990-C3	74390-C3	28.00	74090-C4	74390-C4	35.90

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BALL

CUTTER DIA.	LOC	SHANK DIA.	OAL	UNCOATED				AITIN COATED				AMORPHOUS DIAMOND					
				D <sub>1</sub>	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	4 FL
.093 (3/32)	<b>.074</b> (0.8x)	1/8	1-1/2					<b>758293</b>	22.80				<b>758293-C3</b>	28.00			
.093 (3/32)	<b>.139</b> (1.5x)	1/8	1-1/2	24593	823493	24693	22.80	24593-C3	823493-C3	24693-C3	28.00	24593-C4	24693-C4	35.90			
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	74093	835993	74393	22.80	74093-C3	835993-C3	74393-C3	28.00	74093-C4	74393-C4	35.90			
.095	<b>.142</b> (1.5x)	1/8	1-1/2	24595		24695	22.80				24695-C3	28.00					
.095	<b>.285</b> (3x)	1/8	1-1/2	74095		74395	22.80				74395-C3	28.00					
.098	<b>.294</b> (3x)	1/8	1-1/2								74398-C3	30.60					
.100	<b>.150</b> (1.5x)	1/8	1-1/2	24599	823500	24699	22.80	<b>24599-C3</b>	823500-C3	24699-C3	28.00						
.100	<b>.300</b> (3x)	1/8	1-1/2	74100	836000	74400	22.80	74100-C3	836000-C3	74400-C3	28.00	74100-C4	74400-C4	35.90			
.103	<b>.309</b> (3x)	1/8	1-1/2								<b>74403-C3</b>	28.00					
.105	<b>.158</b> (1.5x)	1/8	1-1/2	50900		51000	22.80				51000-C3	28.00					
.105	<b>.315</b> (3x)	1/8	1-1/2	74105		74405	22.80				74405-C3	28.00					
.109 (7/64)	<b>.164</b> (1.5x)	1/8	1-1/2	50901	823502	51001	22.80	50901-C3	823502-C3	51001-C3	28.00						
.109 (7/64)	<b>.375</b> (3x)	1/8	1-1/2	74109	836002	74409	22.80	74109-C3	836002-C3	74409-C3	28.00						
.110	<b>.165</b> (1.5x)	1/8	1-1/2	50902		51002	22.80				51002-C3	28.00					
.110	<b>.330</b> (3x)	1/8	1-1/2	74110		74410	22.80				74410-C3	28.00					
.115	<b>.173</b> (1.5x)	1/8	1-1/2	50903		51003	22.80				51003-C3	28.00					
.115	<b>.345</b> (3x)	1/8	1-1/2	74115		74415	22.80				74415-C3	28.00					
.118 (3 mm)	<b>.177</b> (1.5x)	1/8	1-1/2	50904	823505	51004	23.40			823505-C3	51004-C3	28.60					
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	74118	836005	74418	23.40	74118-C3	836005-C3	74418-C3	28.60						
.120	<b>.180</b> (1.5x)	1/8	1-1/2	50905		51005	22.80				51005-C3	28.00					
.120	<b>.360</b> (3x)	1/8	1-1/2	74120		74420	22.80				74420-C3	28.00					

D <sub>1</sub>	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	UNCOATED				AITIN COATED				AMORPHOUS DIAMOND					
				2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE			
.125 (1/8)	<b>.100</b> (0.8x)	1/8	1-1/2					<b>758308</b>	21.40				<b>758308-C3</b>	26.60			
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	50908	823508	51008	21.40	50908-C3	823508-C3	51008-C3	26.60	50908-C4	51008-C4	34.50			
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	74125	836008	74425	21.40	74125-C3	836008-C3	74425-C3	26.60	74125-C4	74425-C4	34.50			
.140 (9/64)	<b>.220</b> (1.5x)	3/16	2	50909		51009	21.90				51009-C3	27.50					
.140 (9/64)	<b>.562</b> (3x)	3/16	2	74140	836009	74440	21.90	74140-C3	836009-C3	74440-C3	27.50						
.156 (5/32)	<b>.281</b> (1.5x)	3/16	2	50910	823510	51010	22.70			823510-C3	51010-C3	28.30			51010-C4	40.80	
.156 (5/32)	<b>.562</b> (3x)	3/16	2	74156	836010	74456	22.70	74156-C3	836010-C3	74456-C3	28.30			74456-C4	40.80		
.172 (11/64)	<b>.312</b> (1.5x)	3/16	2			51011	25.40				51011-C3	31.00					
.172 (11/64)	<b>.625</b> (3x)	3/16	2			74472	25.40				74472-C3	31.00					
.187 (3/16)	<b>.312</b> (1.5x)	3/16	2	50912	823512	51012	22.70	50912-C3	823512-C3	51012-C3	28.30			51012-C4	40.80		
.187 (3/16)	<b>.625</b> (3x)	3/16	2	74187	836012	74487	22.70	74187-C3	836012-C3	74487-C3	28.30	74187-C4	74487-C4	40.80			
.203 (13/64)	<b>.312</b> (1.5x)	1/4	2-1/2			51013	27.90				51013-C3	35.50					
.203 (13/64)	<b>.625</b> (3x)	1/4	2-1/2			74490	27.90				74490-C3	35.50					
.218 (7/32)	<b>.330</b> (1.5x)	1/4	2-1/2	50914	823514	51014	25.10			823514-C3	51014-C3	32.70					
.218 (7/32)	<b>.625</b> (3x)	1/4	2-1/2	74193	836014	74493	25.10	74193-C3	836014-C3	74493-C3	32.70						
.234 (15/64)	<b>.750</b> (3x)	1/4	2-1/2			74495	27.90				74495-C3	35.50					
.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2	50916	823516	51016	25.10	50916-C3	823516-C3	51016-C3	32.70	<b>50916-C4</b>	51016-C4	45.70			
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	74199	836016	74499	25.10	74199-C3	836016-C3	74499-C3	32.70	74199-C4	74499-C4	45.70			
.312 (5/16)	<b>.470</b> (1.5x)	5/16	2-1/2			51020	32.50				51020-C3	41.40					
.312 (5/16)	<b>.812</b> (3x)	5/16	2-1/2			74620	32.50				74620-C3	41.40					
.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2			51024	40.50				51024-C3	50.60					
.375 (3/8)	<b>1.000</b> (3x)	3/8	2-1/2			74624	40.50				74624-C3	50.60			74624-C4	65.30	
.500 (1/2)	<b>1.000</b> (2x)	1/2	3	<b>74132</b>		74632	64.20				74632-C3	79.30			74632-C4	94.10	

**NEW!**

# MINIATURE END MILLS

Ball – Stub & Standard – Metric



- All dimensions and tolerances in metric values
- Cutter diameter down to 0.5mm
- Center cutting
- Solid carbide
- CNC ground in the USA

2 Flutes



4 Flutes



Stub Flute & Standard Length  
3x



BALL

	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			A1TiN COATED		
					2 FL	4 FL	PRICE	2 FL	4 FL	PRICE
	$D_1 \begin{smallmatrix} +.00\text{mm} \\ -.02\text{mm} \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$	$D_2$	$L_1$						
NEW	.500 mm	.75 (1.5x)	3 mm	38 mm	741311	741211	25.40	741311-C3	741211-C3	30.60
NEW	.500 mm	1.50 (3x)	3 mm	38 mm	739611	741011	25.40	739611-C3	741011-C3	30.60
NEW	1.00 mm	1.50 (1.5x)	3 mm	38 mm	741322	741222	21.30	741322-C3	741222-C3	26.50
NEW	1.00 mm	3.00 (3x)	3 mm	38 mm	739622	741022	21.30	739622-C3	741022-C3	26.50
NEW	1.50 mm	2.20 (1.5x)	3 mm	38 mm	741333	741233	21.60	741333-C3	741233-C3	26.80
NEW	1.50 mm	4.50 (3x)	3 mm	38 mm	739633	741033	21.60	739633-C3	741033-C3	26.80
NEW	2.00 mm	3.00 (1.5x)	3 mm	38 mm	741345	741245	21.30	741345-C3	741245-C3	26.50
NEW	2.00 mm	6.00 (3x)	3 mm	38 mm	739645	741045	21.30	739645-C3	741045-C3	26.50
NEW	3.00 mm	4.50 (1.5x)	3 mm	38 mm	741357	741257	20.10	741357-C3	741257-C3	25.30
NEW	3.00 mm	9.00 (3x)	3 mm	38 mm	739657	741057	20.10	739657-C3	741057-C3	25.30

	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			A1TiN COATED		
					2 FL	4 FL	PRICE	2 FL	4 FL	PRICE
	$D_1 \begin{smallmatrix} +.00\text{mm} \\ -.04\text{mm} \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.750\text{mm} \\ -.000\text{mm} \end{smallmatrix}$	$D_2$	$L_1$						
NEW	4.00 mm	6.00 (1.5x)	4 mm	50 mm	741361	741261	23.70	741361-C3	741261-C3	29.30
NEW	4.00 mm	12.00 (3x)	4 mm	50 mm	739661	741061	23.70	739661-C3	741061-C3	29.30
NEW	5.00 mm	7.50 (1.5x)	5 mm	50 mm	741364	741264	29.00	741364-C3	741264-C3	35.30
NEW	5.00 mm	15.00 (3x)	5 mm	50 mm	739664	741064	29.00	739664-C3	741064-C3	35.30
NEW	6.00 mm	9.00 (1.5x)	6 mm	50 mm	741366	741266	34.90	741366-C3	741266-C3	42.50
NEW	6.00 mm	18.00 (3x)	6 mm	50 mm	739666	741066	34.90	739666-C3	741066-C3	42.50
NEW	8.00 mm	12.00 (1.5x)	8 mm	63 mm	741370	741270	42.80	741370-C3	741270-C3	51.70
NEW	8.00 mm	24.00 (3x)	8 mm	63 mm	739670	741070	44.30	739670-C3	741070-C3	53.20
NEW	10.0 mm	15.00 (1.5x)	10 mm	75 mm	741373	741273	72.90	741373-C3	741273-C3	88.00
NEW	10.0 mm	30.00 (3x)	10 mm	75 mm	739673	741073	72.90	739673-C3	741073-C3	88.00
NEW	12.0 mm	18.00 (1.5x)	12 mm	75 mm	741376	741276	89.50	741376-C3	741276-C3	104.60
NEW	12.0 mm	36.00 (3x)	12 mm	75 mm	739676	741076	89.50	739676-C3	741076-C3	104.60

# MINIATURE END MILLS

## Ball – Long Flute



Stocked in 10 Lengths of Cut!

- Long flute and long shank design for deep cavities
- Mills deep pockets • Center cutting • Solid carbide • CNC ground in the USA

BALL

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.005"</sup> / <sub>-.0005"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>		D2	L1						
.005	<b>.025</b> (5x)	3	1/8	2-1/2	32205	50.60				
.008	<b>.040</b> (5x)	3	1/8	2-1/2	32208	49.40				
.010	<b>.050</b> (5x)	3	1/8	2-1/2	12810	46.60	12810-C3	51.80	12810-C4	59.70
.010	<b>.080</b> (8x)	3	1/8	2-1/2	34010	78.40	34010-C3	83.60		
.015 (1/64)	<b>.062</b> (4x)	3	1/8	2-1/2	895715	43.00	895715-C3	48.20		
.015 (1/64)	<b>.078</b> (5x)	3	1/8	2-1/2	32215	43.00	32215-C3	48.20	32215-C4	56.10
.015 (1/64)	<b>.078</b> (5x)	4	1/8	2-1/2	841015	44.90	841015-C3	50.10		
.015 (1/64)	<b>.093</b> (6x)	3	1/8	2-1/2	877115	49.80	877115-C3	55.00		
.015 (1/64)	<b>.109</b> (7x)	3	1/8	2-1/2	861415	57.40	861415-C3	62.60		
.015 (1/64)	<b>.125</b> (8x)	3	1/8	2-1/2	34015	75.10	34015-C3	80.30	34015-C4	88.20
.015 (1/64)	<b>.187</b> (12x)	3	1/8	2-1/2	35115	96.00	35115-C3	101.20		
.020 (.5 mm)	<b>.080</b> (4x)	3	1/8	2-1/2	895720	37.10	895720-C3	42.30		
.020 (.5 mm)	<b>.100</b> (5x)	3	1/8	2-1/2	12820	37.10	12820-C3	42.30	12820-C4	50.20
.020 (.5 mm)	<b>.100</b> (5x)	4	1/8	2-1/2	841020	41.10	841020-C3	46.30		
.020 (.5 mm)	<b>.120</b> (6x)	3	1/8	2-1/2	877120	43.10	877120-C3	48.30		
.020 (.5 mm)	<b>.160</b> (8x)	3	1/8	2-1/2	34020	69.80	34020-C3	75.00	34020-C4	82.90
.020 (.5 mm)	<b>.200</b> (10x)	3	1/8	2-1/2	957220	83.80	957220-C3	89.00		
.020 (.5 mm)	<b>.250</b> (12x)	3	1/8	2-1/2	35120	90.50	35120-C3	95.70		
.025	<b>.125</b> (5x)	3	1/8	2-1/2	12825	35.00	12825-C3	40.20	12825-C4	48.10
.025	<b>.203</b> (8x)	3	1/8	2-1/2	34025	68.30	34025-C3	73.50		
.030	<b>.125</b> (4x)	3	1/8	2-1/2	895730	34.10	895730-C3	39.30		
.030	<b>.150</b> (5x)	3	1/8	2-1/2	12830	34.10	12830-C3	39.30	12830-C4	47.20
.030	<b>.156</b> (5x)	4	1/8	2-1/2	841030	37.70	841030-C3	42.90		
.030	<b>.250</b> (8x)	3	1/8	2-1/2	34030	66.30	34030-C3	71.50		
.031 (1/32)	<b>.125</b> (4x)	3	1/8	2-1/2	895731	34.10	895731-C3	39.30	895731-C4	47.20
.031 (1/32)	<b>.125</b> (4x)	4	1/8	2-1/2	801531	37.70	801531-C3	42.90		
.031 (1/32)	<b>.156</b> (5x)	3	1/8	2-1/2	32231	34.10	32231-C3	39.30	32231-C4	47.20
.031 (1/32)	<b>.156</b> (5x)	4	1/8	2-1/2	841031	37.50	841031-C3	42.70		
.031 (1/32)	<b>.187</b> (6x)	3	1/8	2-1/2	877131	38.30	877131-C3	43.50	877131-C4	51.40
.031 (1/32)	<b>.218</b> (7x)	3	1/8	2-1/2	861431	43.00	861431-C3	48.20		
.031 (1/32)	<b>.250</b> (8x)	3	1/8	2-1/2	34031	66.30	34031-C3	71.50	34031-C4	79.40
.031 (1/32)	<b>.250</b> (8x)	4	1/8	2-1/2	845531	68.10	845531-C3	73.30		
.031 (1/32)	<b>.312</b> (10x)	3	1/8	2-1/2	957231	70.90	957231-C3	76.10		
.031 (1/32)	<b>.375</b> (12x)	3	1/8	2-1/2	35131	77.10	35131-C3	82.30	35131-C4	90.20
.031 (1/32)	<b>.470</b> (15x)	3	1/8	2-1/2	36031	96.30	36031-C3	101.50		
.035 (.9 mm)	<b>.175</b> (5x)	3	1/8	2-1/2	12835	34.10	12835-C3	39.30	12835-C4	47.20
.035 (.9 mm)	<b>.281</b> (8x)	3	1/8	2-1/2	34035	66.30	34035-C3	71.50		

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# MINIATURE END MILLS

Ball – Long Flute (cont.)

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	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$						
<b>NEW</b>	.039 (1 mm)	<b>.156</b> (4x)	3	1/8	2-1/2	<b>895739</b>	34.10	<b>895739-C3</b>	39.30		
	.039 (1 mm)	<b>.203</b> (5x)	3	1/8	2-1/2	32239	34.10	32239-C3	39.30		
	.039 (1 mm)	<b>.325</b> (8x)	3	1/8	2-1/2	34039	66.30	34039-C3	71.50		
	.039 (1 mm)	<b>.480</b> (12x)	3	1/8	2-1/2	35139	77.90	35139-C3	83.10		
	.040	<b>.160</b> (4x)	3	1/8	2-1/2	895740	34.10	895740-C3	39.30		
	.040	<b>.200</b> (5x)	3	1/8	2-1/2	12840	34.10	12840-C3	39.30	12840-C4	47.20
	.040	<b>.200</b> (5x)	4	1/8	2-1/2	841040	37.70	841040-C3	42.90		
	.040	<b>.240</b> (6x)	3	1/8	2-1/2	877140	38.30	877140-C3	43.50		
	.040	<b>.281</b> (7x)	3	1/8	2-1/2	861440	43.00	861440-C3	48.20		
	.040	<b>.325</b> (8x)	3	1/8	2-1/2	34040	66.30	34040-C3	71.50	34040-C4	79.40
	.040	<b>.480</b> (12x)	3	1/8	2-1/2	35140	77.10	35140-C3	82.30		
	.045	<b>.225</b> (5x)	3	1/8	2-1/2	12845	34.10	12845-C3	39.30	12845-C4	47.20
	.047 (3/64)	<b>.187</b> (4x)	3	1/8	2-1/2	895747	34.10	895747-C3	39.30		
	.047 (3/64)	<b>.250</b> (5x)	3	1/8	2-1/2	32247	34.10	32247-C3	39.30	32247-C4	47.20
	.047 (3/64)	<b>.250</b> (5x)	4	1/8	2-1/2	841047	37.50	841047-C3	42.70		
	.047 (3/64)	<b>.375</b> (8x)	3	1/8	2-1/2	34047	62.60	34047-C3	67.80	34047-C4	75.70
	.047 (3/64)	<b>.375</b> (8x)	4	1/8	2-1/2	845547	65.70	845547-C3	70.90		
	.047 (3/64)	<b>.570</b> (12x)	3	1/8	2-1/2	35147	77.10	35147-C3	82.30	35147-C4	90.20
	.050	<b>.203</b> (4x)	3	1/8	2-1/2	895750	34.10	895750-C3	39.30		
	.050	<b>.300</b> (6x)	3	1/8	2-1/2	12850	34.10	12850-C3	39.30	12850-C4	47.20
	.050	<b>.400</b> (8x)	3	1/8	2-1/2	34050	66.30	34050-C3	71.50		
	.055 (1.4 mm)	<b>.275</b> (5x)	3	1/8	2-1/2	32255	30.20	32255-C3	35.40		
	.055 (1.4 mm)	<b>.385</b> (7x)	3	1/8	2-1/2	12855	34.10	12855-C3	39.30	12855-C4	47.20
	.060	<b>.250</b> (4x)	3	1/8	2-1/2	895760	30.20	895760-C3	35.40		
	.060	<b>.312</b> (5x)	3	1/8	2-1/2	32260	30.20	32260-C3	35.40	32260-C4	43.30
<b>NEW</b>	.060	<b>.312</b> (5x)	4	1/8	2-1/2	<b>841060</b>	33.30	<b>841060-C3</b>	38.50		
<b>NEW</b>	.060	<b>.375</b> (6x)	3	1/8	2-1/2	<b>877160</b>	31.50	<b>877160-C3</b>	36.70		
	.060	<b>.500</b> (8x)	3	1/8	2-1/2	12860	34.60	12860-C3	39.80	12860-C4	47.70
	.060	<b>.720</b> (12x)	3	1/8	2-1/2	35160	60.00	35160-C3	65.20		
	.062 (1/16)	<b>.250</b> (4x)	3	1/8	2-1/2	895762	30.20	895762-C3	35.40	895762-C4	43.30
	.062 (1/16)	<b>.250</b> (4x)	4	1/8	2-1/2	801562	32.30	801562-C3	37.50		
	.062 (1/16)	<b>.312</b> (5x)	3	1/8	2-1/2	32262	30.20	32262-C3	35.40	32262-C4	43.30
	.062 (1/16)	<b>.312</b> (5x)	4	1/8	2-1/2	841062	33.30	841062-C3	38.50	841062-C4	46.40
	.062 (1/16)	<b>.375</b> (6x)	3	1/8	2-1/2	877162	31.50	877162-C3	36.70	877162-C4	44.60
	.062 (1/16)	<b>.375</b> (6x)	4	1/8	2-1/2	754162	34.60	754162-C3	39.80		
	.062 (1/16)	<b>.437</b> (7x)	3	1/8	2-1/2	861462	32.80	861462-C3	38.00		
	.062 (1/16)	<b>.500</b> (8x)	3	1/8	2-1/2	34062	34.10	34062-C3	39.30	34062-C4	47.20
	.062 (1/16)	<b>.500</b> (8x)	4	1/8	2-1/2	845562	37.10	845562-C3	42.30	845562-C4	50.20
<b>NEW</b>	.062 (1/16)	<b>.558</b> (9x)	3	1/8	2-1/2	<b>757662</b>	41.80	<b>757662-C3</b>	47.00		
	.062 (1/16)	<b>.625</b> (10x)	3	1/8	2-1/2	957262	46.50	957262-C3	51.70	957262-C4	59.60
	.062 (1/16)	<b>.625</b> (10x)	4	1/8	2-1/2	751262	50.60	751262-C3	55.80		
	.062 (1/16)	<b>.750</b> (12x)	3	1/8	2-1/2	35162	60.50	35162-C3	65.70	35162-C4	73.60
	.062 (1/16)	<b>.950</b> (15x)	3	1/8	2-1/2	36062	82.50	36062-C3	87.70	36062-C4	95.60

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BALL

# MINIATURE END MILLS

## Ball – Long Flute (cont.)

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BALL

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.065	<b>.500</b> (8x)	3	1/8	2-1/2	12865	34.00	12865-C3	39.20	12865-C4	47.10
.070	<b>.500</b> (7x)	3	1/8	2-1/2	12870	34.00	12870-C3	39.20	12870-C4	47.10
.075	<b>.500</b> (7x)	3	1/8	2-1/2	12875	34.00	12875-C3	39.20	12875-C4	47.10
.078 (5/64)	<b>.312</b> (4x)	3	1/8	2-1/2	895778	30.20	895778-C3	35.40		
.078 (5/64)	<b>.406</b> (5x)	3	1/8	2-1/2	32278	30.20	32278-C3	35.40	32278-C4	43.30
.078 (5/64)	<b>.406</b> (5x)	4	1/8	2-1/2	841078	33.30	841078-C3	38.50		
.078 (5/64)	<b>.475</b> (6x)	3	1/8	2-1/2	877178	31.50	877178-C3	36.70		
.078 (5/64)	<b>.550</b> (7x)	3	1/8	2-1/2	861478	32.80	861478-C3	38.00		
.078 (5/64)	<b>.625</b> (8x)	3	1/8	2-1/2	34078	34.10	34078-C3	39.30	34078-C4	47.20
.078 (5/64)	<b>.625</b> (8x)	4	1/8	2-1/2	845578	37.10	845578-C3	42.30		
.078 (5/64)	<b>.940</b> (12x)	3	1/8	2-1/2	35178	60.50	35178-C3	65.70	35178-C4	73.60
.078 (5/64)	<b>1.187</b> (15x)	3	1/8	2-1/2	36078	82.50	36078-C3	87.70	36078-C4	95.60
.080	<b>.750</b> (9x)	3	1/8	2-1/2	12880	34.30	12880-C3	39.50	12880-C4	47.40
.085	<b>.750</b> (9x)	3	1/8	2-1/2	12885	34.30	12885-C3	39.50	12885-C4	47.40
.090	<b>.750</b> (8x)	3	1/8	2-1/2	12890	34.30	12890-C3	39.50	12890-C4	47.40
.093 (3/32)	<b>.375</b> (4x)	3	1/8	2-1/2	895793	30.20	895793-C3	35.40	895793-C4	43.30
.093 (3/32)	<b>.375</b> (4x)	4	1/8	2-1/2	801593	30.20	801593-C3	35.40		
.093 (3/32)	<b>.500</b> (5x)	3	1/8	2-1/2	32293	30.20	32293-C3	35.40	32293-C4	43.30
.093 (3/32)	<b>.500</b> (5x)	4	1/8	2-1/2	841093	33.30	841093-C3	38.50		
.093 (3/32)	<b>.585</b> (6x)	3	1/8	2-1/2	877193	31.50	877193-C3	36.70		
.093 (3/32)	<b>.670</b> (7x)	3	1/8	2-1/2	861493	32.80	861493-C3	38.00		
.093 (3/32)	<b>.750</b> (8x)	3	1/8	2-1/2	34093	34.10	34093-C3	39.30	34093-C4	47.20
.093 (3/32)	<b>.750</b> (8x)	4	1/8	2-1/2	845593	37.10	845593-C3	42.30		
.093 (3/32)	<b>.950</b> (10x)	3	1/8	2-1/2	957293	46.50	957293-C3	51.70		
.093 (3/32)	<b>1.125</b> (12x)	3	1/8	2-1/2	35193	60.50	35193-C3	65.70	35193-C4	73.60
.093 (3/32)	<b>1.400</b> (15x)	3	1/8	3	36093	84.60	36093-C3	89.80	36093-C4	97.70
.095	<b>.750</b> (8x)	3	1/8	2-1/2	12895	34.60	12895-C3	39.80	12895-C4	47.70
.100	<b>.500</b> (5x)	3	1/8	2-1/2	32299	30.30	32299-C3	35.50		
.100	<b>.750</b> (7.5x)	3	1/8	2-1/2	12899	34.30	12899-C3	39.50	12899-C4	47.40
.109 (7/64)	<b>.570</b> (5x)	3	1/8	2-1/2	32302	30.20	32302-C3	35.40		
.109 (7/64)	<b>.900</b> (8x)	3	1/8	2-1/2	34102	34.10	34102-C3	39.30		
.118 (3 mm)	<b>.625</b> (5x)	3	1/8	2-1/2	32305	30.20	32305-C3	35.40	32305-C4	43.30
.118 (3 mm)	<b>.950</b> (8x)	3	1/8	2-1/2	34105	34.10	34105-C3	39.30	34105-C4	47.20
.118 (3 mm)	<b>.950</b> (8x)	4	1/8	2-1/2	845605	37.90	845605-C3	43.10		
.118 (3 mm)	<b>1.420</b> (12x)	3	1/8	3	35205	84.60	35205-C3	89.80		

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# MINIATURE END MILLS

Ball – Long Flute (cont.)

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NEW	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED		AMORPHOUS DIAMOND	
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	.125 (1/8)	<b>.500</b> (4x)	3	1/8	2-1/2	895808	27.90	895808-C3	33.10	895808-C4	41.00
	.125 (1/8)	<b>.500</b> (4x)	4	1/8	2-1/2	<b>801608</b>	30.80	<b>801608-C3</b>	36.00		
	.125 (1/8)	<b>.625</b> (5x)	3	1/8	2-1/2	32308	27.90	32308-C3	33.10	32308-C4	41.00
	.125 (1/8)	<b>.625</b> (5x)	4	1/8	2-1/2	12608	30.80	12608-C3	36.00		
	.125 (1/8)	<b>.750</b> (6x)	3	1/8	2-1/2	877208	29.60	877208-C3	34.80	877208-C4	42.70
	.125 (1/8)	<b>.750</b> (6x)	4	1/8	2-1/2	750308	33.30	750308-C3	38.50		
	.125 (1/8)	<b>.875</b> (7x)	3	1/8	2-1/2	861508	30.90	861508-C3	36.10		
	.125 (1/8)	<b>1.000</b> (8x)	3	1/8	2-1/2	34108	30.90	34108-C3	36.10	34108-C4	44.00
	.125 (1/8)	<b>1.000</b> (8x)	4	1/8	2-1/2	845608	34.10	845608-C3	39.30		
	.125 (1/8)	<b>1.250</b> (10x)	3	1/8	2-1/2	957308	46.00	957308-C3	51.20		
	.125 (1/8)	<b>1.500</b> (12x)	3	1/8	3	35208	63.60	35208-C3	68.80	35208-C4	76.70
	.125 (1/8)	<b>1.875</b> (15x)	3	1/8	3	36108	84.60	36108-C3	89.80	36108-C4	97.70
	.140 (9/64)	<b>.750</b> (5x)	4	3/16	3	12609	33.00	12609-C3	38.60		
	.140 (9/64)	<b>1.125</b> (8x)	4	3/16	3	34109	36.80	34109-C3	42.40		
	.156 (5/32)	<b>.750</b> (5x)	4	3/16	3	841110	30.10	841110-C3	35.70		
	.156 (5/32)	<b>1.000</b> (6x)	4	3/16	3	12610	33.00	12610-C3	38.60	12610-C4	51.10
	.156 (5/32)	<b>1.093</b> (7x)	4	3/16	3	856310	39.00	856310-C3	44.60		
	.156 (5/32)	<b>1.250</b> (8x)	4	3/16	3	34110	36.80	34110-C3	42.40		
	.187 (3/16)	<b>.750</b> (4x)	4	3/16	3	837012	30.10	837012-C3	35.70		
	.187 (3/16)	<b>1.000</b> (5x)	4	3/16	3	841112	30.10	841112-C3	35.70		
	.187 (3/16)	<b>1.125</b> (6x)	4	3/16	3	12612	33.00	12612-C3	38.60	77112	51.10
	.187 (3/16)	<b>1.312</b> (7x)	4	3/16	3	856312	34.90	856312-C3	40.50		
	.187 (3/16)	<b>1.500</b> (8x)	4	3/16	3	34112	36.80	34112-C3	42.40		
	.187 (3/16)	<b>1.875</b> (10x)	4	3/16	3	957312	51.70	957312-C3	57.30		
	.250 (1/4)	<b>1.000</b> (4x)	4	1/4	4	837016	35.10	837016-C3	44.00		
	.250 (1/4)	<b>1.250</b> (5x)	4	1/4	4	841116	35.10	841116-C3	44.00		
	.250 (1/4)	<b>1.500</b> (6x)	4	1/4	4	12616	37.10	12616-C3	46.00	77116	57.70
	.250 (1/4)	<b>1.750</b> (7x)	4	1/4	4	856316	39.00	856316-C3	47.90		
	.250 (1/4)	<b>2.000</b> (8x)	4	1/4	4	34116	41.00	34116-C3	49.90	34116-C4	61.60
	.250 (1/4)	<b>2.500</b> (10x)	4	1/4	4	957316	54.50	957316-C3	63.40		
	.312 (5/16)	<b>1.625</b> (5x)	4	5/16	4	12620	50.70	12620-C3	61.40		
	.375 (3/8)	<b>1.750</b> (5x)	4	3/8	4	12624	63.70	12624-C3	77.50		
	.375 (3/8)	<b>3.000</b> (8x)	4	3/8	6	845624	71.50	845624-C3	87.10		
	.500 (1/2)	<b>2.000</b> (4x)	4	1/2	4	12632	77.50	12632-C3	92.60		

BALL

## Check Out Our New CNC Show!

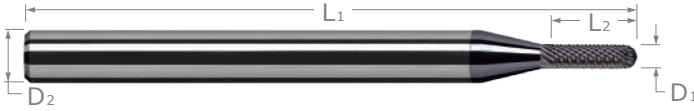


Join Harvey Performance Company National Applications Engineer Don Grandt as he dives into specific cutting tool topics, answering the questions machinists ask most, to help you accomplish more at the spindle.

[YOUTUBE.COM/INTHELOUPE TV](https://www.youtube.com/intheloupetv)

# MINIATURE END MILLS

## Ball – Deburring End Mill



End Mill Tolerances with Bur-Style Geometry!

BALL

- Deburr in your CNC machine with these high-precision burs held to end mill tolerances
- Stop scrapping expensive parts due to handheld operator errors
- High flute count allows for increased feeds which reduces cycle times
- Achieve better finish than with milling type cutters
- Bur geometry is optimized for removing burrs and/or adding a small controlled edge break with superior finish
- Double cut style flute pattern • Center cutting (2 flutes to center)
- Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
						TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.015 (1/64)	<b>.045</b> (3x)	12	10	1/8	2-1/2	892115	31.10	892115-C3	36.30
.020	<b>.060</b> (3x)	12	10	1/8	2-1/2	892120	31.10	892120-C3	36.30
.031 (1/32)	<b>.093</b> (3x)	12	10	1/8	2-1/2	892131	30.80	892131-C3	36.00
.047 (3/64)	<b>.141</b> (3x)	12	10	1/8	2-1/2	892147	31.10	892147-C3	36.30
.062 (1/16)	<b>.186</b> (3x)	14	12	1/8	2-1/2	892162	29.70	892162-C3	34.90
.078 (5/64)	<b>.234</b> (3x)	14	12	1/8	2-1/2	892178	31.10	892178-C3	36.30
.093 (3/32)	<b>.279</b> (3x)	14	12	1/8	2-1/2	892193	29.70	892193-C3	34.90
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.125 (1/8)	<b>.375</b> (3x)	16	13	1/8	2-1/2	892208	28.40	892208-C3	33.60
.187 (3/16)	<b>.561</b> (3x)	16	13	3/16	2-1/2	892212	39.50	892212-C3	45.10
.250 (1/4)	<b>.750</b> (3x)	16	13	1/4	2-1/2	892216	50.10	892216-C3	57.70



Download Speeds & Feeds Charts For Every Harvey Tool End Mill

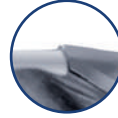
[harveytool.com/resources/speeds-feeds](http://harveytool.com/resources/speeds-feeds)

# MINIATURE END MILLS

## Ball – Long Reach, Standard Flute



- Length of cut = 3x diameter
- Center cutting
- Solid carbide
- CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIA.	OAL	UNCOATED			AITIN COATED		AMORPHOUS DIAMOND	
					2 FL	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
D1 $\pm .0005"$ $-.0005"$	L2 $\pm .010"$ $-.000"$	L3 $\pm .010"$ $-.000"$	D2	L1							
.010	.030	<b>.050</b> (5x)	1/8	1-1/2	948610	982810	68.00	982810-C3	73.20		
.010	.030	<b>.080</b> (8x)	1/8	1-1/2	76610	76810	68.30	76810-C3	73.50		
.010	.030	<b>.125</b> (12x)	1/8	1-1/2	950210	991110	69.30	991110-C3	74.50		
.015 (1/64)	.045	<b>.078</b> (5x)	1/8	1-1/2	948615	982815	52.80	982815-C3	58.00		
.015 (1/64)	.045	<b>.128</b> (8x)	1/8	1-1/2	76615	76815	53.90	76815-C3	59.10		
.015 (1/64)	.045	<b>.156</b> (10x)	1/8	1-1/2		851015	55.80	851015-C3	61.00		
.015 (1/64)	.045	<b>.187</b> (12x)	1/8	1-1/2	950215	991115	56.90	991115-C3	62.10		
.015 (1/64)	.045	<b>.225</b> (15x)	1/8	1-1/2		861215	59.30	861215-C3	64.50		
.020 (.5 mm)	.060	<b>.100</b> (5x)	1/8	1-1/2	948620	982820	51.60	982820-C3	56.80	982820-C4	64.70
.020 (.5 mm)	.060	<b>.120</b> (6x)	1/8	1-1/2		805720	52.80	805720-C3	58.00		
.020 (.5 mm)	.060	<b>.140</b> (7x)	1/8	1-1/2		805520	52.80	805520-C3	58.00		
.020 (.5 mm)	.060	<b>.170</b> (8x)	1/8	1-1/2	76620	76820	51.80	76820-C3	57.00	76820-C4	64.90
.020 (.5 mm)	.060	<b>.200</b> (10x)	1/8	1-1/2		851020	53.50	851020-C3	58.70		
.020 (.5 mm)	.060	<b>.250</b> (12x)	1/8	1-1/2	950220	991120	53.50	991120-C3	58.70		
.020 (.5 mm)	.060	<b>.300</b> (15x)	1/8	1-1/2		861220	57.00	861220-C3	62.20		
.025	.075	<b>.125</b> (5x)	1/8	1-1/2	948625	982825	47.20	982825-C3	52.40		
.025	.075	<b>.213</b> (8x)	1/8	1-1/2	76625	76825	47.40	76825-C3	52.60		
.025	.075	<b>.312</b> (12x)	1/8	1-1/2	950225	991125	49.10	991125-C3	54.30		
.030	.090	<b>.156</b> (5x)	1/8	1-1/2	948630	982830	47.20	982830-C3	52.40		
.030	.090	<b>.270</b> (9x)	1/8	1-1/2	76630	76830	47.40	76830-C3	52.60		
.030	.090	<b>.375</b> (12x)	1/8	1-1/2	950230	991130	49.10	991130-C3	54.30		
.031 (1/32)	.093	<b>.156</b> (5x)	1/8	1-1/2	948631	982831	46.30	982831-C3	51.50	982831-C4	59.40
.031 (1/32)	.093	<b>.187</b> (6x)	1/8	1-1/2		805731	48.30	805731-C3	53.50		
.031 (1/32)	.093	<b>.218</b> (7x)	1/8	1-1/2		805531	48.30	805531-C3	53.50		
.031 (1/32)	.093	<b>.250</b> (8x)	1/8	1-1/2	903831	904431	47.40	904431-C3	52.60		
.031 (1/32)	.093	<b>.279</b> (9x)	1/8	1-1/2	76631	76831	47.40	76831-C3	52.60	76831-C4	60.50
.031 (1/32)	.093	<b>.312</b> (10x)	1/8	1-1/2	811031	851031	49.10	851031-C3	54.30		
.031 (1/32)	.093	<b>.375</b> (12x)	1/8	1-1/2	950231	991131	49.10	991131-C3	54.30		
.031 (1/32)	.093	<b>.470</b> (15x)	1/8	1-1/2		861231	52.50	861231-C3	57.70		
.035 (.9 mm)	.105	<b>.187</b> (5x)	1/8	1-1/2	948635	982835	46.30	982835-C3	51.50		
.035 (.9 mm)	.105	<b>.315</b> (9x)	1/8	1-1/2	76635	76835	47.40	76835-C3	52.60		
.039 (1 mm)	.117	<b>.203</b> (5x)	1/8	1-1/2	948639	982839	46.30	982839-C3	51.50		
.039 (1 mm)	.117	<b>.325</b> (8x)	1/8	1-1/2	903839	904439	47.40	904439-C3	52.60		
.040	.120	<b>.203</b> (5x)	1/8	1-1/2	948640	982840	46.30	982840-C3	51.50		
.040	.120	<b>.325</b> (8x)	1/8	1-1/2		904440	47.40	904440-C3	52.60		
.040	.120	<b>.360</b> (9x)	1/8	1-1/2	76640	76840	47.40	76840-C3	52.60		
.040	.120	<b>.480</b> (12x)	1/8	1-1/2	950240	991140	49.10	991140-C3	54.30		
.045	.135	<b>.405</b> (9x)	1/8	1-1/2	76645	76845	46.00	76845-C3	51.20		

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# MINIATURE END MILLS

## Ball – Long Reach, Standard Flute (cont.)

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BALL

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIA.	OAL	UNCOATED			AITIN COATED		AMORPHOUS DIAMOND	
					2 FL	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
.047 (3/64)	.141	<b>.250</b> (5x)	1/8	1-1/2	948647	982847	44.90	982847-C3	50.10		
.047 (3/64)	.141	<b>.375</b> (8x)	1/8	1-1/2		904447	46.00	904447-C3	51.20		
.047 (3/64)	.141	<b>.423</b> (9x)	1/8	1-1/2	76647	76847	46.00	76847-C3	51.20		
.047 (3/64)	.141	<b>.480</b> (10x)	1/8	1-1/2		851047	47.40	851047-C3	52.60		
.047 (3/64)	.141	<b>.570</b> (12x)	1/8	1-1/2	950247	991147	47.40	991147-C3	52.60		
.047 (3/64)	.141	<b>.710</b> (15x)	1/8	2		861247	50.90	861247-C3	56.10		
.050	.150	<b>.250</b> (5x)	1/8	1-1/2	948650	982850	44.90	982850-C3	50.10		
.050	.150	<b>.500</b> (10x)	1/8	1-1/2	76650	76850	46.00	76850-C3	51.20		
.055 (1.4 mm)	.165	<b>.500</b> (9x)	1/8	1-1/2	76655	76855	46.00	76855-C3	51.20		
.060	.180	<b>.312</b> (5x)	1/8	1-1/2		982860	44.90	982860-C3	50.10		
.060	.180	<b>.500</b> (8x)	1/8	1-1/2	76660	76860	46.00	76860-C3	51.20		
.060	.180	<b>.720</b> (12x)	1/8	2	950260	991160	47.40	991160-C3	52.60		
.062 (1/16)	.186	<b>.312</b> (5x)	1/8	1-1/2	948662	982862	44.90	982862-C3	50.10	982862-C4	58.00
.062 (1/16)	.186	<b>.375</b> (6x)	1/8	1-1/2	755062	805762	46.00	805762-C3	51.20		
.062 (1/16)	.186	<b>.437</b> (7x)	1/8	1-1/2	753862	805562	46.00	805562-C3	51.20		
.062 (1/16)	.186	<b>.500</b> (8x)	1/8	1-1/2	76662	76862	46.00	76862-C3	51.20	76862-C4	59.10
.062 (1/16)	.186	<b>.625</b> (10x)	1/8	2	811062	851062	47.40	851062-C3	52.60		
.062 (1/16)	.186	<b>.750</b> (12x)	1/8	2	950262	991162	47.40	991162-C3	52.60		
.062 (1/16)	.186	<b>.950</b> (15x)	1/8	2	753462	861262	50.90	861262-C3	56.10		
.065	.195	<b>.500</b> (8x)	1/8	1-1/2	76665	76865	46.00	76865-C3	51.20		
.070	.210	<b>.500</b> (7x)	1/8	1-1/2	76670	76870	46.00	76870-C3	51.20		
.075	.225	<b>.500</b> (7x)	1/8	1-1/2	76675	76875	46.00	76875-C3	51.20		
.078 (5/64)	.234	<b>.406</b> (5x)	1/8	1-1/2		982878	45.70	982878-C3	50.90		
.078 (5/64)	.234	<b>.500</b> (6x)	1/8	1-1/2	76678	76878	46.00	76878-C3	51.20		
.078 (5/64)	.234	<b>.625</b> (8x)	1/8	2		904478	46.00	904478-C3	51.20		
.078 (5/64)	.234	<b>.800</b> (10x)	1/8	2		851078	47.40	851078-C3	52.60		
.078 (5/64)	.234	<b>.940</b> (12x)	1/8	2	950278	991178	47.40	991178-C3	52.60		
.078 (5/64)	.234	<b>1.187</b> (15x)	1/8	2-1/2		861278	50.90	861278-C3	56.10		
.080	.240	<b>.500</b> (6x)	1/8	1-1/2	76680	76880	46.00	76880-C3	51.20		
.085	.255	<b>.500</b> (6x)	1/8	1-1/2	76685	76885	45.10	76885-C3	50.30		
.090	.270	<b>.625</b> (7x)	1/8	1-1/2	76690	76890	46.00	76890-C3	51.20		
.093 (3/32)	.279	<b>.500</b> (5x)	1/8	1-1/2	948693	982893	45.80	982893-C3	51.00	982893-C4	58.90
.093 (3/32)	.279	<b>.585</b> (6x)	1/8	1-1/2		805793	46.90	805793-C3	52.10		
.093 (3/32)	.279	<b>.625</b> (7x)	1/8	1-1/2	76693	76893	46.00	76893-C3	51.20	76893-C4	59.10
.093 (3/32)	.279	<b>.750</b> (8x)	1/8	2		904493	46.90	904493-C3	52.10		
.093 (3/32)	.279	<b>.950</b> (10x)	1/8	2		851093	47.40	851093-C3	52.60		
.093 (3/32)	.279	<b>1.125</b> (12x)	1/8	2	950293	991193	47.40	991193-C3	52.60		
.093 (3/32)	.279	<b>1.400</b> (15x)	1/8	2-1/2		861293	50.90	861293-C3	56.10		
.095	.285	<b>.625</b> (6x)	1/8	1-1/2	76695	76895	46.90	76895-C3	52.10		
.100	.300	<b>.625</b> (6x)	1/8	1-1/2	76700	76900	46.00	76900-C3	51.20		
.109 (7/64)	.327	<b>.570</b> (5x)	1/8	1-1/2	948602	982902	45.80	982902-C3	51.00		
.109 (7/64)	.327	<b>.900</b> (8x)	1/8	2	903802	904402	47.40	904402-C3	52.60		
.118 (3 mm)	.354	<b>.625</b> (5x)	1/8	1-1/2	948705	982905	45.80	982905-C3	51.00		
.118 (3 mm)	.354	<b>.950</b> (8x)	1/8	2	903805	904405	47.40	904405-C3	52.60		
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	4 FL	PRICE	4 FL	PRICE	4FL	PRICE
.125 (1/8)	.375	<b>.625</b> (5x)	1/8	1-1/2	948708	982908	45.80	982908-C3	51.00	982908-C4	58.90
.125 (1/8)	.375	<b>.750</b> (6x)	1/8	2		805808	46.00	805808-C3	51.20		
.125 (1/8)	.375	<b>.875</b> (7x)	1/8	2		805608	46.00	805608-C3	51.20		

continued on next page

## MINIATURE END MILLS

Ball – Long Reach, Standard Flute (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIA.	OAL	UNCOATED			AITIN COATED		AMORPHOUS DIAMOND	
					2 FL	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	76708	76908	46.00	76908-C3	51.20	76908-C4	65.30
.125 (1/8)	.375	<b>1.000</b> (8x)	1/8	2							
.125 (1/8)	.375	<b>1.250</b> (10x)	1/8	2-1/2		851108	48.90	851108-C3	54.10		
.125 (1/8)	.375	<b>1.500</b> (12x)	1/8	2-1/2	950308	991208	48.90	991208-C3	54.10		
.125 (1/8)	.375	<b>1.875</b> (15x)	1/8	3		861308	53.60	861308-C3	58.80		
.140 (9/64)	.425	<b>.750</b> (5x)	3/16	2		982909	54.90	982909-C3	60.50		
.140 (9/64)	.425	<b>1.125</b> (8x)	3/16	2-1/2		76909	55.40	76909-C3	61.00		
.156 (5/32)	.470	<b>.750</b> (5x)	3/16	2		982910	52.80	982910-C3	58.40		
.156 (5/32)	.470	<b>1.250</b> (8x)	3/16	2-1/2		76910	53.00	76910-C3	58.60		
.187 (3/16)	.570	<b>1.000</b> (5x)	3/16	2	948712	982912	52.80	982912-C3	58.40		
.187 (3/16)	.570	<b>1.500</b> (8x)	3/16	2-1/2	76712	76912	53.00	76912-C3	58.60		
.250 (1/4)	.750	<b>1.250</b> (5x)	1/4	2-1/2	948716	982916	57.70	982916-C3	65.30		
.250 (1/4)	.750	<b>2.000</b> (8x)	1/4	4	76716	76916	58.00	76916-C3	66.90		

BALL

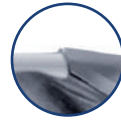


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# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute



Reduced Neck Diameter to Avoid Heeling

- Long length design for deep cavities
- Stub flutes for maximum rigidity
- Length of cut = 1½ x diameter
- Center cutting • Solid carbide • CNC ground in the USA

BALL

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.10"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.005	.007	<b>.025</b> (5x)	3	1/8	2-1/2	33405	63.70				
.005	.007	<b>.040</b> (8x)	3	1/8	2-1/2	34205	64.30				
.008	.012	<b>.040</b> (5x)	3	1/8	2-1/2	33408	62.50				
.008	.012	<b>.064</b> (8x)	3	1/8	2-1/2	34208	63.10				
.010	.015	<b>.030</b> (3x)	3	1/8	2-1/2	47910	62.50	47910-C3	67.70		
.010	.015	<b>.050</b> (5x)	3	1/8	2-1/2	33410	62.50	33410-C3	67.70	33410-C4	75.60
.010	.015	<b>.050</b> (5x)	4	1/8	2-1/2	803110	62.50	803110-C3	67.70		
.010	.015	<b>.080</b> (8x)	3	1/8	2-1/2	34210	63.10	34210-C3	68.30	34210-C4	76.20
.010	.015	<b>.080</b> (8x)	4	1/8	2-1/2	801310	63.10	801310-C3	68.30		
.010	.015	<b>.100</b> (10x)	3	1/8	2-1/2	966010	65.90	966010-C3	71.10	966010-C4	79.00
.010	.015	<b>.125</b> (12x)	3	1/8	2-1/2	35610	65.90	35610-C3	71.10	35610-C4	79.00
.010	.015	<b>.150</b> (15x)	3	1/8	2-1/2	49210	74.20	49210-C3	79.40	49210-C4	87.30
.010	.015	<b>.180</b> (18x)	3	1/8	2-1/2	970710	84.90	970710-C3	90.10		
.011	.016	<b>.055</b> (5x)	3	1/8	2-1/2	33411	63.70	33411-C3	68.90		
.011	.016	<b>.088</b> (8x)	3	1/8	2-1/2	34211	64.30	34211-C3	69.50		
.012 (.3 mm)	.018	<b>.060</b> (5x)	3	1/8	2-1/2	33412	62.50	33412-C3	67.70		
.012 (.3 mm)	.018	<b>.096</b> (8x)	3	1/8	2-1/2	34212	63.10	34212-C3	68.30		
.013	.019	<b>.065</b> (5x)	3	1/8	2-1/2	33413	63.70	33413-C3	68.90		
.013	.019	<b>.104</b> (8x)	3	1/8	2-1/2	34213	64.30	34213-C3	69.50		
.014	.021	<b>.070</b> (5x)	3	1/8	2-1/2	33414	62.50	33414-C3	67.70		
.014	.021	<b>.112</b> (8x)	3	1/8	2-1/2	34214	63.10	34214-C3	68.30		
.015 (1/64)	.022	<b>.045</b> (3x)	3	1/8	2-1/2	47915	52.10	47915-C3	57.30		
.015 (1/64)	.022	<b>.062</b> (4x)	3	1/8	2-1/2	844415	52.10	844415-C3	57.30		
.015 (1/64)	.022	<b>.078</b> (5x)	3	1/8	2-1/2	33415	52.10	33415-C3	57.30	33415-C4	65.20
.015 (1/64)	.022	<b>.078</b> (5x)	4	1/8	2-1/2	803115	53.10	803115-C3	58.30		
.015 (1/64)	.022	<b>.093</b> (6x)	3	1/8	2-1/2	860615	52.10	860615-C3	57.30		
.015 (1/64)	.022	<b>.109</b> (7x)	3	1/8	2-1/2	868215	52.10	868215-C3	57.30		
.015 (1/64)	.022	<b>.125</b> (8x)	3	1/8	2-1/2	34215	53.30	34215-C3	58.50	34215-C4	66.40
.015 (1/64)	.022	<b>.125</b> (8x)	4	1/8	2-1/2	801315	54.30	801315-C3	59.50		
.015 (1/64)	.022	<b>.156</b> (10x)	3	1/8	2-1/2	966015	54.80	966015-C3	60.00	966015-C4	67.90
.015 (1/64)	.022	<b>.187</b> (12x)	3	1/8	2-1/2	35615	54.80	35615-C3	60.00	35615-C4	67.90
.015 (1/64)	.022	<b>.225</b> (15x)	3	1/8	2-1/2	49215	60.60	49215-C3	65.80	49215-C4	73.70
.015 (1/64)	.022	<b>.270</b> (18x)	3	1/8	2-1/2	970715	71.00	970715-C3	76.20		
.015 (1/64)	.022	<b>.300</b> (20x)	3	1/8	2-1/2	59415	71.00	59415-C3	76.20	59415-C4	84.10
.015 (1/64)	.022	<b>.375</b> (25x)	3	1/8	2-1/2	40115	89.90	40115-C3	95.10		
.016 (.4 mm)	.024	<b>.080</b> (5x)	3	1/8	2-1/2	33416	55.80	33416-C3	61.00		
.016 (.4 mm)	.024	<b>.128</b> (8x)	3	1/8	2-1/2	34216	55.80	34216-C3	61.00		
.017	.026	<b>.085</b> (5x)	3	1/8	2-1/2	33417	55.80	33417-C3	61.00		
.017	.026	<b>.136</b> (8x)	3	1/8	2-1/2	34217	56.90	34217-C3	62.10		

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# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.018	.027	<b>.090</b> (5x)	3	1/8	2-1/2	33418	54.80	33418-C3	60.00		
.018	.027	<b>.144</b> (8x)	3	1/8	2-1/2	34218	56.90	34218-C3	62.10		
.019	.029	<b>.095</b> (5x)	3	1/8	2-1/2	33419	54.80	33419-C3	60.00		
.019	.029	<b>.152</b> (8x)	3	1/8	2-1/2	34219	55.80	34219-C3	61.00		
.020 (.5 mm)	.030	<b>.060</b> (3x)	3	1/8	2-1/2	47920	50.40	47920-C3	55.60	47920-C4	63.50
.020 (.5 mm)	.030	<b>.080</b> (4x)	3	1/8	2-1/2	844420	50.40	844420-C3	55.60		
.020 (.5 mm)	.030	<b>.100</b> (5x)	3	1/8	2-1/2	33420	50.40	33420-C3	55.60	33420-C4	63.50
.020 (.5 mm)	.030	<b>.100</b> (5x)	4	1/8	2-1/2	803120	50.40	803120-C3	55.60		
.020 (.5 mm)	.030	<b>.120</b> (6x)	3	1/8	2-1/2	860620	50.40	860620-C3	55.60		
.020 (.5 mm)	.030	<b>.140</b> (7x)	3	1/8	2-1/2	868220	50.40	868220-C3	55.60		
.020 (.5 mm)	.030	<b>.160</b> (8x)	3	1/8	2-1/2	34220	51.70	34220-C3	56.90	34220-C4	64.80
.020 (.5 mm)	.030	<b>.160</b> (8x)	4	1/8	2-1/2	801320	51.70	801320-C3	56.90		
.020 (.5 mm)	.030	<b>.200</b> (10x)	3	1/8	2-1/2	966020	53.10	966020-C3	58.30	966020-C4	66.20
.020 (.5 mm)	.030	<b>.250</b> (12x)	3	1/8	2-1/2	35620	53.10	35620-C3	58.30	35620-C4	66.20
.020 (.5 mm)	.030	<b>.300</b> (15x)	3	1/8	2-1/2	49220	58.70	49220-C3	63.90	49220-C4	71.80
.020 (.5 mm)	.030	<b>.360</b> (18x)	3	1/8	2-1/2	970720	70.50	970720-C3	75.70		
.020 (.5 mm)	.030	<b>.400</b> (20x)	3	1/8	2-1/2	59420	70.50	59420-C3	75.70	59420-C4	83.60
.020 (.5 mm)	.030	<b>.500</b> (25x)	3	1/8	2-1/2	40120	87.80	40120-C3	93.00	40120-C4	100.90
.020 (.5 mm)	.030	<b>.600</b> (30x)	3	1/8	2-1/2	922720	98.50	922720-C3	103.70	<b>30x Diameter!</b>	
.021	.031	<b>.105</b> (5x)	3	1/8	2-1/2	33421	55.80	33421-C3	61.00		
.021	.031	<b>.168</b> (8x)	3	1/8	2-1/2	34221	56.90	34221-C3	62.10		
.022	.033	<b>.110</b> (5x)	3	1/8	2-1/2	33422	55.80	33422-C3	61.00		
.022	.033	<b>.176</b> (8x)	3	1/8	2-1/2	34222	55.80	34222-C3	61.00		
.023	.035	<b>.115</b> (5x)	3	1/8	2-1/2	33423	55.80	33423-C3	61.00		
.023	.035	<b>.187</b> (8x)	3	1/8	2-1/2	34223	55.80	34223-C3	61.00		
.024 (.6 mm)	.036	<b>.120</b> (5x)	3	1/8	2-1/2	33424	54.80	33424-C3	60.00		
.024 (.6 mm)	.036	<b>.192</b> (8x)	3	1/8	2-1/2	34224	55.80	34224-C3	61.00		
.025	.037	<b>.075</b> (3x)	3	1/8	2-1/2	47925	43.70	47925-C3	48.90		
.025	.037	<b>.125</b> (5x)	3	1/8	2-1/2	33425	43.70	33425-C3	48.90	33425-C4	56.80
.025	.037	<b>.150</b> (6x)	3	1/8	2-1/2	860625	44.50	860625-C3	49.70		
.025	.037	<b>.175</b> (7x)	3	1/8	2-1/2	868225	45.30	868225-C3	50.50		
.025	.037	<b>.203</b> (8x)	3	1/8	2-1/2	34225	44.50	34225-C3	49.70	34225-C4	57.60
.025	.037	<b>.250</b> (10x)	3	1/8	2-1/2	966025	46.00	966025-C3	51.20		
.025	.037	<b>.312</b> (12x)	3	1/8	2-1/2	35625	46.00	35625-C3	51.20	35625-C4	59.10
.025	.037	<b>.375</b> (15x)	3	1/8	2-1/2	49225	52.70	49225-C3	57.90	49225-C4	65.80
.026	.039	<b>.130</b> (5x)	3	1/8	2-1/2	33426	55.80	33426-C3	61.00		
.026	.039	<b>.208</b> (8x)	3	1/8	2-1/2	34226	56.90	34226-C3	62.10		
.027	.041	<b>.135</b> (5x)	3	1/8	2-1/2	33427	55.80	33427-C3	61.00		
.027	.041	<b>.216</b> (8x)	3	1/8	2-1/2	34227	56.90	34227-C3	62.10		
.028 (.7 mm)	.042	<b>.140</b> (5x)	3	1/8	2-1/2	33428	54.80	33428-C3	60.00		
.028 (.7 mm)	.042	<b>.224</b> (8x)	3	1/8	2-1/2	34228	55.80	34228-C3	61.00		
.029	.043	<b>.145</b> (5x)	3	1/8	2-1/2	33429	55.80	33429-C3	61.00		
.029	.043	<b>.232</b> (8x)	3	1/8	2-1/2	34229	56.90	34229-C3	62.10		

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BALL

# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.0005'' \\ - .0005'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.010'' \\ - .000'' \end{smallmatrix}$	L <sub>3</sub> $\begin{smallmatrix} +.010'' \\ - .000'' \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>						
.030	.045	<b>.090</b> (3x)	3	1/8	2-1/2	47930	43.70	47930-C3	48.90		
.030	.045	<b>.156</b> (5x)	3	1/8	2-1/2	33430	43.70	33430-C3	48.90	33430-C4	56.80
.030	.045	<b>.250</b> (8x)	3	1/8	2-1/2	34230	44.50	34230-C3	49.70	34230-C4	57.60
.030	.045	<b>.312</b> (10x)	3	1/8	2-1/2	966030	46.00	966030-C3	51.20	966030-C4	59.10
.030	.045	<b>.375</b> (12x)	3	1/8	2-1/2	35630	46.00	35630-C3	51.20	35630-C4	59.10
.030	.045	<b>.450</b> (15x)	3	1/8	2-1/2	49230	52.70	49230-C3	57.90	49230-C4	65.80
.030	.045	<b>.540</b> (18x)	3	1/8	2-1/2	970730	64.00	970730-C3	69.20		
.031 (1/32)	.046	<b>.093</b> (3x)	3	1/8	2-1/2	47931	43.70	47931-C3	48.90	47931-C4	56.80
.031 (1/32)	.046	<b>.125</b> (4x)	3	1/8	2-1/2	844431	43.70	844431-C3	48.90	844431-C4	56.80
.031 (1/32)	.046	<b>.156</b> (5x)	3	1/8	2-1/2	33431	43.70	33431-C3	48.90	33431-C4	56.80
.031 (1/32)	.046	<b>.156</b> (5x)	4	1/8	2-1/2	803131	43.70	803131-C3	48.90		
.031 (1/32)	.046	<b>.187</b> (6x)	3	1/8	2-1/2	860631	43.70	860631-C3	48.90	860631-C4	56.80
.031 (1/32)	.046	<b>.218</b> (7x)	3	1/8	2-1/2	868231	43.70	868231-C3	48.90		
.031 (1/32)	.046	<b>.250</b> (8x)	3	1/8	2-1/2	34231	44.50	34231-C3	49.70	34231-C4	57.60
.031 (1/32)	.046	<b>.250</b> (8x)	4	1/8	2-1/2	801331	44.50	801331-C3	49.70		
.031 (1/32)	.046	<b>.312</b> (10x)	3	1/8	2-1/2	966031	46.00	966031-C3	51.20	966031-C4	59.10
.031 (1/32)	.046	<b>.312</b> (10x)	4	1/8	2-1/2	769231	46.00	769231-C3	51.20		
.031 (1/32)	.046	<b>.375</b> (12x)	3	1/8	2-1/2	35631	46.00	35631-C3	51.20	35631-C4	59.10
.031 (1/32)	.046	<b>.375</b> (12x)	4	1/8	2-1/2	768031	46.90	768031-C3	52.10		
.031 (1/32)	.046	<b>.470</b> (15x)	3	1/8	2-1/2	49231	52.70	49231-C3	57.90	49231-C4	65.80
.031 (1/32)	.046	<b>.565</b> (18x)	3	1/8	2-1/2	970731	64.00	970731-C3	69.20	970731-C4	77.10
.031 (1/32)	.046	<b>.625</b> (20x)	3	1/8	2-1/2	59431	64.00	59431-C3	69.20	59431-C4	77.10
.031 (1/32)	.046	<b>.775</b> (25x)	3	1/8	2-1/2	40131	76.50	40131-C3	81.70	40131-C4	89.60
.031 (1/32)	.046	<b>.937</b> (30x)	3	1/8	2-1/2	922731	91.20	922731-C3	96.40	<b>30x Diameter!</b>	
.035 (.9 mm)	.052	<b>.187</b> (5x)	3	1/8	2-1/2	33435	43.70	33435-C3	48.90	33435-C4	56.80
.035 (.9 mm)	.052	<b>.281</b> (8x)	3	1/8	2-1/2	34235	44.50	34235-C3	49.70	34235-C4	57.60
.035 (.9 mm)	.052	<b>.425</b> (12x)	3	1/8	2-1/2	35635	46.50	35635-C3	51.70	35635-C4	59.60
.035 (.9 mm)	.052	<b>.525</b> (15x)	3	1/8	2-1/2	49235	52.70	49235-C3	57.90		
.039 (1 mm)	.059	<b>.203</b> (5x)	3	1/8	2-1/2	33439	43.90	33439-C3	49.10		
.039 (1 mm)	.059	<b>.240</b> (6x)	3	1/8	2-1/2	860639	43.90	860639-C3	49.10		
.039 (1 mm)	.059	<b>.281</b> (7x)	3	1/8	2-1/2	868239	44.80	868239-C3	50.00		
.039 (1 mm)	.059	<b>.325</b> (8x)	3	1/8	2-1/2	34239	44.50	34239-C3	49.70		
.039 (1 mm)	.059	<b>.400</b> (10x)	3	1/8	2-1/2	966039	46.50	966039-C3	51.70		
.040	.060	<b>.120</b> (3x)	3	1/8	2-1/2	47940	43.70	47940-C3	48.90	47940-C4	56.80
.040	.060	<b>.160</b> (4x)	3	1/8	2-1/2	844440	44.60	844440-C3	49.80		
.040	.060	<b>.203</b> (5x)	3	1/8	2-1/2	33440	43.70	33440-C3	48.90	33440-C4	56.80
.040	.060	<b>.203</b> (5x)	4	1/8	2-1/2	803140	43.70	803140-C3	48.90		
.040	.060	<b>.240</b> (6x)	3	1/8	2-1/2	860640	43.70	860640-C3	48.90		
.040	.060	<b>.281</b> (7x)	3	1/8	2-1/2	868240	43.70	868240-C3	48.90		
.040	.060	<b>.325</b> (8x)	3	1/8	2-1/2	34240	44.50	34240-C3	49.70	34240-C4	57.60
.040	.060	<b>.325</b> (8x)	4	1/8	2-1/2	801340	44.50	801340-C3	49.70		
.040	.060	<b>.400</b> (10x)	3	1/8	2-1/2	966040	46.50	966040-C3	51.70	966040-C4	59.60
.040	.060	<b>.480</b> (12x)	3	1/8	2-1/2	35640	46.50	35640-C3	51.70	35640-C4	59.60
.040	.060	<b>.600</b> (15x)	3	1/8	2-1/2	49240	52.70	49240-C3	57.90	49240-C4	65.80
.040	.060	<b>.720</b> (18x)	3	1/8	2-1/2	970740	64.00	970740-C3	69.20		
.040	.060	<b>.800</b> (20x)	3	1/8	2-1/2	59440	64.00	59440-C3	69.20	59440-C4	77.10
.040	.060	<b>1.000</b> (25x)	3	1/8	2-1/2	40140	76.50	40140-C3	81.70	<b>25x Diameter!</b>	

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# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.045	.067	<b>.225</b> (5x)	3	1/8	2-1/2	33445	42.60	33445-C3	47.80	33445-C4	55.70
.045	.067	<b>.375</b> (8x)	3	1/8	2-1/2	34245	43.60	34245-C3	48.80	34245-C4	56.70
.045	.067	<b>.550</b> (12x)	3	1/8	2-1/2	35645	44.80	35645-C3	50.00	35645-C4	57.90
.045	.067	<b>.680</b> (15x)	3	1/8	2-1/2	49245	50.70	49245-C3	55.90		
.047 (3/64)	.070	<b>.141</b> (3x)	3	1/8	2-1/2	47947	42.60	47947-C3	47.80		
.047 (3/64)	.070	<b>.187</b> (4x)	3	1/8	2-1/2	844447	42.60	844447-C3	47.80		
.047 (3/64)	.070	<b>.250</b> (5x)	3	1/8	2-1/2	33447	42.60	33447-C3	47.80	33447-C4	55.70
.047 (3/64)	.070	<b>.250</b> (5x)	4	1/8	2-1/2	803147	42.60	803147-C3	47.80		
.047 (3/64)	.070	<b>.281</b> (6x)	3	1/8	2-1/2	860647	42.60	860647-C3	47.80		
.047 (3/64)	.070	<b>.328</b> (7x)	3	1/8	2-1/2	868247	42.60	868247-C3	47.80		
.047 (3/64)	.070	<b>.375</b> (8x)	3	1/8	2-1/2	34247	43.60	34247-C3	48.80	34247-C4	56.70
.047 (3/64)	.070	<b>.375</b> (8x)	4	1/8	2-1/2	801347	43.60	801347-C3	48.80		
.047 (3/64)	.070	<b>.480</b> (10x)	3	1/8	2-1/2	966047	44.80	966047-C3	50.00	966047-C4	57.90
.047 (3/64)	.070	<b>.570</b> (12x)	3	1/8	2-1/2	35647	44.80	35647-C3	50.00	35647-C4	57.90
.047 (3/64)	.070	<b>.710</b> (15x)	3	1/8	2-1/2	49247	49.80	49247-C3	55.00	49247-C4	62.90
.047 (3/64)	.070	<b>.850</b> (18x)	3	1/8	2-1/2	970747	60.20	970747-C3	65.40		
.047 (3/64)	.070	<b>.950</b> (20x)	3	1/8	2-1/2	59447	60.20	59447-C3	65.40	59447-C4	73.30
.047 (3/64)	.070	<b>1.187</b> (25x)	3	1/8	2-1/2	40147	73.80	40147-C3	79.00	<b>25x Diameter!</b>	
.050	.075	<b>.150</b> (3x)	3	1/8	2-1/2	47950	42.60	47950-C3	47.80		
.050	.075	<b>.250</b> (5x)	3	1/8	2-1/2	33450	42.60	33450-C3	47.80	33450-C4	55.70
.050	.075	<b>.400</b> (8x)	3	1/8	2-1/2	34250	43.60	34250-C3	48.80	34250-C4	56.70
.050	.075	<b>.500</b> (10x)	3	1/8	2-1/2	966050	44.80	966050-C3	50.00		
.050	.075	<b>.600</b> (12x)	3	1/8	2-1/2	35650	44.80	35650-C3	50.00	35650-C4	57.90
.050	.075	<b>.750</b> (15x)	3	1/8	2-1/2	49250	49.80	49250-C3	55.00		
.055 (1.4 mm)	.082	<b>.165</b> (3x)	3	1/8	2-1/2	47955	42.60	47955-C3	47.80		
.055 (1.4 mm)	.082	<b>.275</b> (5x)	3	1/8	2-1/2	33455	42.60	33455-C3	47.80	33455-C4	55.70
.055 (1.4 mm)	.082	<b>.450</b> (8x)	3	1/8	2-1/2	34255	43.60	34255-C3	48.80	34255-C4	56.70
.055 (1.4 mm)	.082	<b>.560</b> (10x)	3	1/8	2-1/2	966055	45.60	966055-C3	50.80		
.055 (1.4 mm)	.082	<b>.660</b> (12x)	3	1/8	2-1/2	35655	44.80	35655-C3	50.00	35655-C4	57.90
.060	.090	<b>.180</b> (3x)	3	1/8	2-1/2	47960	42.60	47960-C3	47.80		
.060	.090	<b>.312</b> (5x)	3	1/8	2-1/2	33460	42.60	33460-C3	47.80	33460-C4	55.70
.060	.090	<b>.375</b> (6x)	3	1/8	2-1/2	860660	43.60	860660-C3	48.80		
.060	.090	<b>.437</b> (7x)	3	1/8	2-1/2	868260	43.60	868260-C3	48.80		
.060	.090	<b>.500</b> (8x)	3	1/8	2-1/2	34260	43.60	34260-C3	48.80	34260-C4	56.70
.060	.090	<b>.625</b> (10x)	3	1/8	2-1/2	966060	44.80	966060-C3	50.00		
.060	.090	<b>.720</b> (12x)	3	1/8	2-1/2	35660	44.80	35660-C3	50.00	35660-C4	57.90
.060	.090	<b>.900</b> (15x)	3	1/8	2-1/2	49260	49.80	49260-C3	55.00		
.060	.090	<b>1.062</b> (18x)	3	1/8	2-1/2	970760	60.20	970760-C3	65.40		
.060	.090	<b>1.200</b> (20x)	3	1/8	2-1/2	59460	60.20	59460-C3	65.40		
.062 (1/16)	.093	<b>.186</b> (3x)	3	1/8	2-1/2	47962	42.60	47962-C3	47.80	47962-C4	55.70
.062 (1/16)	.093	<b>.250</b> (4x)	3	1/8	2-1/2	844462	42.60	844462-C3	47.80	844462-C4	55.70
.062 (1/16)	.093	<b>.250</b> (4x)	4	1/8	2-1/2	754362	42.60	754362-C3	47.80		
.062 (1/16)	.093	<b>.312</b> (5x)	3	1/8	2-1/2	33462	42.60	33462-C3	47.80	33462-C4	55.70
.062 (1/16)	.093	<b>.312</b> (5x)	4	1/8	2-1/2	803162	42.60	803162-C3	47.80		
.062 (1/16)	.093	<b>.375</b> (6x)	3	1/8	2-1/2	860662	42.60	860662-C3	47.80	860662-C4	55.70
.062 (1/16)	.093	<b>.375</b> (6x)	4	1/8	2-1/2	753062	42.60	753062-C3	47.80		

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BALL

# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.10"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.062 (1/16)	.093	<b>.437</b> (7x)	3	1/8	2-1/2	868262	42.60	868262-C3	47.80	868262-C4	55.70
.062 (1/16)	.093	<b>.500</b> (8x)	3	1/8	2-1/2	34262	43.60	34262-C3	48.80	34262-C4	56.70
.062 (1/16)	.093	<b>.500</b> (8x)	4	1/8	2-1/2	801362	43.60	801362-C3	48.80		
.062 (1/16)	.093	<b>.558</b> (9x)	3	1/8	2-1/2	805362	44.80	805362-C3	50.00		
.062 (1/16)	.093	<b>.625</b> (10x)	3	1/8	2-1/2	966062	44.80	966062-C3	50.00	966062-C4	57.90
.062 (1/16)	.093	<b>.625</b> (10x)	4	1/8	2-1/2	769262	44.80	769262-C3	50.00		
.062 (1/16)	.093	<b>.750</b> (12x)	3	1/8	2-1/2	35662	44.80	35662-C3	50.00	35662-C4	57.90
.062 (1/16)	.093	<b>.750</b> (12x)	4	1/8	2-1/2	768062	44.80	768062-C3	50.00		
.062 (1/16)	.093	<b>.950</b> (15x)	3	1/8	2-1/2	49262	49.80	49262-C3	55.00	49262-C4	62.90
.062 (1/16)	.093	<b>.950</b> (15x)	4	1/8	2-1/2	752262	50.70	752262-C3	55.90		
.062 (1/16)	.093	<b>1.125</b> (18x)	3	1/8	2-1/2	970762	60.20	970762-C3	65.40	970762-C4	73.30
.062 (1/16)	.093	<b>1.250</b> (20x)	3	1/8	2-1/2	59462	60.20	59462-C3	65.40	59462-C4	73.30
.062 (1/16)	.093	<b>1.550</b> (25x)	3	1/8	3	40162	73.80	40162-C3	79.00	40162-C4	86.90
.062 (1/16)	.093	<b>1.875</b> (30x)	3	1/8	3	922762	95.70	922762-C3	100.90	<b>30x Diameter!</b>	
.065	.097	<b>.325</b> (5x)	3	1/8	2-1/2	33465	42.60	33465-C3	47.80		
.065	.097	<b>.530</b> (8x)	3	1/8	2-1/2	34265	43.60	34265-C3	48.80	34265-C4	56.70
.070	.105	<b>.375</b> (5x)	3	1/8	2-1/2	33470	42.60	33470-C3	47.80		
.070	.105	<b>.570</b> (8x)	3	1/8	2-1/2	34270	43.60	34270-C3	48.80	34270-C4	56.70
.075	.112	<b>.375</b> (5x)	3	1/8	2-1/2	33475	42.60	33475-C3	47.80		
.075	.112	<b>.625</b> (8x)	3	1/8	2-1/2	34275	43.60	34275-C3	48.80	34275-C4	56.70
.078 (5/64)	.117	<b>.234</b> (3x)	3	1/8	2-1/2	47978	42.60	47978-C3	47.80		
.078 (5/64)	.117	<b>.312</b> (4x)	3	1/8	2-1/2	844478	42.60	844478-C3	47.80		
.078 (5/64)	.117	<b>.406</b> (5x)	3	1/8	2-1/2	33478	42.60	33478-C3	47.80	33478-C4	55.70
.078 (5/64)	.117	<b>.406</b> (5x)	4	1/8	2-1/2	803178	42.60	803178-C3	47.80		
.078 (5/64)	.117	<b>.475</b> (6x)	3	1/8	2-1/2	860678	42.60	860678-C3	47.80		
.078 (5/64)	.117	<b>.550</b> (7x)	3	1/8	2-1/2	868278	42.60	868278-C3	47.80		
.078 (5/64)	.117	<b>.625</b> (8x)	3	1/8	2-1/2	34278	43.60	34278-C3	48.80	34278-C4	56.70
.078 (5/64)	.117	<b>.800</b> (10x)	3	1/8	2-1/2	966078	44.80	966078-C3	50.00		
.078 (5/64)	.117	<b>.940</b> (12x)	3	1/8	2-1/2	35678	44.80	35678-C3	50.00	35678-C4	57.90
.078 (5/64)	.117	<b>1.187</b> (15x)	3	1/8	2-1/2	49278	49.80	49278-C3	55.00	49278-C4	62.90
.078 (5/64)	.117	<b>1.400</b> (18x)	3	1/8	3	970778	60.20	970778-C3	65.40		
.078 (5/64)	.117	<b>1.562</b> (20x)	3	1/8	3	59478	60.20	59478-C3	65.40		
.078 (5/64)	.117	<b>1.950</b> (25x)	3	1/8	3	40178	73.80	40178-C3	79.00	<b>25x Diameter!</b>	
.080	.120	<b>.406</b> (5x)	3	1/8	2-1/2	33480	42.60	33480-C3	47.80		
.080	.120	<b>.650</b> (8x)	3	1/8	2-1/2	34280	43.60	34280-C3	48.80	34280-C4	56.70
.085	.127	<b>.425</b> (5x)	3	1/8	2-1/2	33485	42.60	33485-C3	47.80		
.085	.127	<b>.700</b> (8x)	3	1/8	2-1/2	34285	43.60	34285-C3	48.80	34285-C4	56.70
.090	.135	<b>.450</b> (5x)	3	1/8	2-1/2	33490	43.40	33490-C3	48.60		
.090	.135	<b>.750</b> (8x)	3	1/8	2-1/2	34290	43.60	34290-C3	48.80	34290-C4	56.70
.093 (3/32)	.139	<b>.279</b> (3x)	3	1/8	2-1/2	47993	42.60	47993-C3	47.80		
.093 (3/32)	.139	<b>.375</b> (4x)	3	1/8	2-1/2	844493	42.60	844493-C3	47.80		
.093 (3/32)	.139	<b>.500</b> (5x)	3	1/8	2-1/2	33493	42.60	33493-C3	47.80	33493-C4	55.70
.093 (3/32)	.139	<b>.500</b> (5x)	4	1/8	2-1/2	803193	42.60	803193-C3	47.80		
.093 (3/32)	.139	<b>.585</b> (6x)	3	1/8	2-1/2	860693	42.60	860693-C3	47.80		
.093 (3/32)	.139	<b>.670</b> (7x)	3	1/8	2-1/2	868293	42.60	868293-C3	47.80		
.093 (3/32)	.139	<b>.750</b> (8x)	3	1/8	2-1/2	34293	43.60	34293-C3	48.80	34293-C4	56.70
.093 (3/32)	.139	<b>.750</b> (8x)	4	1/8	2-1/2	801393	43.60	801393-C3	48.80		

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# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.093 (3/32)	.139	<b>.950</b> (10x)	3	1/8	2-1/2	966093	44.80	966093-C3	50.00	966093-C4	57.90
.093 (3/32)	.139	<b>1.125</b> (12x)	3	1/8	2-1/2	35693	44.80	35693-C3	50.00	35693-C4	57.90
.093 (3/32)	.139	<b>1.400</b> (15x)	3	1/8	3	49293	52.40	49293-C3	57.60	49293-C4	65.50
.093 (3/32)	.139	<b>1.675</b> (18x)	3	1/8	3	970793	63.90	970793-C3	69.10		
.093 (3/32)	.139	<b>1.875</b> (20x)	3	1/8	4	59493	66.60	59493-C3	72.20		
.093 (3/32)	.139	<b>2.312</b> (25x)	3	1/8	4	40193	76.30	40193-C3	81.90		<b>25x Diameter!</b>
.093 (3/32)	.139	<b>2.812</b> (30x)	3	1/8	4	922793	104.30	922793-C3	109.90		<b>30x Diameter!</b>
.095	.142	<b>.500</b> (5x)	3	1/8	2-1/2	33495	42.60	33495-C3	47.80		
.095	.142	<b>.750</b> (8x)	3	1/8	2-1/2	34295	43.60	34295-C3	48.80	34295-C4	56.70
.100	.150	<b>.300</b> (3x)	3	1/8	2-1/2	978500	42.60	978500-C3	47.80		
.100	.150	<b>.500</b> (5x)	3	1/8	2-1/2	33500	42.60	33500-C3	47.80		
.100	.150	<b>.800</b> (8x)	3	1/8	2-1/2	34300	43.60	34300-C3	48.80	34300-C4	56.70
.100	.150	<b>1.000</b> (10x)	3	1/8	2-1/2	966100	44.80	966100-C3	50.00		
.100	.150	<b>1.200</b> (12x)	3	1/8	2-1/2	35700	44.80	35700-C3	50.00		
.109 (7/64)	.163	<b>.570</b> (5x)	3	1/8	2-1/2	33502	42.60	33502-C3	47.80		
.109 (7/64)	.163	<b>.900</b> (8x)	3	1/8	2-1/2	34302	43.60	34302-C3	48.80		
<b>NEW</b> .118 (3 mm)	.177	<b>.475</b> (4x)	3	1/8	2-1/2	<b>844505</b>	42.60	<b>844505-C3</b>	47.80		
.118 (3 mm)	.177	<b>.625</b> (5x)	3	1/8	2-1/2	33505	42.60	33505-C3	47.80		
.118 (3 mm)	.177	<b>.950</b> (8x)	3	1/8	2-1/2	34305	43.60	34305-C3	48.80		
.118 (3 mm)	.177	<b>1.187</b> (10x)	3	1/8	2-1/2	966105	44.80	966105-C3	50.00		

BALL

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	.187	<b>.375</b> (3x)	3	1/8	2-1/2	978508	42.60	978508-C3	47.80	978508-C4	55.70
.125 (1/8)	.187	<b>.375</b> (3x)	4	1/8	2-1/2	751908	43.40	751908-C3	48.60		
.125 (1/8)	.187	<b>.500</b> (4x)	3	1/8	2-1/2	844508	42.60	844508-C3	47.80		
.125 (1/8)	.187	<b>.625</b> (5x)	3	1/8	2-1/2	33508	42.60	33508-C3	47.80	33508-C4	55.70
.125 (1/8)	.187	<b>.625</b> (5x)	4	1/8	2-1/2	803208	42.60	803208-C3	47.80		
.125 (1/8)	.187	<b>.750</b> (6x)	3	1/8	2-1/2	860708	42.60	860708-C3	47.80	860708-C4	55.70
.125 (1/8)	.187	<b>.875</b> (7x)	3	1/8	2-1/2	868308	42.60	868308-C3	47.80		
.125 (1/8)	.187	<b>1.000</b> (8x)	3	1/8	2-1/2	34308	43.60	34308-C3	48.80	34308-C4	56.70
.125 (1/8)	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	801408	43.60	801408-C3	48.80		
.125 (1/8)	.187	<b>1.125</b> (9x)	3	1/8	2-1/2	805408	46.80	805408-C3	52.00		
.125 (1/8)	.187	<b>1.250</b> (10x)	3	1/8	2-1/2	966108	46.80	966108-C3	52.00	966108-C4	59.90
.125 (1/8)	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	769308	46.80	769308-C3	52.00		
.125 (1/8)	.187	<b>1.500</b> (12x)	3	1/8	3	35708	46.80	35708-C3	52.00	35708-C4	59.90
.125 (1/8)	.187	<b>1.500</b> (12x)	4	1/8	3	768108	46.80	768108-C3	52.00		
.125 (1/8)	.187	<b>1.875</b> (15x)	3	1/8	3	49308	52.40	49308-C3	57.60	49308-C4	65.50
.125 (1/8)	.187	<b>2.250</b> (18x)	3	1/8	4	970808	63.90	970808-C3	69.50	970808-C4	77.00
.125 (1/8)	.187	<b>2.500</b> (20x)	3	1/8	4	59508	63.90	59508-C3	69.50	59508-C4	83.00
.125 (1/8)	.187	<b>3.125</b> (25x)	3	1/8	4	959108	81.10	959108-C3	86.70		<b>25x Diameter!</b>
.125 (1/8)	.187	<b>3.750</b> (30x)	3	1/8	6	922808	97.20	922808-C3	104.10		<b>30x Diameter!</b>
.140 (9/64)	.220	<b>.750</b> (5x)	3	3/16	3	33509	47.00	33509-C3	52.60		
.140 (9/64)	.220	<b>1.125</b> (8x)	3	3/16	3	34309	48.00	34309-C3	53.60		
.140 (9/64)	.220	<b>1.450</b> (10x)	3	3/16	3	966109	51.20	966109-C3	56.80		

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# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute (cont.)

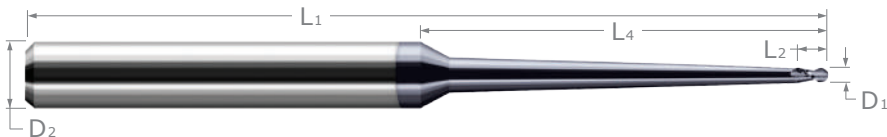
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BALL

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.009"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.156 (5/32)	.234	<b>.470</b> (3x)	3	3/16	3	978510	47.00	978510-C3	52.60		
.156 (5/32)	.234	<b>.750</b> (5x)	3	3/16	3	33510	47.00	33510-C3	52.60		
.156 (5/32)	.234	<b>1.250</b> (8x)	3	3/16	3	34310	48.00	34310-C3	53.60	34310-C4	66.10
.156 (5/32)	.234	<b>1.570</b> (10x)	3	3/16	3	966110	51.20	966110-C3	56.80		
.156 (5/32)	.234	<b>1.875</b> (12x)	3	3/16	4	35710	51.20	35710-C3	58.80		
.156 (5/32)	.234	<b>2.375</b> (15x)	3	3/16	4	49310	55.20	49310-C3	62.80		
.187 (3/16)	.281	<b>.570</b> (3x)	3	3/16	3	978512	47.00	978512-C3	52.60		
.187 (3/16)	.281	<b>1.000</b> (5x)	3	3/16	3	33512	47.00	33512-C3	52.60	33512-C4	65.10
.187 (3/16)	.281	<b>1.000</b> (5x)	4	3/16	3	803212	47.00	803212-C3	52.60		
.187 (3/16)	.281	<b>1.156</b> (6x)	3	3/16	3	860712	48.00	860712-C3	53.60		
.187 (3/16)	.281	<b>1.312</b> (7x)	3	3/16	3	868312	48.00	868312-C3	53.60		
.187 (3/16)	.281	<b>1.500</b> (8x)	3	3/16	3	34312	48.00	34312-C3	53.60	34312-C4	66.10
.187 (3/16)	.281	<b>1.500</b> (8x)	4	3/16	3	801412	48.00	801412-C3	53.60		
.187 (3/16)	.281	<b>1.875</b> (10x)	3	3/16	4	966112	51.20	966112-C3	58.80	966112-C4	70.50
.187 (3/16)	.281	<b>2.250</b> (12x)	3	3/16	4	35712	51.20	35712-C3	58.80	35712-C4	70.50
.187 (3/16)	.281	<b>2.812</b> (15x)	3	3/16	4	49312	54.10	49312-C3	61.70	49312-C4	73.40
.187 (3/16)	.281	<b>3.375</b> (18x)	3	3/16	6	970812	74.60	970812-C3	84.70		
.218 (7/32)	.330	<b>1.125</b> (5x)	3	1/4	4	33514	54.60	33514-C3	63.50		
.218 (7/32)	.330	<b>1.750</b> (8x)	3	1/4	4	34314	55.20	34314-C3	64.10		
.250 (1/4)	.375	<b>.750</b> (3x)	3	1/4	4	978516	51.80	978516-C3	60.70		
.250 (1/4)	.375	<b>1.250</b> (5x)	3	1/4	4	33516	51.80	33516-C3	60.70	33516-C4	72.40
.250 (1/4)	.375	<b>1.250</b> (5x)	4	1/4	4	803216	52.80	803216-C3	61.70		
.250 (1/4)	.375	<b>2.000</b> (8x)	3	1/4	4	34316	53.10	34316-C3	62.00	34316-C4	73.70
.250 (1/4)	.375	<b>2.000</b> (8x)	4	1/4	4	801416	53.10	801416-C3	62.00		
.250 (1/4)	.375	<b>2.500</b> (10x)	3	1/4	4	966116	59.30	966116-C3	68.20	966116-C4	79.90
.250 (1/4)	.375	<b>3.000</b> (12x)	3	1/4	6	35716	63.70	35716-C3	73.80	35716-C4	93.50
.250 (1/4)	.375	<b>3.750</b> (15x)	3	1/4	6	49316	65.30	49316-C3	75.40		
.250 (1/4)	.375	<b>5.000</b> (20x)	3	1/4	8	59516	131.30	59516-C3	146.40		
.375 (3/8)	.570	<b>2.000</b> (5x)	3	3/8	4	33524	90.50	33524-C3	104.30		
.375 (3/8)	.570	<b>3.000</b> (8x)	3	3/8	6	34324	121.90	34324-C3	137.50		

# MINIATURE END MILLS

## Ball – Tapered Reach (Clearance Cutters)



Maximum Reach & Maximum Rigidity!

- Designed for deep cavity profiling
- 2° tapered neck design minimizes deflection and maximizes wall clearance
- Length of cut = 1½x diameter • Neck behind length of cut is reduced for 1x diameter
- h6 shank tolerance for high precision tool holders • Center cutting
- Solid carbide • CNC ground in the USA

CUTTER DIA.	LOC	EFFECTIVE WALL ANGLE		SHANK DIA.	OAL	INTERFERENCE DEPTH AT WALL ANGLE*			UNCOATED			AITIN NANO COATED			AMORPHOUS DIAMOND	
		REACH	ANGLE			0°	.5°	1°	2 FL	4 FL	PRICE	2 FL	4 FL	PRICE	2 FL	PRICE
D1 +.000" / -.001"	L2 +.020" / -.000"	L4 +.020" / -.000"		D2 (h6)	L1											
.010	.015	<b>1/2</b>	6.6°	1/8	2-1/2	.054	.070	.102	29810		74.10	29810-C6		81.70		
.015	.023	<b>1/2</b>	6.4°	1/8	2-1/2	.060	.080	.120	29815	778115	73.40	29815-C6	778115-C6	81.00	29815-C4	86.50
.015	.023	<b>1</b>	6.7°	1/4	4	.060	.080	.120	17715		87.00	17715-C6		98.20		
.020	.030	<b>1/2</b>	6.1°	1/8	2-1/2	.070	.095	.140	29820		74.10	29820-C6		81.70		
.020	.030	<b>1</b>	6.6°	1/4	4	.070	.095	.140	17720		87.00	17720-C6		98.20		
.031	.047	<b>1/2</b>	5.5°	1/8	2-1/2	.115	.150	.220	29831	778131	57.40	29831-C6	778131-C6	65.00	29831-C4	70.50
.031	.047	<b>1</b>	6.3°	1/4	4	.115	.150	.220	17731	777231	71.60	17731-C6	777231-C6	82.80	17731-C4	92.20
.031	.047	<b>1-1/2</b>	4.2°	1/4	4	.115	.150	.220	24831	776231	77.10	24831-C6	776231-C6	88.30	24831-C4	97.70
.031	.047	<b>2</b>	3.2°	1/4	4	.115	.150	.220	18831		87.50	18831-C6		98.70	18831-C4	108.10
.039	.059	<b>1/2</b>	5.1°	1/8	2-1/2	.150	.195	.285	29839		57.90	29839-C6		65.50		
.039	.059	<b>1</b>	6.1°	1/4	4	.150	.195	.285	17739		71.60	17739-C6		82.80		
.047	.071	<b>1/2</b>	4.7°	1/8	2-1/2	.180	.235	.350	29847	778147	57.40	29847-C6	778147-C6	65.00	29847-C4	70.50
.047	.071	<b>1</b>	5.9°	1/4	4	.180	.235	.350	17747	777247	71.60	17747-C6	777247-C6	82.80	17747-C4	92.20
.047	.071	<b>1-1/2</b>	3.9°	1/4	4	.180	.235	.350	24847		77.10	24847-C6		88.30	24847-C4	97.70
.047	.071	<b>2</b>	2.9°	1/4	4	.180	.235	.350	18847		87.50	18847-C6		98.70	18847-C4	108.10
.062	.093	<b>1/2</b>	3.8°	1/8	2-1/2	.220	.285	.370	29862	778162	55.60	29862-C6	778162-C6	63.20	29862-C4	68.70
.062	.093	<b>1</b>	5.5°	1/4	4	.220	.285	.415	17762	777262	69.40	17762-C6	777262-C6	80.60	17762-C4	90.00
.062	.093	<b>1-1/2</b>	3.7°	1/4	4	.220	.285	.415	24862	776262	74.40	24862-C6	776262-C6	85.60	24862-C4	95.00
.062	.093	<b>2</b>	2.7°	1/4	4	.220	.285	.415	18862	775262	85.30	18862-C6	775262-C6	96.50	18862-C4	105.90
.062	.093	<b>2-1/2</b>	2.2°	1/4	4	.220	.285	.415	21362		87.40	21362-C6		98.60		
.078	.118	<b>1</b>	5.1°	1/4	4	.305	.395	.575	17778		69.40	17778-C6		80.60	17778-C4	90.00
.078	.118	<b>1-1/2</b>	3.4°	1/4	4	.305	.395	.575	24878		74.40	24878-C6		85.60	24878-C4	95.00
.078	.118	<b>2</b>	2.5°	1/4	4	.305	.395	.575	18878		85.30	18878-C6		96.50	18878-C4	105.90
.093	.140	<b>1</b>	4.7°	1/4	4	.340	.440	.640	17793	777293	70.20	17793-C6	777293-C6	81.40	17793-C4	90.80
.093	.140	<b>1-1/2</b>	3.1°	1/4	4	.340	.440	.640	24893	776293	74.40	24893-C6	776293-C6	85.60	24893-C4	95.00
.093	.140	<b>2</b>	2.3°	1/4	4	.340	.440	.640	18893		83.10	18893-C6		94.30	18893-C4	103.70
.118	.177	<b>1</b>	4.0°	1/4	4	.438	.565	.756	17805		70.90	17805-C6		82.10		
.118	.177	<b>1-1/2</b>	2.6°	1/4	4	.438	.565	.818	24905		75.10	24905-C6		86.30		
.125	.188	<b>1</b>	3.8°	1/4	4	.450	.580	.750	17808	777308	70.20	17808-C6	777308-C6	81.40	17808-C4	90.80
.125	.188	<b>1-1/2</b>	2.5°	1/4	4	.450	.580	.840	24908	776308	74.40	24908-C6	776308-C6	85.60	24908-C4	95.00
.125	.188	<b>2</b>	1.8°	1/4	4	.450	.580	.840	18908	775308	83.10	18908-C6	775308-C6	94.30	18908-C4	103.70
.125	.188	<b>2-1/2</b>	2.2°	5/16	4	.450	.580	.840	21408		87.20	21408-C6		99.80		

\*Values are approximate and may vary due to tolerancing. †Tapered neck angle is 1.85°.

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For detailed interference charts with more angles, scan the QR code or visit [www.harveytool.com/resources](http://www.harveytool.com/resources)

# MINIATURE END MILLS

## Ball – Tapered Reach (Clearance Cutters) (cont.)

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BALL

CUTTER DIA.	LOC	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIA.	OAL	INTERFERENCE DEPTH AT WALL ANGLE*			UNCOATED			AITIN NANO COATED			AMORPHOUS DIAMOND	
						0°	.5°	1°	2 FL	4 FL	PRICE	2 FL	4 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	L <sub>4</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>											
.156	.234	<b>1</b>	2.9°	1/4	4	.525	.680	.775	17810		70.20	17810-C6		81.40	17810-C4	90.80
.156	.234	<b>1-1/2</b>	1.9°	1/4	4	.525	.680	.980	24910		74.40	24910-C6		85.60	24910-C4	95.00
.156	.234	<b>2</b>	1.4°	1/4	4	.540	.710	1.085	18910†		83.10	18910-C6†		94.30	18910-C4†	103.70
.187	.281	<b>1-1/2</b>	1.3°	1/4	4	.605	.775	1.120	24912	776312	76.30	24912-C6	776312-C6	87.50	24912-C4	96.90
.187	.281	<b>2</b>	2.7°	3/8	4	.605	.775	1.120	18912	775312	111.60	18912-C6	775312-C6	124.20	18912-C4	136.40
.187	.281	<b>2-1/2</b>	2.2°	3/8	4	.605	.775	1.120	21412		115.20	21412-C6		127.80		
.250	.375	<b>1-1/2</b>	2.6°	3/8	4	.760	.975	1.260	24916	776316	97.90	24916-C6	776316-C6	110.50	24916-C4	122.70
.250	.375	<b>2</b>	1.8°	3/8	4	.760	.975	1.405	18916	775316	111.60	18916-C6	775316-C6	124.20	18916-C4	136.40
.250	.375	<b>2-1/2</b>	1.5°	3/8	4	.760	.975	1.405	21416		115.20	21416-C6		127.80		
.312	.468	<b>2</b>	2.7°	1/2	4	.915	1.170	1.685	18920		151.20	18920-C6		168.60	18920-C4	181.00
.375	.563	<b>2</b>	1.8°	1/2	4	1.075	1.370	1.770	18924		151.20	18924-C6		168.60	18924-C4	181.00

\*Values are approximate and may vary due to tolerancing. †Tapered neck angle is 1.85°.

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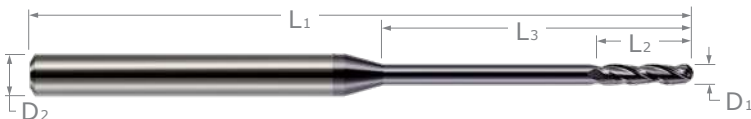
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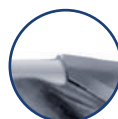


# MINIATURE END MILLS

## Ball – Long Reach, Long Flute



- Long length design for deep cavities
- Long flutes for deep pocket milling
- Length of cut  $\geq 5x$  diameter
- 3 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA



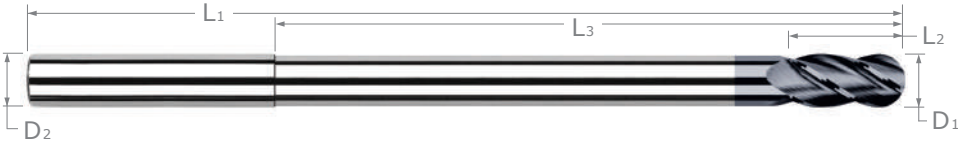
Reduced Neck Diameter to Avoid Heeling

BALL

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.010	.050	.100 (10x)	1/8	2-1/2	13810	65.90	13810-C3	71.10	10210	79.00
.015 (1/64)	.075	.150 (10x)	1/8	2-1/2	13815	56.20	13815-C3	61.40	10215	69.30
.020 (.5 mm)	.100	.200 (10x)	1/8	2-1/2	13820	54.60	13820-C3	59.80	10220	67.70
.025	.125	.250 (10x)	1/8	2-1/2	13825	47.10	13825-C3	52.30	10225	60.20
.030	.150	.300 (10x)	1/8	2-1/2	13830	47.10	13830-C3	52.30	10230	60.20
.031 (1/32)	.155	.250 (8x)	1/8	2-1/2	750431	46.00	750431-C3	51.20		
.031 (1/32)	.155	.310 (10x)	1/8	2-1/2	13831	47.10	13831-C3	52.30	10231	60.20
.035 (.9 mm)	.175	.350 (10x)	1/8	2-1/2	13835	47.50	13835-C3	52.70	10235	60.60
.040	.200	.400 (10x)	1/8	2-1/2	13840	47.10	13840-C3	52.30	10240	60.20
.045	.225	.450 (10x)	1/8	2-1/2	13845	46.00	13845-C3	51.20	10245	59.10
.047 (3/64)	.250	.500 (10x)	1/8	2-1/2	13847	46.00	13847-C3	51.20	10247	59.10
.050	.300	.600 (12x)	1/8	2-1/2	13850	46.00	13850-C3	51.20	10250	59.10
.055 (1.4 mm)	.385	.770 (14x)	1/8	2-1/2	13855	46.00	13855-C3	51.20	10255	59.10
.060	.500	1.000 (16x)	1/8	2-1/2	13860	47.00	13860-C3	52.20	10260	60.10
.062 (1/16)	.312	.500 (8x)	1/8	2-1/2	750462	44.90	750462-C3	50.10		
.062 (1/16)	.500	.625 (10x)	1/8	2-1/2	803562	46.00	803562-C3	51.20	803362	59.10
.062 (1/16)	.500	1.000 (16x)	1/8	2-1/2	13862	47.00	13862-C3	52.20	10262	60.10
.065	.500	1.000 (15x)	1/8	2-1/2	13865	46.50	13865-C3	51.70	10265	59.60
.070	.500	1.000 (14x)	1/8	2-1/2	13870	46.00	13870-C3	51.20	10270	59.10
.075	.500	1.000 (13x)	1/8	2-1/2	13875	46.00	13875-C3	51.20	10275	59.10
.078 (5/64)	.500	1.000 (12x)	1/8	2-1/2	13878	46.00	13878-C3	51.20	10278	59.10
.080	.750	1.250 (15x)	1/8	2-1/2	13880	46.00	13880-C3	51.20	10280	59.10
.085	.750	1.250 (14x)	1/8	2-1/2	13885	46.00	13885-C3	51.20	10285	59.10
.090	.750	1.250 (13x)	1/8	2-1/2	13890	46.50	13890-C3	51.70	10290	59.60
.093 (3/32)	.500	.750 (8x)	1/8	2-1/2	750493	44.90	750493-C3	50.10		
.093 (3/32)	.750	1.250 (13x)	1/8	2-1/2	13893	46.00	13893-C3	51.20	10293	59.10
.095	.750	1.250 (13x)	1/8	2-1/2	13895	46.00	13895-C3	51.20	10295	59.10
.100	.750	1.250 (12x)	1/8	2-1/2	14800	46.00	14800-C3	51.20	10300	59.10
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)	1.000	1.500 (12x)	1/8	2-1/2	14808	46.00	14808-C3	51.20	10308	59.10
.187 (3/16)	1.125	1.625 (8x)	3/16	3	14812	49.80	14812-C3	55.40	10312	67.90
.250 (1/4)	1.500	2.000 (8x)	1/4	4	14816	55.80	14816-C3	61.40	10316	76.40

# MINIATURE END MILLS

## Ball - Extra Long Length



- Up to 8" overall length
- Longest overall length carbide end mill available in stock
- Extended reach
- 4 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA

BALL

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE
.250 (1/4)	.375	4.375 (17.5x)	1/4	6	14916	100.60	14916-C3	110.70
.312 (5/16)	.470	4.343 (14x)	5/16	6	14920	121.60	14920-C3	136.70
.375 (3/8)	.562	4.312 (11.5x)	3/8	6	14924	137.90	14924-C3	153.50
.500 (1/2)	.750	5.750 (11.5x)	1/2	8	14932	240.00	14932-C3	271.10
.625 (5/8)	.937	5.687 (9x)	5/8	8	14940	405.70		
.750 (3/4)	1.125	5.625 (7.5x)	3/4	8	14948	487.70		



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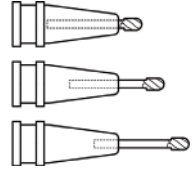
## MINIATURE END MILLS

## Ball – Reduced Shank



- Reduced straight shank allows any chucking depth
- Solid carbide construction for maximum rigidity
- Long length design for deep cavity machining
- Length of cut = 1½ x diameter
- Center cutting
- Solid carbide
- CNC ground in the USA

Chuck at  
Any Depth!



BALL

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
					TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2 \text{ (h6)}$	$L_1$				
<b>1/8</b>	3/16	2	<b>3 mm</b>	2-1/2	24708	100.60	24708-C3	105.80
<b>1/8</b>	3/16	4	<b>3 mm</b>	2-1/2	804208	104.20	804208-C3	109.40
<b>5/32</b>	15/64	2	<b>1/8</b>	2-1/2	24710	100.60	24710-C3	106.20
<b>3/16</b>	9/32	2	<b>1/8</b>	2-1/2	24712	101.60	24712-C3	107.20
<b>3/16</b>	9/32	2	<b>5/32</b>	2-1/2	24713	103.90	24713-C3	109.50
<b>3/16</b>	9/32	4	<b>5/32</b>	2-1/2	804212	108.50	804212-C3	114.10
<b>1/4</b>	3/8	2	<b>3/16</b>	3	24716	109.00	24716-C3	116.60
<b>1/4</b>	3/8	4	<b>3/16</b>	3	804216	112.90	804216-C3	120.50
<b>5/16</b>	15/32	2	<b>1/4</b>	4	24720	133.90	24720-C3	144.60
<b>3/8</b>	9/16	2	<b>5/16</b>	4	24724	158.20	24724-C3	172.00
<b>7/16</b>	21/32	2	<b>3/8</b>	6	24728	235.30	24728-C3	252.20
<b>1/2</b>	3/4	2	<b>7/16</b>	6	24732	245.90	24732-C3	261.00
<b>5/8</b>	15/16	2	<b>1/2</b>	6	24740	318.80	24740-C3	341.30
<b>3/4</b>	1-1/8	2	<b>5/8</b>	6	24748	394.00	24748-C3	417.60

For Square Reduced Shank, please see page 42.

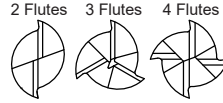
For Corner Radius Reduced Shank, please see page 89.

# MINIATURE END MILLS

## Corner Radius – Stub & Standard



- Corner radius for improved strength
- Center cutting
- Solid carbide
- CNC ground in the USA



Stub Flute & Standard Length



CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.		UNCOATED				AITIN COATED			AMORPHOUS DIAMOND		
			D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	R <sup>+0.001"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>										
.008	.002	.012 (1.5x)	1/8	1-1/2			856008	52.40		856008-C3	57.60			
.008	.002	.024 (3x)	1/8	1-1/2			854208	52.40		854208-C3	57.60			
.010	.003	.015 (1.5x)	1/8	1-1/2			987510	47.20		987510-C3	52.40			
.010	.003	.030 (3x)	1/8	1-1/2			47210	47.20		47210-C3	52.40			
.012	.003	.018 (1.5x)	1/8	1-1/2			987512	48.10		987512-C3	53.30			
.012	.003	.036 (3x)	1/8	1-1/2			47212	48.10		47212-C3	53.30			
.015 (1/64)	.003	.023 (1.5x)	1/8	1-1/2			987515	47.20		987515-C3	52.40			
.015 (1/64)	.003	.045 (3x)	1/8	1-1/2	45415		47215	47.20		47215-C3	52.40	47215-C4	60.30	
.015 (1/64)	.005	.023 (1.5x)	1/8	1-1/2			993815	47.20		993815-C3	52.40			
.015 (1/64)	.005	.045 (3x)	1/8	1-1/2	44715		26315	47.20		26315-C3	52.40			
.018	.005	.027 (1.5x)	1/8	1-1/2			993818	47.20		993818-C3	52.40			
.018	.005	.054 (3x)	1/8	1-1/2			26318	47.20		26318-C3	52.40			
.020 (.5 mm)	.003	.030 (1.5x)	1/8	1-1/2			987520	45.20		987520-C3	50.40			
.020 (.5 mm)	.003	.060 (3x)	1/8	1-1/2			47220	45.20		47220-C3	50.40			
.020 (.5 mm)	.005	.030 (1.5x)	1/8	1-1/2			993820	45.20		993820-C3	50.40			
.020 (.5 mm)	.005	.060 (3x)	1/8	1-1/2	44720	848320	26320	45.20	848320-C3	26320-C3	50.40	26320-C4	58.30	
.022	.005	.066 (3x)	1/8	1-1/2			26322	41.10		26322-C3	46.30			
.024 (.6 mm)	.005	.072 (3x)	1/8	1-1/2			26324	41.10		26324-C3	46.30			
.025	.003	.038 (1.5x)	1/8	1-1/2			987525	41.10		987525-C3	46.30			
.025	.003	.075 (3x)	1/8	1-1/2			47225	41.10		47225-C3	46.30			
.025	.005	.038 (1.5x)	1/8	1-1/2			993825	41.10		993825-C3	46.30			
.025	.005	.075 (3x)	1/8	1-1/2	44725		26325	41.10		26325-C3	46.30	26325-C4	54.20	
.025	.008	.038 (1.5x)	1/8	1-1/2			994525	41.10		994525-C3	46.30			
.025	.008	.075 (3x)	1/8	1-1/2			953025	41.10		953025-C3	46.30			
.028 (.7mm)	.005	.084 (3x)	1/8	1-1/2			26328	38.10		26328-C3	43.30			
.030	.003	.090 (3x)	1/8	1-1/2			47230	38.10		47230-C3	43.30			
.030	.005	.045 (1.5x)	1/8	1-1/2			993830	38.10		993830-C3	43.30			
.030	.005	.090 (3x)	1/8	1-1/2	44730		26330	38.10		26330-C3	43.30	26330-C4	51.20	
.030	.008	.090 (3x)	1/8	1-1/2			953030	38.10		953030-C3	43.30			
.030	.010	.045 (1.5x)	1/8	1-1/2			994530	38.10		994530-C3	43.30			
.030	.010	.090 (3x)	1/8	1-1/2	45230		27230	38.10		27230-C3	43.30	27230-C4	51.20	
.031 (1/32)	.003	.047 (1.5x)	1/8	1-1/2			987531	38.10		987531-C3	43.30			
.031 (1/32)	.003	.093 (3x)	1/8	1-1/2			47231	38.10		47231-C3	43.30	47231-C4	51.20	
.031 (1/32)	.005	.047 (1.5x)	1/8	1-1/2			993831	38.10		993831-C3	43.30			
.031 (1/32)	.005	.093 (3x)	1/8	1-1/2	44731	848331	26331	38.10	848331-C3	26331-C3	43.30	44731-C4	26331-C4	51.20
.031 (1/32)	.008	.047 (1.5x)	1/8	1-1/2			913731	38.10		913731-C3	43.30			
.031 (1/32)	.008	.093 (3x)	1/8	1-1/2			953031	38.10		953031-C3	43.30			
.031 (1/32)	.010	.047 (1.5x)	1/8	1-1/2			994531	38.10		994531-C3	43.30			
.031 (1/32)	.010	.093 (3x)	1/8	1-1/2	45231	854131	27231	38.10	854131-C3	27231-C3	43.30	27231-C4	51.20	
.034	.005	.102 (3x)	1/8	1-1/2			26334	32.00		26334-C3	37.20			

continued on next page

# MINIATURE END MILLS

## Corner Radius – Stub & Standard (cont.)

continued from previous page

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.		UNCOATED				AITIN COATED			AMORPHOUS DIAMOND				
			D <sub>2</sub>	OAL	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE		
.035 (.9 mm)	.005	.053 (1.5x)	1/8	1-1/2				993835	32.00			993835-C3	37.20			
.035 (.9 mm)	.005	.105 (3x)	1/8	1-1/2	44735			26335	32.00			26335-C3	37.20		26335-C4	45.10
.035 (.9 mm)	.010	.053 (1.5x)	1/8	1-1/2				994535	32.00			994535-C3	37.20			
.035 (.9 mm)	.010	.105 (3x)	1/8	1-1/2	45235			27235	32.00			27235-C3	37.20		27235-C4	45.10
.037	.005	.111 (3x)	1/8	1-1/2				26337	32.00			26337-C3	37.20			
.039 (1 mm)	.003	.059 (1.5x)	1/8	1-1/2				987539	24.80			987539-C3	30.00			
.039 (1 mm)	.003	.117 (3x)	1/8	1-1/2				47239	24.80			47239-C3	30.00			
.039 (1 mm)	.005	.059 (1.5x)	1/8	1-1/2	804539			993839	24.80			993839-C3	30.00			
.039 (1 mm)	.005	.117 (3x)	1/8	1-1/2	44739			26339	24.80			26339-C3	30.00			
.039 (1 mm)	.008	.059 (1.5x)	1/8	1-1/2				913739	24.80			913739-C3	30.00			
.039 (1 mm)	.008	.117 (3x)	1/8	1-1/2				953039	24.80			953039-C3	30.00			
.039 (1 mm)	.010	.059 (1.5x)	1/8	1-1/2				994539	24.80			994539-C3	30.00			
.039 (1 mm)	.010	.117 (3x)	1/8	1-1/2				27239	24.80			27239-C3	30.00			
.040	.003	.120 (3x)	1/8	1-1/2				47240	24.40			47240-C3	29.60			
.040	.005	.060 (1.5x)	1/8	1-1/2	804540	865140	993840	24.40		865140-C3	993840-C3	29.60				
.040	.005	.120 (3x)	1/8	1-1/2	44740	848340	26340	24.40		848340-C3	26340-C3	29.60			26340-C4	37.50
.040	.008	.120 (3x)	1/8	1-1/2				953040	24.40			953040-C3	29.60			
.040	.010	.060 (1.5x)	1/8	1-1/2				994540	24.40			994540-C3	29.60			
.040	.010	.120 (3x)	1/8	1-1/2	45240			27240	24.40			27240-C3	29.60		27240-C4	37.50
.045	.005	.068 (1.5x)	1/8	1-1/2				993845	24.40			993845-C3	29.60			
.045	.005	.135 (3x)	1/8	1-1/2	44745			26345	24.40			26345-C3	29.60		26345-C4	37.50
.045	.010	.068 (1.5x)	1/8	1-1/2				994545	24.40			994545-C3	29.60			
.045	.010	.135 (3x)	1/8	1-1/2	45245			27245	24.40			27245-C3	29.60		27245-C4	37.50
.045	.015	.068 (1.5x)	1/8	1-1/2				997945	24.40			997945-C3	29.60			
.045	.015	.135 (3x)	1/8	1-1/2	45545			28145	24.40			28145-C3	29.60		28145-C4	37.50
.046	.005	.138 (3x)	1/8	1-1/2				26346	24.40			26346-C3	29.60			
.047 (3/64)	.003	.071 (1.5x)	1/8	1-1/2				987547	24.40			987547-C3	29.60			
.047 (3/64)	.003	.141 (3x)	1/8	1-1/2				47247	24.40			47247-C3	29.60			
.047 (3/64)	.005	.071 (1.5x)	1/8	1-1/2				993847	24.40			993847-C3	29.60			
.047 (3/64)	.005	.141 (3x)	1/8	1-1/2	44747	848347	26347	24.40		848347-C3	26347-C3	29.60			26347-C4	37.50
.047 (3/64)	.008	.071 (1.5x)	1/8	1-1/2				913747	24.40			913747-C3	29.60			
.047 (3/64)	.008	.141 (3x)	1/8	1-1/2				953047	24.40			953047-C3	29.60			
.047 (3/64)	.010	.071 (1.5x)	1/8	1-1/2				994547	24.40			994547-C3	29.60			
.047 (3/64)	.010	.141 (3x)	1/8	1-1/2	45247			27247	24.40			27247-C3	29.60		27247-C4	37.50
.047 (3/64)	.012	.141 (3x)	1/8	1-1/2				966947	24.40			966947-C3	29.60			
.047 (3/64)	.015	.071 (1.5x)	1/8	1-1/2	830147	860847	997947	24.40		860847-C3	997947-C3	29.60				
.047 (3/64)	.015	.141 (3x)	1/8	1-1/2	45547	867247	28147	24.40		867247-C3	28147-C3	29.60			28147-C4	37.50
.050	.003	.150 (3x)	1/8	1-1/2				47250	24.40			47250-C3	29.60			
.050	.005	.075 (1.5x)	1/8	1-1/2				993850	24.40			993850-C3	29.60			
.050	.005	.150 (3x)	1/8	1-1/2	44750	848350	26350	24.40		848350-C3	26350-C3	29.60			26350-C4	37.50
.050	.008	.075 (1.5x)	1/8	1-1/2				913750	24.90			913750-C3	30.10			
.050	.008	.150 (3x)	1/8	1-1/2				953050	24.40			953050-C3	29.60			
.050	.010	.075 (1.5x)	1/8	1-1/2				994550	24.40			994550-C3	29.60			
.050	.010	.150 (3x)	1/8	1-1/2	45250			27250	24.40			27250-C3	29.60		27250-C4	37.50
.050	.012	.150 (3x)	1/8	1-1/2				966950	24.90			966950-C3	30.10			
.050	.015	.075 (1.5x)	1/8	1-1/2				997950	24.40			997950-C3	29.60			
.050	.015	.150 (3x)	1/8	1-1/2	45550			28150	24.40			28150-C3	29.60		28150-C4	37.50

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CORNER RADIUS

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# MINIATURE END MILLS

## Corner Radius – Stub & Standard (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.		UNCOATED				AITIN COATED			AMORPHOUS DIAMOND		
			D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
D <sub>1</sub> $\pm \frac{+.0005"}{- .0005"}$	R $\pm \frac{+.001"}{- .001"}$	L <sub>2</sub> $\pm \frac{+.010"}{- .000"}$												
.055 (1.4 mm)	<b>.003</b>	.165 (3x)	1/8	1-1/2				47255	24.40		47255-C3	29.60		
.055 (1.4 mm)	<b>.005</b>	.083 (1.5x)	1/8	1-1/2				993855	24.40		993855-C3	29.60		
.055 (1.4 mm)	<b>.005</b>	.165 (3x)	1/8	1-1/2	44755			26355	24.40		26355-C3	29.60	26355-C4	37.50
.055 (1.4 mm)	<b>.008</b>	.165 (3x)	1/8	1-1/2				953055	24.40		953055-C3	29.60		
.055 (1.4 mm)	<b>.010</b>	.083 (1.5x)	1/8	1-1/2				994555	24.40		994555-C3	29.60		
.055 (1.4 mm)	<b>.010</b>	.165 (3x)	1/8	1-1/2	45255			27255	24.40		27255-C3	29.60	27255-C4	37.50
.055 (1.4 mm)	<b>.015</b>	.083 (1.5x)	1/8	1-1/2				997955	24.40		997955-C3	29.60		
.055 (1.4 mm)	<b>.015</b>	.165 (3x)	1/8	1-1/2	45555			28155	24.40		28155-C3	29.60	28155-C4	37.50
.059	<b>.005</b>	.177 (3x)	1/8	1-1/2				26359	24.40		26359-C3	29.60		
.060	<b>.003</b>	.180 (3x)	1/8	1-1/2				47260	24.40		47260-C3	29.60		
.060	<b>.005</b>	.090 (1.5x)	1/8	1-1/2				993860	24.40		993860-C3	29.60		
.060	<b>.005</b>	.180 (3x)	1/8	1-1/2	44760	848360	26360	24.40		848360-C3	26360-C3	29.60	26360-C4	37.50
.060	<b>.008</b>	.180 (3x)	1/8	1-1/2				953060	24.40		953060-C3	29.60		
.060	<b>.010</b>	.090 (1.5x)	1/8	1-1/2				994560	24.40		994560-C3	29.60		
.060	<b>.010</b>	.180 (3x)	1/8	1-1/2	45260			27260	24.40		27260-C3	29.60	27260-C4	37.50
.060	<b>.015</b>	.090 (1.5x)	1/8	1-1/2				997960	24.40		997960-C3	29.60		
.060	<b>.015</b>	.180 (3x)	1/8	1-1/2	45560			28160	24.40		28160-C3	29.60	28160-C4	37.50
.060	<b>.020</b>	.090 (1.5x)	1/8	1-1/2				966460	24.40		966460-C3	29.60		
.060	<b>.020</b>	.180 (3x)	1/8	1-1/2				51660	24.40		51660-C3	29.60		
.062 (1/16)	<b>.003</b>	.093 (1.5x)	1/8	1-1/2				987562	24.40		987562-C3	29.60		
.062 (1/16)	<b>.003</b>	.186 (3x)	1/8	1-1/2	45462			47262	24.40		47262-C3	29.60		
.062 (1/16)	<b>.005</b>	.093 (1.5x)	1/8	1-1/2	804562	865162	993862	24.40		865162-C3	993862-C3	29.60	993862-C4	37.50
.062 (1/16)	<b>.005</b>	.186 (3x)	1/8	1-1/2	44762	848362	26362	24.40		848362-C3	26362-C3	29.60	44762-C4	26362-C4 37.50
.062 (1/16)	<b>.008</b>	.093 (1.5x)	1/8	1-1/2				913762	24.40		913762-C3	29.60		
.062 (1/16)	<b>.008</b>	.186 (3x)	1/8	1-1/2	843962			953062	24.40		953062-C3	29.60		
.062 (1/16)	<b>.010</b>	.093 (1.5x)	1/8	1-1/2	830362	864662	994562	24.40		864662-C3	994562-C3	29.60	994562-C4	37.50
.062 (1/16)	<b>.010</b>	.186 (3x)	1/8	1-1/2	45262	854162	27262	24.40		854162-C3	27262-C3	29.60	45262-C4	27262-C4 37.50
.062 (1/16)	<b>.012</b>	.093 (1.5x)	1/8	1-1/2				904862	24.40		904862-C3	29.60		
.062 (1/16)	<b>.012</b>	.186 (3x)	1/8	1-1/2				966962	24.40		966962-C3	29.60		
.062 (1/16)	<b>.015</b>	.093 (1.5x)	1/8	1-1/2	830162	860862	997962	24.40		860862-C3	997962-C3	29.60		
.062 (1/16)	<b>.015</b>	.186 (3x)	1/8	1-1/2	45562	867262	28162	24.40		867262-C3	28162-C3	29.60	28162-C4	37.50
.062 (1/16)	<b>.020</b>	.093 (1.5x)	1/8	1-1/2	810662			966462	24.40		966462-C3	29.60		
.062 (1/16)	<b>.020</b>	.186 (3x)	1/8	1-1/2	51362	857762	51662	24.40		857762-C3	51662-C3	29.60	51362-C4	51662-C4 37.50
.065	<b>.005</b>	.098 (1.5x)	1/8	1-1/2				993865	24.40		993865-C3	29.60		
.065	<b>.005</b>	.195 (3x)	1/8	1-1/2	44765			26365	24.40		26365-C3	29.60	26365-C4	37.50
.065	<b>.010</b>	.098 (1.5x)	1/8	1-1/2				994565	24.40		994565-C3	29.60		
.065	<b>.010</b>	.195 (3x)	1/8	1-1/2	45265			27265	24.40		27265-C3	29.60	27265-C4	37.50
.065	<b>.015</b>	.195 (3x)	1/8	1-1/2	45565			28165	24.40		28165-C3	29.60	28165-C4	37.50
.065	<b>.020</b>	.195 (3x)	1/8	1-1/2				51665	24.90		51665-C3	30.10		
.070	<b>.003</b>	.210 (3x)	1/8	1-1/2				47270	24.40		47270-C3	29.60		
.070	<b>.005</b>	.105 (1.5x)	1/8	1-1/2				993870	24.40		993870-C3	29.60		
.070	<b>.005</b>	.210 (3x)	1/8	1-1/2	44770			26370	24.40		26370-C3	29.60	26370-C4	37.50
.070	<b>.008</b>	.210 (3x)	1/8	1-1/2				953070	24.40		953070-C3	29.60		
.070	<b>.010</b>	.105 (1.5x)	1/8	1-1/2				994570	24.40		994570-C3	29.60		
.070	<b>.010</b>	.210 (3x)	1/8	1-1/2	45270			27270	24.40		27270-C3	29.60	27270-C4	37.50
.070	<b>.015</b>	.210 (3x)	1/8	1-1/2	45570			28170	24.40		28170-C3	29.60	28170-C4	37.50
.070	<b>.020</b>	.105 (1.5x)	1/8	1-1/2				966470	24.90		966470-C3	30.10		
.070	<b>.020</b>	.210 (3x)	1/8	1-1/2				51670	24.40		51670-C3	29.60		

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# MINIATURE END MILLS

## Corner Radius – Stub & Standard (cont.)

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CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.		UNCOATED				AITIN COATED			AMORPHOUS DIAMOND		
			D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	R <sup>+0.001"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>										
.075	.005	.113 (1.5x)	1/8	1-1/2				993875	24.40		993875-C3	29.60		
.075	.005	.225 (3x)	1/8	1-1/2	44775			26375	24.40		26375-C3	29.60	26375-C4	37.50
.075	.010	.113 (1.5x)	1/8	1-1/2				994575	24.40		994575-C3	29.60		
.075	.010	.225 (3x)	1/8	1-1/2	45275			27275	24.40		27275-C3	29.60	27275-C4	37.50
.075	.015	.225 (3x)	1/8	1-1/2	45575			28175	24.40		28175-C3	29.60	28175-C4	37.50
<b>NEW</b> .078 (5/64)	.003	.117 (1.5x)	1/8	1-1/2				987578	24.40		987578-C3	29.60		
.078 (5/64)	.003	.234 (3x)	1/8	1-1/2				47278	24.40		47278-C3	29.60		
.078 (5/64)	.005	.117 (1.5x)	1/8	1-1/2				993878	24.40		993878-C3	29.60		
.078 (5/64)	.005	.234 (3x)	1/8	1-1/2	44778	848378	26378	24.40	24.40	848378-C3	26378-C3	29.60	26378-C4	37.50
.078 (5/64)	.008	.117 (1.5x)	1/8	1-1/2				913778	24.40		913778-C3	29.60		
.078 (5/64)	.008	.234 (3x)	1/8	1-1/2				953078	24.40		953078-C3	29.60		
.078 (5/64)	.010	.117 (1.5x)	1/8	1-1/2	830378	864678	994578	24.40	24.40	864678-C3	994578-C3	29.60	994578-C4	37.50
.078 (5/64)	.010	.234 (3x)	1/8	1-1/2	45278	854178	27278	24.40	24.40	854178-C3	27278-C3	29.60	27278-C4	37.50
.078 (5/64)	.012	.234 (3x)	1/8	1-1/2				966978	24.40		966978-C3	29.60		
.078 (5/64)	.015	.117 (1.5x)	1/8	1-1/2				860878	24.40	860878-C3	997978-C3	29.60		
.078 (5/64)	.015	.234 (3x)	1/8	1-1/2	45578	867278	28178	24.40	24.40	867278-C3	28178-C3	29.60	28178-C4	37.50
.078 (5/64)	.020	.117 (1.5x)	1/8	1-1/2	810678			966478	24.40		966478-C3	29.60		
.078 (5/64)	.020	.234 (3x)	1/8	1-1/2	51378	857778	51678	24.40	24.40	857778-C3	51678-C3	29.60	51678-C4	37.50
.078 (5/64)	.025	.117 (1.5x)	1/8	1-1/2				964078	24.40		964078-C3	29.60		
.078 (5/64)	.025	.234 (3x)	1/8	1-1/2				842678	24.40	842678-C3	957178-C3	29.60		
.080	.003	.240 (3x)	1/8	1-1/2				47280	24.40		47280-C3	29.60		
.080	.005	.120 (1.5x)	1/8	1-1/2				993880	24.40		993880-C3	29.60		
.080	.005	.240 (3x)	1/8	1-1/2	44780			26380	24.40		26380-C3	29.60	26380-C4	37.50
.080	.008	.240 (3x)	1/8	1-1/2				953080	24.90		953080-C3	30.10		
.080	.010	.120 (1.5x)	1/8	1-1/2				994580	24.40		994580-C3	29.60		
.080	.010	.240 (3x)	1/8	1-1/2	45280			27280	24.40		27280-C3	29.60	27280-C4	37.50
.080	.015	.240 (3x)	1/8	1-1/2	45580			28180	24.40		28180-C3	29.60	28180-C4	37.50
.080	.020	.240 (3x)	1/8	1-1/2				51680	24.40		51680-C3	29.60		
.085	.005	.128 (1.5x)	1/8	1-1/2				993885	24.40		993885-C3	29.60		
.085	.005	.255 (3x)	1/8	1-1/2	44785			26385	24.40		26385-C3	29.60	26385-C4	37.50
.085	.010	.128 (1.5x)	1/8	1-1/2				994585	24.40		994585-C3	29.60		
.085	.010	.255 (3x)	1/8	1-1/2	45285			27285	24.40		27285-C3	29.60	27285-C4	37.50
.085	.015	.255 (3x)	1/8	1-1/2	45585			28185	24.40		28185-C3	29.60	28185-C4	37.50
<b>NEW</b> .085	.020	.255 (3x)	1/8	1-1/2				51685	24.40		51685-C3	29.60		
.090	.003	.270 (3x)	1/8	1-1/2				47290	24.90		47290-C3	30.10		
.090	.005	.135 (1.5x)	1/8	1-1/2				993890	24.40		993890-C3	29.60		
.090	.005	.270 (3x)	1/8	1-1/2	44790			26390	24.40		26390-C3	29.60	26390-C4	37.50
.090	.008	.270 (3x)	1/8	1-1/2				953090	24.40		953090-C3	29.60		
.090	.010	.135 (1.5x)	1/8	1-1/2				994590	24.40		994590-C3	29.60		
.090	.010	.270 (3x)	1/8	1-1/2	45290			27290	24.40		27290-C3	29.60	27290-C4	37.50
.090	.015	.135 (1.5x)	1/8	1-1/2				997990	24.40		997990-C3	29.60		
.090	.015	.270 (3x)	1/8	1-1/2	45590			28190	24.40		28190-C3	29.60	28190-C4	37.50
.090	.020	.135 (1.5x)	1/8	1-1/2				966490	24.40		966490-C3	29.60		
.090	.020	.270 (3x)	1/8	1-1/2				51690	24.40		51690-C3	29.60		
.090	.030	.135 (1.5x)	1/8	1-1/2				958890	24.40		958890-C3	29.60		
.090	.030	.270 (3x)	1/8	1-1/2				28690	24.40		28690-C3	29.60		

CORNER RADIUS

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# MINIATURE END MILLS

## Corner Radius – Stub & Standard (cont.)

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NEW	CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.		UNCOATED				A1TiN COATED			AMORPHOUS DIAMOND			
				D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE	
	.118 (3 mm)	<b>.003</b>	.354 (3x)	1/8	1-1/2											
	.118 (3 mm)	<b>.005</b>	.177 (1.5x)	1/8	1-1/2											
	.118 (3 mm)	<b>.005</b>	.354 (3x)	1/8	1-1/2											
	.118 (3 mm)	<b>.008</b>	.177 (1.5x)	1/8	1-1/2											
	.118 (3 mm)	<b>.008</b>	.354 (3x)	1/8	1-1/2											
	.118 (3 mm)	<b>.010</b>	.177 (1.5x)	1/8	1-1/2											
	.118 (3 mm)	<b>.010</b>	.354 (3x)	1/8	1-1/2											
	.118 (3 mm)	<b>.015</b>	.177 (1.5x)	1/8	1-1/2											
	.118 (3 mm)	<b>.015</b>	.354 (3x)	1/8	1-1/2	45605										
	.118 (3 mm)	<b>.020</b>	.177 (1.5x)	1/8	1-1/2											
	.118 (3 mm)	<b>.020</b>	.354 (3x)	1/8	1-1/2											
	.118 (3 mm)	<b>.030</b>	.177 (1.5x)	1/8	1-1/2											
	.118 (3 mm)	<b>.030</b>	.354 (3x)	1/8	1-1/2											
	.118 (3 mm)	<b>.030</b>	.354 (3x)	1/8	1-1/2											937605-C4 37.90
	.118 (3 mm)	<b>.040</b>	.354 (3x)	1/8	1-1/2											

CORNER RADIUS

NEW	D <sub>1</sub>	CORNER RADIUS	L <sub>2</sub>	SHANK DIA.		UNCOATED				A1TiN COATED			AMORPHOUS DIAMOND			
				D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE	
	.125 (1/8)	<b>.003</b>	.187 (1.5x)	1/8	1-1/2											
	.125 (1/8)	<b>.003</b>	.500 (4x)	1/8	1-1/2	46403										
	.125 (1/8)	<b>.005</b>	.187 (1.5x)	1/8	1-1/2	832905	833405	980205	24.40	833405-C3	980205-C3	29.60				
	.125 (1/8)	<b>.005</b>	.500 (4x)	1/8	1-1/2	46405	870905	32405	24.40	870905-C3	32405-C3	29.60			32405-C4	37.50
	.125 (1/8)	<b>.008</b>	.187 (1.5x)	1/8	1-1/2											
	.125 (1/8)	<b>.008</b>	.500 (4x)	1/8	1-1/2	46408			24.40							
	.125 (1/8)	<b>.010</b>	.187 (1.5x)	1/8	1-1/2	832910	833410	980210	22.90	833410-C3	980210-C3	28.10				
	.125 (1/8)	<b>.010</b>	.500 (4x)	1/8	1-1/2	46410	870910	32410	22.90	870910-C3	32410-C3	28.10			46410-C4	32410-C4 36.00
	.125 (1/8)	<b>.012</b>	.187 (1.5x)	1/8	1-1/2											
	.125 (1/8)	<b>.012</b>	.500 (4x)	1/8	1-1/2											
	.125 (1/8)	<b>.015</b>	.187 (1.5x)	1/8	1-1/2	832915	833415	980215	22.90	833415-C3	980215-C3	28.10				
	.125 (1/8)	<b>.015</b>	.500 (4x)	1/8	1-1/2	46415	870915	32415	22.90	870915-C3	32415-C3	28.10				
	.125 (1/8)	<b>.020</b>	.187 (1.5x)	1/8	1-1/2	832920	833420	980220	22.90	833420-C3	980220-C3	28.10				
	.125 (1/8)	<b>.020</b>	.500 (4x)	1/8	1-1/2	46420	870920	32420	22.90	870920-C3	32420-C3	28.10				
	.125 (1/8)	<b>.025</b>	.187 (1.5x)	1/8	1-1/2											
	.125 (1/8)	<b>.025</b>	.500 (4x)	1/8	1-1/2	46425			24.40							
	.125 (1/8)	<b>.030</b>	.187 (1.5x)	1/8	1-1/2	832930	833430	980230	22.90	833430-C3	980230-C3	28.10				
	.125 (1/8)	<b>.030</b>	.500 (4x)	1/8	1-1/2	46430	870930	32430	22.90	870930-C3	32430-C3	28.10				
	.125 (1/8)	<b>.040</b>	.187 (1.5x)	1/8	1-1/2											
	.125 (1/8)	<b>.040</b>	.500 (4x)	1/8	1-1/2	46440			24.40							
	.125 (1/8)	<b>.045</b>	.187 (1.5x)	1/8	1-1/2											
	.125 (1/8)	<b>.045</b>	.500 (4x)	1/8	1-1/2											
	.140 (9/64)	<b>.005</b>	.220 (1.5x)	3/16	2											
	.140 (9/64)	<b>.005</b>	.425 (3x)	3/16	2											
	.140 (9/64)	<b>.008</b>	.425 (3x)	3/16	2											
	.140 (9/64)	<b>.010</b>	.220 (1.5x)	3/16	2											
	.140 (9/64)	<b>.010</b>	.425 (3x)	3/16	2	810910										
	.140 (9/64)	<b>.012</b>	.425 (3x)	3/16	2											
	.140 (9/64)	<b>.015</b>	.220 (1.5x)	3/16	2											
	.140 (9/64)	<b>.015</b>	.425 (3x)	3/16	2	810915	832115	966715	27.80	832115-C3	966715-C3	33.40				
	.140 (9/64)	<b>.020</b>	.220 (1.5x)	3/16	2											
	.140 (9/64)	<b>.020</b>	.425 (3x)	3/16	2											

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# MINIATURE END MILLS

## Corner Radius – Stub & Standard (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.	OAL	UNCOATED				AITIN COATED			AMORPHOUS DIAMOND			
					2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE	
D <sub>1</sub> <sup>+0.001"</sup> / <sub>-.002"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>											
.140 (9/64)	.030	.220 (1.5x)	3/16	2				857130	27.80		857130-C3	33.40			
.140 (9/64)	.030	.425 (3x)	3/16	2				966730	27.80		966730-C3	33.40			
.140 (9/64)	.040	.220 (1.5x)	3/16	2				857140	29.60		857140-C3	35.20			
.140 (9/64)	.040	.425 (3x)	3/16	2				966740	29.60		966740-C3	35.20			
.140 (9/64)	.045	.220 (1.5x)	3/16	2				857145	27.80		857145-C3	33.40			
.140 (9/64)	.045	.425 (3x)	3/16	2				966745	27.80		966745-C3	33.40			
.156 (5/32)	.005	.235 (1.5x)	3/16	2				954805	27.10		954805-C3	32.70			
.156 (5/32)	.005	.562 (3x)	3/16	2				75205	27.10		75205-C3	32.70			
.156 (5/32)	.008	.562 (3x)	3/16	2				75208	27.10		75208-C3	32.70			NEW
.156 (5/32)	.010	.235 (1.5x)	3/16	2				954810	25.40		954810-C3	31.00			
.156 (5/32)	.010	.562 (3x)	3/16	2	71910			75210	25.40		75210-C3	31.00			
.156 (5/32)	.015	.235 (1.5x)	3/16	2				954815	25.40		954815-C3	31.00			
.156 (5/32)	.015	.562 (3x)	3/16	2	71915			75215	25.40		75215-C3	31.00			
.156 (5/32)	.020	.235 (1.5x)	3/16	2				954820	25.40		954820-C3	31.00			
.156 (5/32)	.020	.562 (3x)	3/16	2				75220	25.40		75220-C3	31.00	75220-C4	43.50	
.156 (5/32)	.025	.562 (3x)	3/16	2				75225	25.40		75225-C3	31.00			
.156 (5/32)	.030	.235 (1.5x)	3/16	2				954830	25.40		954830-C3	31.00			
.156 (5/32)	.030	.562 (3x)	3/16	2	71930	832030		75230	25.40	832030-C3	75230-C3	31.00	75230-C4	43.50	
.156 (5/32)	.040	.235 (1.5x)	3/16	2				954840	27.10		954840-C3	32.70			
.156 (5/32)	.040	.562 (3x)	3/16	2				75240	27.10		75240-C3	32.70			
.156 (5/32)	.045	.235 (1.5x)	3/16	2				954845	25.40		954845-C3	31.00			
.156 (5/32)	.045	.562 (3x)	3/16	2				75245	25.40		75245-C3	31.00			
.172 (11/64)	.005	.515 (3x)	3/16	2				855305	27.10		855305-C3	32.70			NEW
.172 (11/64)	.010	.260 (1.5x)	3/16	2				758710	27.10		758710-C3	32.70			NEW
.172 (11/64)	.010	.515 (3x)	3/16	2				855310	25.40		855310-C3	31.00			
.172 (11/64)	.020	.515 (3x)	3/16	2				855320	27.10		855320-C3	32.70			NEW
.172 (11/64)	.030	.515 (3x)	3/16	2				855330	25.40		855330-C3	31.00			
.187 (3/16)	.003	.625 (3x)	3/16	2				34803	27.10		34803-C3	32.70			NEW
.187 (3/16)	.005	.285 (1.5x)	3/16	2				937905	27.10		937905-C3	32.70	937905-C4	45.20	
.187 (3/16)	.005	.625 (3x)	3/16	2	46705			34805	27.10		34805-C3	32.70	34805-C4	45.20	
.187 (3/16)	.008	.285 (1.5x)	3/16	2				937908	27.10		937908-C3	32.70			
.187 (3/16)	.008	.625 (3x)	3/16	2		831908		34808	27.10	831908-C3	34808-C3	32.70			
.187 (3/16)	.010	.285 (1.5x)	3/16	2		833210		937910	25.40	833210-C3	937910-C3	31.00	937910-C4	43.50	
.187 (3/16)	.010	.625 (3x)	3/16	2	46710	831910		34810	25.40	831910-C3	34810-C3	31.00	46710-C4	34810-C4	43.50
.187 (3/16)	.012	.285 (1.5x)	3/16	2				937912	27.10		937912-C3	32.70			
.187 (3/16)	.012	.625 (3x)	3/16	2				34812	27.10		34812-C3	32.70			
.187 (3/16)	.015	.285 (1.5x)	3/16	2				937915	25.40		937915-C3	31.00			
.187 (3/16)	.015	.625 (3x)	3/16	2	46715			34815	25.40		34815-C3	31.00	46715-C4	34815-C4	43.50
.187 (3/16)	.020	.285 (1.5x)	3/16	2	810520			937920	25.60		937920-C3	31.20			
.187 (3/16)	.020	.625 (3x)	3/16	2	46720			34820	25.40		34820-C3	31.00			
.187 (3/16)	.025	.285 (1.5x)	3/16	2				937925	27.10		937925-C3	32.70			
.187 (3/16)	.025	.625 (3x)	3/16	2	46725			34825	27.10		34825-C3	32.70			
.187 (3/16)	.030	.285 (1.5x)	3/16	2	810530			937930	25.60		937930-C3	31.20	937930-C4	43.70	
.187 (3/16)	.030	.625 (3x)	3/16	2	46730	831930		34830	25.40	831930-C3	34830-C3	31.00	34830-C4	43.50	NEW
.187 (3/16)	.040	.285 (1.5x)	3/16	2				937940	27.10		937940-C3	32.70			
.187 (3/16)	.040	.625 (3x)	3/16	2	46740			34840	27.10		34840-C3	32.70	34840-C4	45.20	

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# MINIATURE END MILLS

## Corner Radius – Stub & Standard (cont.)

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NEW

NEW

NEW

CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.		UNCOATED				AITIN COATED			AMORPHOUS DIAMOND		
			D <sub>2</sub>	OAL	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
.187 (3/16)	<b>.045</b>	.285 (1.5x)	3/16	2				937945	25.40		937945-C3	31.00		
.187 (3/16)	<b>.045</b>	.625 (3x)	3/16	2	46745			34845	25.40		34845-C3	31.00	34845-C4	43.50
.187 (3/16)	<b>.050</b>	.285 (1.5x)	3/16	2				937950	27.10		937950-C3	32.70		
.187 (3/16)	<b>.050</b>	.625 (3x)	3/16	2				34850	27.10		34850-C3	32.70	34850-C4	45.20
.187 (3/16)	<b>.060</b>	.285 (1.5x)	3/16	2	810560	833260		937960	25.40	833260-C3	937960-C3	31.00		
.187 (3/16)	<b>.060</b>	.625 (3x)	3/16	2	46760	831960		34860	25.40	831960-C3	34860-C3	31.00	34860-C4	43.50
.203 (13/64)	<b>.010</b>	.610 (3x)	1/4	2-1/2				865610	31.60		865610-C3	39.20		
.203 (13/64)	<b>.030</b>	.610 (3x)	1/4	2-1/2				865630	31.60		865630-C3	39.20		
.203 (13/64)	<b>.040</b>	.610 (3x)	1/4	2-1/2				865640	32.20		865640-C3	39.80		
.218 (7/32)	<b>.010</b>	.660 (3x)	1/4	2-1/2				863910	31.30		863910-C3	38.90		
.218 (7/32)	<b>.030</b>	.660 (3x)	1/4	2-1/2				863930	31.30		863930-C3	38.90		
.218 (7/32)	<b>.040</b>	.660 (3x)	1/4	2-1/2				863940	31.30		863940-C3	38.90		
.234 (15/64)	<b>.010</b>	.705 (3x)	1/4	2-1/2				863510	31.30		863510-C3	38.90		
.234 (15/64)	<b>.030</b>	.705 (3x)	1/4	2-1/2				863530	31.30		863530-C3	38.90		
.234 (15/64)	<b>.040</b>	.705 (3x)	1/4	2-1/2				863540	32.20		863540-C3	39.80		
.250 (1/4)	<b>.003</b>	.750 (3x)	1/4	2-1/2				36203	33.30		36203-C3	40.90		
.250 (1/4)	<b>.005</b>	.375 (1.5x)	1/4	2-1/2	810805	833005		941105	33.30	833005-C3	941105-C3	40.90		
.250 (1/4)	<b>.005</b>	.750 (3x)	1/4	2-1/2	47405	831805		36205	33.30	831805-C3	36205-C3	40.90	36205-C4	53.90
.250 (1/4)	<b>.008</b>	.375 (1.5x)	1/4	2-1/2				941108	33.30		941108-C3	40.90		
.250 (1/4)	<b>.008</b>	.750 (3x)	1/4	2-1/2				36208	33.30		36208-C3	40.90		
.250 (1/4)	<b>.010</b>	.375 (1.5x)	1/4	2-1/2	810810	833010		941110	31.30	833010-C3	941110-C3	38.90		
.250 (1/4)	<b>.010</b>	.750 (3x)	1/4	2-1/2	47410	831810		36210	31.30	831810-C3	36210-C3	38.90	47410-C4	36210-C4 51.90
.250 (1/4)	<b>.012</b>	.750 (3x)	1/4	2-1/2				36212	33.30		36212-C3	40.90		
.250 (1/4)	<b>.015</b>	.375 (1.5x)	1/4	2-1/2				833015	31.30	833015-C3	941115-C3	38.90		
.250 (1/4)	<b>.015</b>	.750 (3x)	1/4	2-1/2	47415	831815		36215	31.30	831815-C3	36215-C3	38.90	36215-C4	51.90
.250 (1/4)	<b>.020</b>	.375 (1.5x)	1/4	2-1/2				941120	31.30		941120-C3	38.90	941120-C4	51.90
.250 (1/4)	<b>.020</b>	.750 (3x)	1/4	2-1/2	47420			36220	31.30		36220-C3	38.90	36220-C4	51.90
.250 (1/4)	<b>.025</b>	.375 (1.5x)	1/4	2-1/2				833025	33.30	833025-C3	941125-C3	40.90		
.250 (1/4)	<b>.025</b>	.750 (3x)	1/4	2-1/2				831825	36225	33.30	831825-C3	36225-C3	40.90	
.250 (1/4)	<b>.030</b>	.375 (1.5x)	1/4	2-1/2				941130	31.30		941130-C3	38.90	941130-C4	51.90
.250 (1/4)	<b>.030</b>	.750 (3x)	1/4	2-1/2	47430	831830		36230	31.30	831830-C3	36230-C3	38.90	47430-C4	36230-C4 51.90
.250 (1/4)	<b>.040</b>	.375 (1.5x)	1/4	2-1/2				833040	33.30	833040-C3	941140-C3	40.90		
.250 (1/4)	<b>.040</b>	.750 (3x)	1/4	2-1/2	47440	831840		36240	33.30	831840-C3	36240-C3	40.90		
.250 (1/4)	<b>.045</b>	.375 (1.5x)	1/4	2-1/2				941145	31.30		941145-C3	38.90		
.250 (1/4)	<b>.045</b>	.750 (3x)	1/4	2-1/2	47445			36245	31.30		36245-C3	38.90	36245-C4	51.90
.250 (1/4)	<b>.050</b>	.375 (1.5x)	1/4	2-1/2				941150	33.30		941150-C3	40.90		
.250 (1/4)	<b>.050</b>	.750 (3x)	1/4	2-1/2				36250	33.30		36250-C3	40.90	36250-C4	53.90
.250 (1/4)	<b>.060</b>	.375 (1.5x)	1/4	2-1/2				941160	31.30		941160-C3	38.90		
.250 (1/4)	<b>.060</b>	.750 (3x)	1/4	2-1/2	47460	831860		36260	31.30	831860-C3	36260-C3	38.90	47460-C4	36260-C4 51.90
.250 (1/4)	<b>.075</b>	.375 (1.5x)	1/4	2-1/2				941175	33.30		941175-C3	40.90		
.250 (1/4)	<b>.075</b>	.750 (3x)	1/4	2-1/2	47475			36275	33.30		36275-C3	40.90		
.312 (5/16)	<b>.005</b>	1.000 (3x)	5/16	2-1/2				945105	37.30		945105-C3	46.20		
.312 (5/16)	<b>.010</b>	1.000 (3x)	5/16	2-1/2				945110	35.00		945110-C3	43.90		
.312 (5/16)	<b>.030</b>	1.000 (3x)	5/16	2-1/2				945130	35.00		945130-C3	43.90		
.312 (5/16)	<b>.040</b>	1.000 (3x)	5/16	2-1/2				945140	35.00		945140-C3	43.90		
.312 (5/16)	<b>.060</b>	1.000 (3x)	5/16	2-1/2				945160	35.00		945160-C3	43.90		

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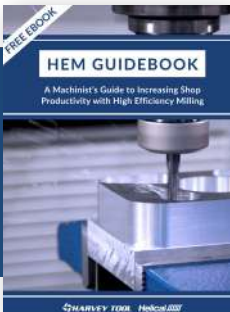
# MINIATURE END MILLS

## Corner Radius – Stub & Standard (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA.		UNCOATED				AITIN COATED			AMORPHOUS DIAMOND				
			D2	OAL	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE		
D1 $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	R $\begin{smallmatrix} +.001" \\ -.001" \end{smallmatrix}$	L2 $\begin{smallmatrix} +.030" \\ -.000" \end{smallmatrix}$		L1												
.375 (3/8)	<b>.005</b>	.570 (1.5X)	3/8	2-1/2				915205	50.70		915205-C3	60.80				
.375 (3/8)	<b>.005</b>	1.000 (3X)	3/8	2-1/2	804305			72805	50.70		72805-C3	60.80		72805-C4	75.50	
.375 (3/8)	<b>.008</b>	1.000 (3X)	3/8	2-1/2				72808	50.70		72808-C3	60.80			NEW	
.375 (3/8)	<b>.010</b>	.570 (1.5X)	3/8	2-1/2				915210	47.50		915210-C3	57.60				
.375 (3/8)	<b>.010</b>	1.000 (3X)	3/8	2-1/2				72810	47.50		72810-C3	57.60				
.375 (3/8)	<b>.015</b>	.570 (1.5X)	3/8	2-1/2				915215	48.00		915215-C3	58.10			NEW	
.375 (3/8)	<b>.015</b>	1.000 (3X)	3/8	2-1/2				72815	47.50		72815-C3	57.60				
.375 (3/8)	<b>.020</b>	.570 (1.5X)	3/8	2-1/2				915220	48.00		915220-C3	58.10				
.375 (3/8)	<b>.020</b>	1.000 (3X)	3/8	2-1/2				72820	47.50		72820-C3	57.60		72820-C4	72.30	
.375 (3/8)	<b>.025</b>	1.000 (3X)	3/8	2-1/2				72825	47.50		72825-C3	57.60				
.375 (3/8)	<b>.030</b>	.570 (1.5X)	3/8	2-1/2				915230	47.50		915230-C3	57.60		915230-C4	72.30	
.375 (3/8)	<b>.030</b>	1.000 (3X)	3/8	2-1/2				72830	47.50		72830-C3	57.60		72830-C4	72.30	
.375 (3/8)	<b>.040</b>	.570 (1.5X)	3/8	2-1/2				915240	50.70		915240-C3	60.80				
.375 (3/8)	<b>.040</b>	1.000 (3X)	3/8	2-1/2	804340	831740		72840	50.70		831740-C3	72840-C3	60.80		72840-C4	75.50
.375 (3/8)	<b>.045</b>	1.000 (3X)	3/8	2-1/2				72845	47.50		72845-C3	57.60				
.375 (3/8)	<b>.050</b>	.570 (1.5X)	3/8	2-1/2				915250	47.50		915250-C3	57.60				
.375 (3/8)	<b>.050</b>	1.000 (3X)	3/8	2-1/2				72850	47.50		72850-C3	57.60				
.375 (3/8)	<b>.060</b>	.570 (1.5X)	3/8	2-1/2				915260	48.00		915260-C3	58.10			NEW	
.375 (3/8)	<b>.060</b>	1.000 (3X)	3/8	2-1/2				72860	47.50		72860-C3	57.60				
.375 (3/8)	<b>.075</b>	.570 (1.5X)	3/8	2-1/2				915275	48.00		915275-C3	58.10			NEW	
.375 (3/8)	<b>.075</b>	1.000 (3X)	3/8	2-1/2				72875	47.50		72875-C3	57.60				
.375 (3/8)	<b>.090</b>	1.000 (3X)	3/8	2-1/2				72890	47.50		72890-C3	57.60			NEW	
.500 (1/2)	<b>.010</b>	1.000 (2X)	1/2	3				74510	73.50		74510-C3	88.60				
.500 (1/2)	<b>.015</b>	1.000 (2X)	1/2	3				74515	73.50		74515-C3	88.60				
.500 (1/2)	<b>.020</b>	1.000 (2X)	1/2	3				74520	73.50		74520-C3	88.60				
.500 (1/2)	<b>.030</b>	1.000 (2X)	1/2	3				74530	73.50		74530-C3	88.60		74530-C4	103.40	
.500 (1/2)	<b>.040</b>	1.000 (2X)	1/2	3				74540	73.50		74540-C3	88.60				
.500 (1/2)	<b>.045</b>	1.000 (2X)	1/2	3				74545	74.20		74545-C3	89.30				
.500 (1/2)	<b>.050</b>	1.000 (2X)	1/2	3				74550	73.50		74550-C3	88.60				
.500 (1/2)	<b>.060</b>	1.000 (2X)	1/2	3				74560	73.50		74560-C3	88.60		74560-C4	103.40	
.500 (1/2)	<b>.090</b>	1.000 (2X)	1/2	3				74590	73.50		74590-C3	88.60			NEW	



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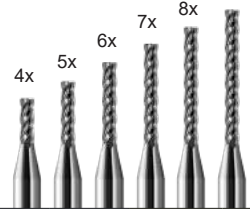
# MINIATURE END MILLS

## Corner Radius – Long Flute



- **Long flute and long shank design for deep cavities**
- Mills deep pockets
- 4 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA

Stocked in **Six** Flute Lengths!



CORNER RADIUS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	R <sup>+0.01"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.015 (1/64)	<b>.003</b>	<b>.078</b> (5x)	4	1/8	2-1/2	981415	72.80	981415-C3	78.00		
.015 (1/64)	<b>.003</b>	<b>.125</b> (8x)	4	1/8	2-1/2	933615	83.50	933615-C3	88.70		
.020 (.5 mm)	<b>.005</b>	<b>.100</b> (5x)	4	1/8	2-1/2	959620	64.00	959620-C3	69.20		
.020 (.5 mm)	<b>.005</b>	<b>.160</b> (8x)	4	1/8	2-1/2	949820	74.40	949820-C3	79.60		
.025	<b>.005</b>	<b>.125</b> (5x)	4	1/8	2-1/2	959625	60.90	959625-C3	66.10		
.025	<b>.005</b>	<b>.203</b> (8x)	4	1/8	2-1/2	949825	71.30	949825-C3	76.50		
.031 (1/32)	<b>.005</b>	<b>.125</b> (4x)	4	1/8	2-1/2	787531	57.90	787531-C3	63.10		
.031 (1/32)	<b>.005</b>	<b>.156</b> (5x)	4	1/8	2-1/2	959631	59.10	959631-C3	64.30		
.031 (1/32)	<b>.005</b>	<b>.187</b> (6x)	4	1/8	2-1/2	801131	62.40	801131-C3	67.60		
.031 (1/32)	<b>.005</b>	<b>.218</b> (7x)	4	1/8	2-1/2	800931	64.80	800931-C3	70.00		
.031 (1/32)	<b>.005</b>	<b>.250</b> (8x)	4	1/8	2-1/2	949831	69.30	949831-C3	74.50		
.031 (1/32)	<b>.008</b>	<b>.156</b> (5x)	4	1/8	2-1/2	884231	59.30	884231-C3	64.50		
.031 (1/32)	<b>.008</b>	<b>.250</b> (8x)	4	1/8	2-1/2	887431	69.30	887431-C3	74.50		
.031 (1/32)	<b>.010</b>	<b>.156</b> (5x)	4	1/8	2-1/2	964331	59.10	964331-C3	64.30		
.031 (1/32)	<b>.010</b>	<b>.250</b> (8x)	4	1/8	2-1/2	938031	69.30	938031-C3	74.50		
.039 (1 mm)	<b>.005</b>	<b>.203</b> (5x)	4	1/8	2-1/2	959639	56.20	959639-C3	61.40		
.039 (1 mm)	<b>.005</b>	<b>.325</b> (8x)	4	1/8	2-1/2	949839	62.70	949839-C3	67.90		
.039 (1 mm)	<b>.010</b>	<b>.203</b> (5x)	4	1/8	2-1/2	964339	56.20	964339-C3	61.40		
.039 (1 mm)	<b>.010</b>	<b>.325</b> (8x)	4	1/8	2-1/2	938039	62.70	938039-C3	67.90		
.040	<b>.005</b>	<b>.203</b> (5x)	4	1/8	2-1/2	959640	56.20	959640-C3	61.40		
.040	<b>.005</b>	<b>.325</b> (8x)	4	1/8	2-1/2	949840	62.70	949840-C3	67.90		
.047 (3/64)	<b>.005</b>	<b>.250</b> (5x)	4	1/8	2-1/2	959647	30.90	959647-C3	36.10		
.047 (3/64)	<b>.005</b>	<b>.375</b> (8x)	4	1/8	2-1/2	949847	35.10	949847-C3	40.30		
.047 (3/64)	<b>.010</b>	<b>.187</b> (4x)	4	1/8	2-1/2	787347	29.70	787347-C3	34.90		
.047 (3/64)	<b>.010</b>	<b>.250</b> (5x)	4	1/8	2-1/2	964347	30.90	964347-C3	36.10		
.047 (3/64)	<b>.010</b>	<b>.375</b> (8x)	4	1/8	2-1/2	938047	35.10	938047-C3	40.30		
.047 (3/64)	<b>.015</b>	<b>.250</b> (5x)	4	1/8	2-1/2	885047	30.90	885047-C3	36.10		
.047 (3/64)	<b>.015</b>	<b>.375</b> (8x)	4	1/8	2-1/2	888247	35.10	888247-C3	40.30		
.050	<b>.005</b>	<b>.250</b> (5x)	4	1/8	2-1/2	959650	30.90	959650-C3	36.10		
.050	<b>.005</b>	<b>.400</b> (8x)	4	1/8	2-1/2	949850	35.80	949850-C3	41.00		
.060	<b>.005</b>	<b>.312</b> (5x)	4	1/8	2-1/2	959660	30.90	959660-C3	36.10		
.060	<b>.005</b>	<b>.500</b> (8x)	4	1/8	2-1/2	949860	35.80	949860-C3	41.00		

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# MINIATURE END MILLS

## Corner Radius – Long Flute (cont.)

continued from previous page

CORNER RADIUS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TIN COATED		AMORPHOUS DIAMOND	
						4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	R <sup>+0.001"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.062 (1/16)	.005	.250 (4x)	4	1/8	2-1/2	787562	29.70	787562-C3	34.90		
.062 (1/16)	.005	.312 (5x)	4	1/8	2-1/2	959662	30.90	959662-C3	36.10		
.062 (1/16)	.005	.375 (6x)	4	1/8	2-1/2	801162	32.80	801162-C3	38.00		
.062 (1/16)	.005	.437 (7x)	4	1/8	2-1/2	800962	33.20	800962-C3	38.40		
.062 (1/16)	.005	.500 (8x)	4	1/8	2-1/2	949862	35.10	949862-C3	40.30		
.062 (1/16)	.005	.625 (10x)	4	1/8	2-1/2	870562	40.90	870562-C3	46.10		
.062 (1/16)	.008	.312 (5x)	4	1/8	2-1/2	884262	31.20	884262-C3	36.40		
.062 (1/16)	.008	.500 (8x)	4	1/8	2-1/2	887462	35.80	887462-C3	41.00		
.062 (1/16)	.010	.250 (4x)	4	1/8	2-1/2	787362	29.70	787362-C3	34.90		
.062 (1/16)	.010	.312 (5x)	4	1/8	2-1/2	964362	30.90	964362-C3	36.10	964362-C4	44.00
.062 (1/16)	.010	.375 (6x)	4	1/8	2-1/2	739862	32.80	739862-C3	38.00		NEW
.062 (1/16)	.010	.500 (8x)	4	1/8	2-1/2	938062	35.10	938062-C3	40.30	938062-C4	48.20
.062 (1/16)	.010	.625 (10x)	4	1/8	2-1/2	849262	40.90	849262-C3	46.10		
.062 (1/16)	.015	.312 (5x)	4	1/8	2-1/2	885062	30.90	885062-C3	36.10		
.062 (1/16)	.015	.500 (8x)	4	1/8	2-1/2	888262	35.10	888262-C3	40.30		
.062 (1/16)	.020	.312 (5x)	4	1/8	2-1/2	885862	30.90	885862-C3	36.10	885862-C4	44.00
.062 (1/16)	.020	.500 (8x)	4	1/8	2-1/2	889062	35.10	889062-C3	40.30		
.062 (1/16)	.020	.625 (10x)	4	1/8	2-1/2	762662	40.90	762662-C3	46.10		
.078 (5/64)	.005	.406 (5x)	4	1/8	2-1/2	959678	30.90	959678-C3	36.10		
.078 (5/64)	.005	.625 (8x)	4	1/8	2-1/2	949878	35.10	949878-C3	40.30		
.078 (5/64)	.010	.312 (4x)	4	1/8	2-1/2	787378	29.70	787378-C3	34.90		
.078 (5/64)	.010	.406 (5x)	4	1/8	2-1/2	964378	30.90	964378-C3	36.10	964378-C4	44.00
.078 (5/64)	.010	.625 (8x)	4	1/8	2-1/2	938078	35.10	938078-C3	40.30		
.078 (5/64)	.015	.406 (5x)	4	1/8	2-1/2	885078	30.90	885078-C3	36.10		
.078 (5/64)	.015	.625 (8x)	4	1/8	2-1/2	888278	35.10	888278-C3	40.30		
.078 (5/64)	.020	.406 (5x)	4	1/8	2-1/2	885878	30.90	885878-C3	36.10		
.078 (5/64)	.020	.625 (8x)	4	1/8	2-1/2	889078	35.10	889078-C3	40.30		
.093 (3/32)	.005	.375 (4x)	4	1/8	2-1/2	787593	29.70	787593-C3	34.90		
.093 (3/32)	.005	.500 (5x)	4	1/8	2-1/2	959693	30.90	959693-C3	36.10		
.093 (3/32)	.005	.585 (6x)	4	1/8	2-1/2	801193	32.80	801193-C3	38.00		
.093 (3/32)	.005	.670 (7x)	4	1/8	2-1/2	800993	33.20	800993-C3	38.40		
.093 (3/32)	.005	.750 (8x)	4	1/8	2-1/2	949893	35.10	949893-C3	40.30		
.093 (3/32)	.005	.950 (10x)	4	1/8	2-1/2	870593	41.70	870593-C3	46.90		
.093 (3/32)	.008	.500 (5x)	4	1/8	2-1/2	884293	31.20	884293-C3	36.40		
.093 (3/32)	.008	.750 (8x)	4	1/8	2-1/2	887493	35.80	887493-C3	41.00		
.093 (3/32)	.010	.375 (4x)	4	1/8	2-1/2	787393	29.70	787393-C3	34.90		
.093 (3/32)	.010	.500 (5x)	4	1/8	2-1/2	964393	30.90	964393-C3	36.10	964393-C4	44.00
.093 (3/32)	.010	.750 (8x)	4	1/8	2-1/2	938093	35.10	938093-C3	40.30		
.093 (3/32)	.010	.950 (10x)	4	1/8	2-1/2	849293	40.90	849293-C3	46.10		
.093 (3/32)	.015	.500 (5x)	4	1/8	2-1/2	885093	30.90	885093-C3	36.10		
.093 (3/32)	.015	.750 (8x)	4	1/8	2-1/2	888293	35.10	888293-C3	40.30		
.093 (3/32)	.020	.500 (5x)	4	1/8	2-1/2	885893	30.90	885893-C3	36.10		
.093 (3/32)	.020	.750 (8x)	4	1/8	2-1/2	889093	35.10	889093-C3	40.30		
.093 (3/32)	.020	.950 (10x)	4	1/8	2-1/2	762693	41.70	762693-C3	46.90		
.093 (3/32)	.030	.500 (5x)	4	1/8	2-1/2	886693	30.90	886693-C3	36.10		
.093 (3/32)	.030	.750 (8x)	4	1/8	2-1/2	889893	35.10	889893-C3	40.30		

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# MINIATURE END MILLS

## Corner Radius – Long Flute (cont.)

continued from previous page

	CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
	D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	R <sup>+0.01"</sup> / <sub>-0.01"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
NEW	.100	.005	.500 (5x)	4	1/8	2-1/2	959700	30.90	959700-C3	36.10		
	.100	.010	.500 (5x)	4	1/8	2-1/2	964400	30.90	964400-C3	36.10		
	.100	.010	.800 (8x)	4	1/8	2-1/2	938100	35.10	938100-C3	40.30		
	.109 (7/64)	.005	.570 (5x)	4	1/8	2-1/2	912502	30.90	912502-C3	36.10		
	.118 (3 mm)	.005	.625 (5x)	4	1/8	2-1/2	912505	30.90	912505-C3	36.10		
	.118 (3 mm)	.005	.950 (8x)	4	1/8	2-1/2	905305	35.10	905305-C3	40.30		
	.118 (3 mm)	.010	.625 (5x)	4	1/8	2-1/2	912605	30.90	912605-C3	36.10		
	.118 (3 mm)	.010	.950 (8x)	4	1/8	2-1/2	905405	35.10	905405-C3	40.30		
	.125 (1/8)	.005	.625 (5x)	4	1/8	2-1/2	950905	29.20	950905-C3	34.40		
	.125 (1/8)	.005	1.000 (8x)	4	1/8	2-1/2	981905	32.00	981905-C3	37.20		
	.125 (1/8)	.010	.625 (5x)	4	1/8	2-1/2	950910	29.20	950910-C3	34.40	950910-C4	42.30
	.125 (1/8)	.010	1.000 (8x)	4	1/8	2-1/2	981910	32.00	981910-C3	37.20		
	.125 (1/8)	.015	.625 (5x)	4	1/8	2-1/2	950915	29.20	950915-C3	34.40		
	.125 (1/8)	.015	1.000 (8x)	4	1/8	2-1/2	981915	32.00	981915-C3	37.20		
	.125 (1/8)	.020	.625 (5x)	4	1/8	2-1/2	950920	29.20	950920-C3	34.40		
	.125 (1/8)	.020	1.000 (8x)	4	1/8	2-1/2	981920	32.00	981920-C3	37.20		
	.125 (1/8)	.020	1.250 (10x)	4	1/8	3	762220	37.50	762220-C3	42.70		
	.125 (1/8)	.030	.625 (5x)	4	1/8	2-1/2	950930	29.20	950930-C3	34.40	950930-C4	42.30
	.125 (1/8)	.030	1.000 (8x)	4	1/8	2-1/2	981930	32.00	981930-C3	37.20		
	.125 (1/8)	.040	.625 (5x)	4	1/8	2-1/2	950940	29.20	950940-C3	34.40		
	.140 (9/64)	.010	.750 (5x)	4	3/16	3	793610	36.10	793610-C3	41.70		
	.140 (9/64)	.015	.750 (5x)	4	3/16	3	793615	36.80	793615-C3	42.40		
	.156 (5/32)	.010	.750 (5x)	4	3/16	3	830910	36.10	830910-C3	41.70		
NEW	.156 (5/32)	.010	1.250 (8x)	4	3/16	3	739710	37.10	739710-C3	42.70		
	.156 (5/32)	.030	.750 (5x)	4	3/16	3	830930	36.10	830930-C3	41.70		
	.187 (3/16)	.005	1.000 (5x)	4	3/16	3	932405	34.40	932405-C3	40.00		
	.187 (3/16)	.010	1.000 (5x)	4	3/16	3	932410	34.40	932410-C3	40.00		
	.187 (3/16)	.010	1.680 (8x)	4	3/16	3	830810	35.30	830810-C3	40.90		
	.187 (3/16)	.020	1.000 (5x)	4	3/16	3	932420	34.40	932420-C3	40.00		
	.187 (3/16)	.020	1.500 (8x)	4	3/16	3	830820	35.30	830820-C3	40.90		
	.187 (3/16)	.030	1.000 (5x)	4	3/16	3	932430	34.40	932430-C3	40.00	932430-C4	52.50
	.187 (3/16)	.030	1.500 (8x)	4	3/16	3	830830	35.30	830830-C3	40.90		
	.187 (3/16)	.040	1.000 (5x)	4	3/16	3	932450	34.40	932450-C3	40.00		
	.250 (1/4)	.005	1.250 (5x)	4	1/4	4	917105	38.40	917105-C3	47.30		
	.250 (1/4)	.010	1.250 (5x)	4	1/4	4	917110	38.40	917110-C3	47.30		
	.250 (1/4)	.020	1.250 (5x)	4	1/4	4	917120	38.40	917120-C3	47.30		
	.250 (1/4)	.020	2.000 (8x)	4	1/4	4	763020	39.80	763020-C3	48.70		
	.250 (1/4)	.030	1.250 (5x)	4	1/4	4	917130	38.40	917130-C3	47.30	917130-C4	59.00
	.250 (1/4)	.030	2.000 (8x)	4	1/4	4	763030	39.80	763030-C3	48.70		
	.250 (1/4)	.040	1.250 (5x)	4	1/4	4	917140	38.40	917140-C3	47.30		
	.375 (3/8)	.005	2.000 (5x)	4	3/8	4	800805	52.10	800805-C3	65.90		
	.375 (3/8)	.010	2.000 (5x)	4	3/8	4	800810	52.10	800810-C3	65.90		
	.375 (3/8)	.040	2.000 (5x)	4	3/8	4	800840	52.10	800840-C3	65.90		

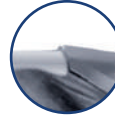
CORNER RADIUS

# MINIATURE END MILLS

## Corner Radius – Long Reach, Standard Flute



- Corner radius for improved strength
- Length of cut = 3x diameter
- Center cutting
- Solid carbide
- CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling

CORNER RADIUS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			AISI IN COATED	
						2 FL	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>					
.020	<b>.005</b>	.060	<b>.100</b> (5x)	1/8	1-1/2		864120	47.70	864120-C3	52.90
.020	<b>.005</b>	.060	<b>.160</b> (8x)	1/8	1-1/2		865720	49.60	865720-C3	54.80
.031 (1/32)	<b>.005</b>	.093	<b>.156</b> (5x)	1/8	1-1/2	864131	875231	46.50	875231-C3	51.70
.031 (1/32)	<b>.005</b>	.093	<b>.250</b> (8x)	1/8	1-1/2	865731	876831	47.40	876831-C3	52.60
.031 (1/32)	<b>.010</b>	.093	<b>.156</b> (5x)	1/8	1-1/2	864931	876031	46.50	876031-C3	51.70
.031 (1/32)	<b>.010</b>	.093	<b>.250</b> (8x)	1/8	1-1/2	866531	877631	47.40	877631-C3	52.60
.039 (1 mm)	<b>.005</b>	.117	<b>.325</b> (8x)	1/8	1-1/2		865739	47.40	865739-C3	52.60
.047 (3/64)	<b>.005</b>	.141	<b>.250</b> (5x)	1/8	1-1/2	864147	875247	45.10	875247-C3	50.30
.047 (3/64)	<b>.005</b>	.141	<b>.375</b> (8x)	1/8	1-1/2	865747	876847	46.00	876847-C3	51.20
.047 (3/64)	<b>.010</b>	.141	<b>.250</b> (5x)	1/8	1-1/2	864947	876047	45.10	876047-C3	50.30
.047 (3/64)	<b>.010</b>	.141	<b>.375</b> (8x)	1/8	1-1/2	866547	877647	46.00	877647-C3	51.20
.062 (1/16)	<b>.005</b>	.186	<b>.312</b> (5x)	1/8	1-1/2	864162	875262	45.10	875262-C3	50.30
.062 (1/16)	<b>.005</b>	.186	<b>.500</b> (8x)	1/8	1-1/2	865762	876862	46.00	876862-C3	51.20
.062 (1/16)	<b>.010</b>	.186	<b>.312</b> (5x)	1/8	1-1/2	864962	876062	45.10	876062-C3	50.30
.062 (1/16)	<b>.010</b>	.186	<b>.500</b> (8x)	1/8	1-1/2	866562	877662	46.00	877662-C3	51.20
.062 (1/16)	<b>.020</b>	.186	<b>.312</b> (5x)	1/8	1-1/2		764362	45.10	764362-C3	50.30
.062 (1/16)	<b>.020</b>	.186	<b>.500</b> (8x)	1/8	1-1/2		759362	46.00	759362-C3	51.20
.078 (5/64)	<b>.005</b>	.234	<b>.406</b> (5x)	1/8	1-1/2	864178	875278	45.10	875278-C3	50.30
.078 (5/64)	<b>.005</b>	.234	<b>.625</b> (8x)	1/8	2	865778	876878	46.50	876878-C3	51.70
.078 (5/64)	<b>.010</b>	.234	<b>.406</b> (5x)	1/8	1-1/2	864978	876078	45.10	876078-C3	50.30
.078 (5/64)	<b>.010</b>	.234	<b>.625</b> (8x)	1/8	2	866578	877678	46.50	877678-C3	51.70
.093 (3/32)	<b>.005</b>	.279	<b>.500</b> (5x)	1/8	1-1/2	864193	875293	46.00	875293-C3	51.20
.093 (3/32)	<b>.005</b>	.279	<b>.750</b> (8x)	1/8	2	865793	876893	46.50	876893-C3	51.70
.093 (3/32)	<b>.010</b>	.279	<b>.500</b> (5x)	1/8	1-1/2	864993	876093	46.00	876093-C3	51.20
.093 (3/32)	<b>.010</b>	.279	<b>.750</b> (8x)	1/8	2	866593	877693	46.50	877693-C3	51.70
.093 (3/32)	<b>.020</b>	.279	<b>.500</b> (5x)	1/8	1-1/2		764393	46.00	764393-C3	51.20
.093 (3/32)	<b>.020</b>	.279	<b>.750</b> (8x)	1/8	2		759393	46.50	759393-C3	51.70
.093 (3/32)	<b>.030</b>	.279	<b>.500</b> (5x)	1/8	1-1/2		762793	46.00	762793-C3	51.20
.093 (3/32)	<b>.030</b>	.279	<b>.750</b> (8x)	1/8	2		762093	46.50	762093-C3	51.70
.118 (3 mm)	<b>.010</b>	.354	<b>.950</b> (8x)	1/8	2		866605	47.10	866605-C3	52.30

continued on next page



## MINIATURE END MILLS

## Corner Radius – Long Reach, Standard Flute (cont.)

continued from previous page

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			AITIN COATED	
						2 FL	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	R $\begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	L <sub>3</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub>	L <sub>1</sub>					
.125 (1/8)	<b>.005</b>	.375	<b>.625</b> (5x)	1/8	1-1/2	864208	875308	46.00	875308-C3	51.20
.125 (1/8)	<b>.005</b>	.375	<b>1.000</b> (8x)	1/8	2	865808	876908	46.00	876908-C3	51.20
.125 (1/8)	<b>.010</b>	.375	<b>.625</b> (5x)	1/8	1-1/2	865008	876108	46.00	876108-C3	51.20
.125 (1/8)	<b>.010</b>	.375	<b>1.000</b> (8x)	1/8	2	866608	877708	46.00	877708-C3	51.20
.125 (1/8)	<b>.020</b>	.375	<b>.625</b> (5x)	1/8	1-1/2		764408	46.90	764408-C3	52.10
.125 (1/8)	<b>.020</b>	.375	<b>1.000</b> (8x)	1/8	2-1/2		759408	46.90	759408-C3	52.10
.125 (1/8)	<b>.030</b>	.375	<b>.625</b> (5x)	1/8	1-1/2		762808	46.00	762808-C3	51.20
.125 (1/8)	<b>.030</b>	.375	<b>1.000</b> (8x)	1/8	2-1/2		762108	46.00	762108-C3	51.20
.187 (3/16)	<b>.010</b>	.563	<b>1.000</b> (5x)	3/16	2		876112	53.70	876112-C3	59.30
.187 (3/16)	<b>.010</b>	.563	<b>1.500</b> (8x)	3/16	2-1/2		877712	53.70	877712-C3	59.30
.250 (1/4)	<b>.010</b>	.750	<b>1.250</b> (5x)	1/4	2-1/2		876116	60.40	876116-C3	68.00
.250 (1/4)	<b>.010</b>	.750	<b>2.000</b> (8x)	1/4	4		877716	61.50	877716-C3	70.40

CORNER RADIUS



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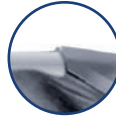
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# MINIATURE END MILLS

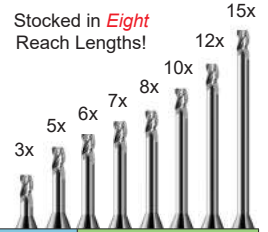
## Corner Radius – Long Reach, Stub Flute



- Long length design for deep cavities
- Corner radius for improved strength
- Length of cut = 1½ x diameter
- Solid carbide • CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling



CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.010	.003	.015	.050 (5x)	3	1/8	2-1/2	968210	57.80	968210-C3	63.00		
.010	.003	.015	.080 (8x)	3	1/8	2-1/2	972710	58.70	972710-C3	63.90		
.015 (1/64)	.003	.022	.078 (5x)	3	1/8	2-1/2	968215	51.60	968215-C3	56.80		
.015 (1/64)	.003	.022	.125 (8x)	3	1/8	2-1/2	972715	53.00	972715-C3	58.20		
.015 (1/64)	.005	.022	.078 (5x)	3	1/8	2-1/2	37115	51.80	37115-C3	57.00		
.015 (1/64)	.005	.022	.125 (8x)	3	1/8	2-1/2	38315	53.00	38315-C3	58.20		
.020 (.5 mm)	.003	.030	.100 (5x)	3	1/8	2-1/2	968220	50.00	968220-C3	55.20		
.020 (.5 mm)	.005	.030	.100 (5x)	3	1/8	2-1/2	37120	50.00	37120-C3	55.20		
.020 (.5 mm)	.005	.030	.160 (8x)	3	1/8	2-1/2	38320	51.40	38320-C3	56.60		
.020 (.5 mm)	.005	.030	.200 (10x)	3	1/8	2-1/2	917820	54.30	917820-C3	59.50		
.025	.005	.037	.125 (5x)	3	1/8	2-1/2	37125	50.00	37125-C3	55.20		
.025	.005	.037	.203 (8x)	3	1/8	2-1/2	38325	51.40	38325-C3	56.60	38325-C4	64.50
.025	.005	.037	.250 (10x)	3	1/8	2-1/2	917825	54.30	917825-C3	59.50		
.030	.005	.045	.156 (5x)	3	1/8	2-1/2	37130	43.00	37130-C3	48.20		
.030	.005	.045	.250 (8x)	3	1/8	2-1/2	38330	44.20	38330-C3	49.40		
.031 (1/32)	.003	.046	.156 (5x)	3	1/8	2-1/2	968231	43.00	968231-C3	48.20		
.031 (1/32)	.003	.046	.250 (8x)	3	1/8	2-1/2	972731	44.20	972731-C3	49.40		
.031 (1/32)	.005	.046	.156 (5x)	3	1/8	2-1/2	37131	43.00	37131-C3	48.20	37131-C4	56.10
.031 (1/32)	.005	.046	.156 (5x)	4	1/8	2-1/2	800531	46.10	800531-C3	51.30		
.031 (1/32)	.005	.046	.250 (8x)	3	1/8	2-1/2	38331	44.20	38331-C3	49.40	38331-C4	57.30
.031 (1/32)	.005	.046	.250 (8x)	4	1/8	2-1/2	800331	47.20	800331-C3	52.40		
.031 (1/32)	.005	.046	.312 (10x)	3	1/8	2-1/2	917831	47.10	917831-C3	52.30		
.031 (1/32)	.005	.046	.375 (12x)	3	1/8	2-1/2	39431	47.10	39431-C3	52.30	39431-C4	60.20
.031 (1/32)	.008	.046	.156 (5x)	3	1/8	2-1/2	912731	43.00	912731-C3	48.20		
.031 (1/32)	.008	.046	.250 (8x)	3	1/8	2-1/2	909331	44.20	909331-C3	49.40		
.031 (1/32)	.010	.046	.093 (3x)	3	1/8	2-1/2	925631	43.00	925631-C3	48.20		
.031 (1/32)	.010	.046	.156 (5x)	3	1/8	2-1/2	41531	43.00	41531-C3	48.20		
.031 (1/32)	.010	.046	.250 (8x)	3	1/8	2-1/2	41731	44.20	41731-C3	49.40		
.031 (1/32)	.010	.046	.312 (10x)	3	1/8	2-1/2	953731	47.10	953731-C3	52.30		
.031 (1/32)	.010	.046	.375 (12x)	3	1/8	2-1/2	41931	47.10	41931-C3	52.30		
.031 (1/32)	.010	.046	.470 (15x)	3	1/8	2-1/2	947831	54.10	947831-C3	59.30		
.039 (1 mm)	.005	.059	.203 (5x)	3	1/8	2-1/2	37139	43.00	37139-C3	48.20		
.039 (1 mm)	.005	.059	.325 (8x)	3	1/8	2-1/2	38339	44.20	38339-C3	49.40		
.039 (1 mm)	.010	.059	.325 (8x)	3	1/8	2-1/2	41739	44.20	41739-C3	49.40		
.040	.005	.060	.203 (5x)	3	1/8	2-1/2	37140	43.00	37140-C3	48.20		
.040	.005	.060	.325 (8x)	3	1/8	2-1/2	38340	44.20	38340-C3	49.40		
.040	.010	.060	.203 (5x)	3	1/8	2-1/2	41540	43.00	41540-C3	48.20		
.040	.010	.060	.325 (8x)	3	1/8	2-1/2	41740	44.20	41740-C3	49.40		
.047 (3/64)	.005	.070	.250 (5x)	3	1/8	2-1/2	37147	42.30	37147-C3	47.50	37147-C4	55.40
.047 (3/64)	.005	.070	.375 (8x)	3	1/8	2-1/2	38347	43.20	38347-C3	48.40	38347-C4	56.30
.047 (3/64)	.005	.070	.480 (10x)	3	1/8	2-1/2	917847	46.00	917847-C3	51.20		
.047 (3/64)	.005	.070	.570 (12x)	3	1/8	2-1/2	39447	46.00	39447-C3	51.20	39447-C4	59.10

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# MINIATURE END MILLS

## Corner Radius – Long Reach, Stub Flute (cont.)

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CUTTER DIA.	CORNER RADIUS	LOC	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 $\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	R $\begin{matrix} +.001'' \\ -.001'' \end{matrix}$	L2 $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	L3 $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$		D2	L1						
.047 (3/64)	.010	.070	.141 (3x)	3	1/8	2-1/2	925647	42.30	925647-C3	47.50		
.047 (3/64)	.010	.070	.250 (5x)	3	1/8	2-1/2	41547	42.30	41547-C3	47.50	41547-C4	55.40
.047 (3/64)	.010	.070	.375 (8x)	3	1/8	2-1/2	41747	43.20	41747-C3	48.40		
.047 (3/64)	.010	.070	.480 (10x)	3	1/8	2-1/2	953747	46.00	953747-C3	51.20		
.047 (3/64)	.010	.070	.570 (12x)	3	1/8	2-1/2	41947	45.40	41947-C3	50.60		
.047 (3/64)	.010	.070	.710 (15x)	3	1/8	2-1/2	947847	51.80	947847-C3	57.00		
.047 (3/64)	.015	.070	.250 (5x)	3	1/8	2-1/2	42747	42.30	42747-C3	47.50		
.047 (3/64)	.015	.070	.375 (8x)	3	1/8	2-1/2	42947	43.20	42947-C3	48.40		
.050	.005	.075	.250 (5x)	3	1/8	2-1/2	37150	42.30	37150-C3	47.50		
.050	.005	.075	.400 (8x)	3	1/8	2-1/2	38350	43.20	38350-C3	48.40		
.050	.010	.075	.250 (5x)	3	1/8	2-1/2	41550	42.30	41550-C3	47.50		
.050	.010	.075	.400 (8x)	3	1/8	2-1/2	41750	43.20	41750-C3	48.40		
.060	.005	.090	.312 (5x)	3	1/8	2-1/2	37160	42.30	37160-C3	47.50		
.060	.005	.090	.500 (8x)	3	1/8	2-1/2	38360	43.20	38360-C3	48.40		
.060	.010	.090	.312 (5x)	3	1/8	2-1/2	41560	42.30	41560-C3	47.50		
.060	.010	.090	.500 (8x)	3	1/8	2-1/2	41760	43.20	41760-C3	48.40		
.060	.015	.090	.500 (8x)	3	1/8	2-1/2	42960	43.20	42960-C3	48.40		
.060	.020	.090	.500 (8x)	3	1/8	2-1/2	970160	43.20	970160-C3	48.40		
.062 (1/16)	.003	.093	.312 (5x)	3	1/8	2-1/2	968262	42.30	968262-C3	47.50		
.062 (1/16)	.003	.093	.500 (8x)	3	1/8	2-1/2	972762	43.20	972762-C3	48.40		
.062 (1/16)	.005	.093	.312 (5x)	3	1/8	2-1/2	37162	42.30	37162-C3	47.50	37162-C4	55.40
.062 (1/16)	.005	.093	.312 (5x)	4	1/8	2-1/2	800562	45.30	800562-C3	50.50		
.062 (1/16)	.005	.093	.500 (8x)	3	1/8	2-1/2	38362	43.20	38362-C3	48.40	38362-C4	56.30
.062 (1/16)	.005	.093	.500 (8x)	4	1/8	2-1/2	800362	46.30	800362-C3	51.50		
.062 (1/16)	.005	.093	.625 (10x)	3	1/8	2-1/2	917862	46.00	917862-C3	51.20		
.062 (1/16)	.005	.093	.750 (12x)	3	1/8	2-1/2	39462	46.00	39462-C3	51.20		
.062 (1/16)	.008	.093	.312 (5x)	3	1/8	2-1/2	912762	42.30	912762-C3	47.50		
.062 (1/16)	.008	.093	.500 (8x)	3	1/8	2-1/2	909362	43.20	909362-C3	48.40		
.062 (1/16)	.010	.093	.187 (3x)	3	1/8	2-1/2	925662	42.30	925662-C3	47.50		
.062 (1/16)	.010	.093	.312 (5x)	3	1/8	2-1/2	41562	42.30	41562-C3	47.50	41562-C4	55.40
.062 (1/16)	.010	.093	.375 (6x)	3	1/8	2-1/2	768462	42.30	768462-C3	47.50		
.062 (1/16)	.010	.093	.437 (7x)	3	1/8	2-1/2	766862	43.20	766862-C3	48.40		
.062 (1/16)	.010	.093	.500 (8x)	3	1/8	2-1/2	41762	43.20	41762-C3	48.40	41762-C4	56.30
.062 (1/16)	.010	.093	.625 (10x)	3	1/8	2-1/2	953762	46.00	953762-C3	51.20		
.062 (1/16)	.010	.093	.750 (12x)	3	1/8	2-1/2	41962	46.00	41962-C3	51.20	41962-C4	59.10
.062 (1/16)	.010	.093	.950 (15x)	3	1/8	2-1/2	947862	51.80	947862-C3	57.00		
.062 (1/16)	.012	.093	.312 (5x)	3	1/8	2-1/2	901962	42.30	901962-C3	47.50		
.062 (1/16)	.012	.093	.500 (8x)	3	1/8	2-1/2	913562	43.20	913562-C3	48.40		
.062 (1/16)	.015	.093	.312 (5x)	3	1/8	2-1/2	42762	42.30	42762-C3	47.50	42762-C4	55.40
.062 (1/16)	.015	.093	.500 (8x)	3	1/8	2-1/2	42962	43.20	42962-C3	48.40	42962-C4	56.30
.062 (1/16)	.015	.093	.625 (10x)	3	1/8	2-1/2	965662	46.00	965662-C3	51.20		
.062 (1/16)	.015	.093	.750 (12x)	3	1/8	2-1/2	43162	46.00	43162-C3	51.20		
.062 (1/16)	.020	.093	.312 (5x)	3	1/8	2-1/2	953562	42.30	953562-C3	47.50	953562-C4	55.40
.062 (1/16)	.020	.093	.500 (8x)	3	1/8	2-1/2	970162	43.20	970162-C3	48.40	970162-C4	56.30
.062 (1/16)	.020	.093	.625 (10x)	3	1/8	2-1/2	923262	46.00	923262-C3	51.20		
.062 (1/16)	.020	.093	.750 (12x)	3	1/8	2-1/2	872662	46.00	872662-C3	51.20		

CORNER RADIUS

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# MINIATURE END MILLS

## Corner Radius – Long Reach, Stub Flute (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.005"</sup> / <sub>-.0005"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>	L3 <sup>+0.010"</sup> / <sub>-.000"</sub>		D2	L1						
.070	.005	.105	.375 (5x)	3	1/8	2-1/2	37170	42.30	37170-C3	47.50		
.070	.005	.105	.570 (8x)	3	1/8	2-1/2	38370	43.20	38370-C3	48.40		
.070	.010	.105	.375 (5x)	3	1/8	2-1/2	41570	42.30	41570-C3	47.50		
.070	.010	.105	.570 (8x)	3	1/8	2-1/2	41770	43.20	41770-C3	48.40		
.078 (5/64)	.005	.117	.406 (5x)	3	1/8	2-1/2	37178	42.30	37178-C3	47.50		
.078 (5/64)	.005	.117	.625 (8x)	3	1/8	2-1/2	38378	43.20	38378-C3	48.40		
.078 (5/64)	.005	.117	.800 (10x)	3	1/8	2-1/2	917878	46.00	917878-C3	51.20		
.078 (5/64)	.005	.117	.940 (12x)	3	1/8	2-1/2	39478	46.00	39478-C3	51.20		
.078 (5/64)	.010	.117	.406 (5x)	3	1/8	2-1/2	41578	42.30	41578-C3	47.50	41578-C4	55.40
.078 (5/64)	.010	.117	.475 (6x)	3	1/8	2-1/2	768478	42.30	768478-C3	47.50		
.078 (5/64)	.010	.117	.550 (7x)	3	1/8	2-1/2	766878	43.20	766878-C3	48.40		
.078 (5/64)	.010	.117	.625 (8x)	3	1/8	2-1/2	41778	43.20	41778-C3	48.40	41778-C4	56.30
.078 (5/64)	.010	.117	.800 (10x)	3	1/8	2-1/2	953778	46.00	953778-C3	51.20		
.078 (5/64)	.010	.117	.940 (12x)	3	1/8	2-1/2	41978	46.00	41978-C3	51.20	41978-C4	59.10
.078 (5/64)	.015	.117	.234 (3x)	3	1/8	2-1/2	944978	42.30	944978-C3	47.50		
.078 (5/64)	.015	.117	.406 (5x)	3	1/8	2-1/2	42778	42.30	42778-C3	47.50		
.078 (5/64)	.015	.117	.625 (8x)	3	1/8	2-1/2	42978	43.20	42978-C3	48.40		
.078 (5/64)	.015	.117	.800 (10x)	3	1/8	2-1/2	965678	46.00	965678-C3	51.20		
.078 (5/64)	.015	.117	.940 (12x)	3	1/8	2-1/2	43178	46.50	43178-C3	51.70		
.078 (5/64)	.015	.117	1.187 (15x)	3	1/8	2-1/2	939378	51.80	939378-C3	57.00		
.078 (5/64)	.020	.117	.406 (5x)	3	1/8	2-1/2	953578	42.30	953578-C3	47.50		
.078 (5/64)	.020	.117	.625 (8x)	3	1/8	2-1/2	970178	43.20	970178-C3	48.40		
.078 (5/64)	.020	.117	.800 (10x)	3	1/8	2-1/2	923278	46.00	923278-C3	51.20		
.080	.005	.120	.406 (5x)	3	1/8	2-1/2	37180	42.30	37180-C3	47.50		
.080	.005	.120	.650 (8x)	3	1/8	2-1/2	38380	43.20	38380-C3	48.40		
.080	.010	.120	.406 (5x)	3	1/8	2-1/2	41580	42.30	41580-C3	47.50		
.080	.010	.120	.650 (8x)	3	1/8	2-1/2	41780	43.20	41780-C3	48.40		
.090	.005	.135	.450 (5x)	3	1/8	2-1/2	37190	42.30	37190-C3	47.50		
.090	.005	.135	.750 (8x)	3	1/8	2-1/2	38390	43.20	38390-C3	48.40		
.090	.010	.135	.450 (5x)	3	1/8	2-1/2	41590	42.30	41590-C3	47.50		
.090	.010	.135	.750 (8x)	3	1/8	2-1/2	41790	43.20	41790-C3	48.40		
.093 (3/32)	.003	.139	.500 (5x)	3	1/8	2-1/2	968293	42.30	968293-C3	47.50		
.093 (3/32)	.003	.139	.750 (8x)	3	1/8	2-1/2	972793	44.00	972793-C3	49.20		
.093 (3/32)	.005	.139	.500 (5x)	3	1/8	2-1/2	37193	42.30	37193-C3	47.50	37193-C4	55.40
.093 (3/32)	.005	.139	.500 (5x)	4	1/8	2-1/2	800593	45.30	800593-C3	50.50		
.093 (3/32)	.005	.139	.750 (8x)	3	1/8	2-1/2	38393	43.20	38393-C3	48.40		
.093 (3/32)	.005	.139	.750 (8x)	4	1/8	2-1/2	800393	46.30	800393-C3	51.50		
.093 (3/32)	.005	.139	.950 (10x)	3	1/8	2-1/2	917893	46.00	917893-C3	51.20		
.093 (3/32)	.005	.139	1.125 (12x)	3	1/8	2-1/2	39493	46.00	39493-C3	51.20		
.093 (3/32)	.008	.139	.500 (5x)	3	1/8	2-1/2	912793	42.30	912793-C3	47.50		
.093 (3/32)	.008	.139	.750 (8x)	3	1/8	2-1/2	909393	43.00	909393-C3	48.20		
.093 (3/32)	.010	.139	.500 (5x)	3	1/8	2-1/2	41593	42.30	41593-C3	47.50	41593-C4	55.40
.093 (3/32)	.010	.139	.750 (8x)	3	1/8	2-1/2	41793	43.20	41793-C3	48.40		
.093 (3/32)	.010	.139	.950 (10x)	3	1/8	2-1/2	953793	46.00	953793-C3	51.20		
.093 (3/32)	.010	.139	1.125 (12x)	3	1/8	2-1/2	41993	46.00	41993-C3	51.20		
.093 (3/32)	.012	.139	.500 (5x)	3	1/8	2-1/2	901993	43.10	901993-C3	48.30		
.093 (3/32)	.012	.139	.750 (8x)	3	1/8	2-1/2	913593	44.00	913593-C3	49.20		

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## Corner Radius – Long Reach, Stub Flute (cont.)

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CUTTER DIA.	CORNER RADIUS	LOC	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	R $\begin{smallmatrix} +.001" \\ -.001" \end{smallmatrix}$	L2 $\begin{smallmatrix} +.010" \\ -.000" \end{smallmatrix}$	L3 $\begin{smallmatrix} +.010" \\ -.000" \end{smallmatrix}$		D2	L1						
.093 (3/32)	.015	.139	.279 (3x)	3	1/8	2-1/2	944993	42.30	944993-C3	47.50		
.093 (3/32)	.015	.139	.500 (5x)	3	1/8	2-1/2	42793	42.30	42793-C3	47.50	42793-C4	55.40
.093 (3/32)	.015	.139	.585 (6x)	3	1/8	2-1/2	765893	42.30	765893-C3	47.50		
.093 (3/32)	.015	.139	.670 (7x)	3	1/8	2-1/2	766093	43.20	766093-C3	48.40		
.093 (3/32)	.015	.139	.750 (8x)	3	1/8	2-1/2	42993	43.20	42993-C3	48.40	42993-C4	56.30
.093 (3/32)	.015	.139	.950 (10x)	3	1/8	2-1/2	965693	46.00	965693-C3	51.20		
.093 (3/32)	.015	.139	1.125 (12x)	3	1/8	2-1/2	43193	46.00	43193-C3	51.20	43193-C4	59.10
.093 (3/32)	.015	.139	1.400 (15x)	3	1/8	3	939393	51.80	939393-C3	57.00		
.093 (3/32)	.020	.139	.500 (5x)	3	1/8	2-1/2	953593	42.30	953593-C3	47.50		
.093 (3/32)	.020	.139	.750 (8x)	3	1/8	2-1/2	970193	43.20	970193-C3	48.40		
.093 (3/32)	.020	.139	.950 (10x)	3	1/8	2-1/2	923293	46.00	923293-C3	51.20		
.093 (3/32)	.030	.139	.500 (5x)	3	1/8	2-1/2	42193	42.30	42193-C3	47.50	42193-C4	55.40
.093 (3/32)	.030	.139	.750 (8x)	3	1/8	2-1/2	42393	43.20	42393-C3	48.40		
.093 (3/32)	.030	.139	.950 (10x)	3	1/8	2-1/2	921493	46.00	921493-C3	51.20		
.100	.005	.150	.500 (5x)	3	1/8	2-1/2	37200	42.30	37200-C3	47.50		
.100	.005	.150	.800 (8x)	3	1/8	2-1/2	38400	43.20	38400-C3	48.40		
.100	.010	.150	.500 (5x)	3	1/8	2-1/2	41600	42.30	41600-C3	47.50		
.100	.010	.150	.800 (8x)	3	1/8	2-1/2	41800	43.20	41800-C3	48.40		
.109 (7/64)	.005	.163	.570 (5x)	3	1/8	2-1/2	37202	42.30	37202-C3	47.50		
.109 (7/64)	.005	.163	.900 (8x)	3	1/8	2-1/2	38402	43.20	38402-C3	48.40		
.109 (7/64)	.010	.163	.570 (5x)	3	1/8	2-1/2	41602	42.30	41602-C3	47.50		
.109 (7/64)	.010	.163	.900 (8x)	3	1/8	2-1/2	41802	43.20	41802-C3	48.40		
.118 (3 mm)	.005	.177	.950 (8x)	3	1/8	2-1/2	38405	43.20	38405-C3	48.40		
.118 (3 mm)	.010	.177	.950 (8x)	3	1/8	2-1/2	41805	43.20	41805-C3	48.40		

CORNER RADIUS

D1 $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	R $\begin{smallmatrix} +.001" \\ -.001" \end{smallmatrix}$	L2 $\begin{smallmatrix} +.030" \\ -.000" \end{smallmatrix}$	L3 $\begin{smallmatrix} +.030" \\ -.000" \end{smallmatrix}$		D2	L1	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	.005	.187	.625 (5x)	3	1/8	2-1/2	37208	42.30	37208-C3	47.50	37208-C4	55.40
.125 (1/8)	.005	.187	1.000 (8x)	3	1/8	2-1/2	38408	43.20	38408-C3	48.40		
.125 (1/8)	.005	.187	1.250 (10x)	3	1/8	2-1/2	917908	47.80	917908-C3	53.00		
.125 (1/8)	.005	.187	1.500 (12x)	3	1/8	3	39508	46.50	39508-C3	51.70		
.125 (1/8)	.008	.187	.625 (5x)	3	1/8	2-1/2	912808	42.30	912808-C3	47.50		
.125 (1/8)	.008	.187	1.000 (8x)	3	1/8	2-1/2	909408	43.00	909408-C3	48.20		
.125 (1/8)	.010	.187	.375 (3x)	3	1/8	2-1/2	925708	42.30	925708-C3	47.50		
.125 (1/8)	.010	.187	.625 (5x)	3	1/8	2-1/2	41608	42.30	41608-C3	47.50	41608-C4	55.40
.125 (1/8)	.010	.187	.625 (5x)	4	1/8	2-1/2	800208	46.60	800208-C3	51.80		
.125 (1/8)	.010	.187	.750 (6x)	3	1/8	2-1/2	768508	42.30	768508-C3	47.50		
.125 (1/8)	.010	.187	.875 (7x)	3	1/8	2-1/2	766908	43.20	766908-C3	48.40		
.125 (1/8)	.010	.187	1.000 (8x)	3	1/8	2-1/2	41808	43.20	41808-C3	48.40		
.125 (1/8)	.010	.187	1.000 (8x)	4	1/8	2-1/2	800008	47.60	800008-C3	52.80		
.125 (1/8)	.010	.187	1.250 (10x)	3	1/8	2-1/2	953808	46.30	953808-C3	51.50		
.125 (1/8)	.010	.187	1.500 (12x)	3	1/8	3	42008	46.50	42008-C3	51.70		
.125 (1/8)	.010	.187	1.875 (15x)	3	1/8	3	947908	52.70	947908-C3	57.90		
.125 (1/8)	.015	.187	.625 (5x)	3	1/8	2-1/2	42808	42.30	42808-C3	47.50	42808-C4	55.40
.125 (1/8)	.015	.187	1.000 (8x)	3	1/8	2-1/2	43008	43.20	43008-C3	48.40	43008-C4	56.30
.125 (1/8)	.015	.187	1.250 (10x)	3	1/8	2-1/2	965708	46.30	965708-C3	51.50		
.125 (1/8)	.015	.187	1.500 (12x)	3	1/8	3	43208	46.50	43208-C3	51.70	43208-C4	59.60
.125 (1/8)	.015	.187	1.875 (15x)	3	1/8	3	939408	52.50	939408-C3	57.70		

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# MINIATURE END MILLS

## Corner Radius – Long Reach, Stub Flute (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+ .000"</sup> / <sub>-.002"</sub>	R <sup>+ .001"</sup> / <sub>-.001"</sub>	L2 <sup>+ .030"</sup> / <sub>-.000"</sub>	L3 <sup>+ .030"</sup> / <sub>-.000"</sub>		D2	L1						
.125 (1/8)	.020	.187	.625 (5x)	3	1/8	2-1/2	953608	42.30	953608-C3	47.50	953608-C4	55.40
.125 (1/8)	.020	.187	1.000 (8x)	3	1/8	2-1/2	970208	43.20	970208-C3	48.40		
.125 (1/8)	.020	.187	1.250 (10x)	3	1/8	2-1/2	923308	46.30	923308-C3	51.50		
.125 (1/8)	.025	.187	.625 (5x)	3	1/8	2-1/2	839908	42.30	839908-C3	47.50		
.125 (1/8)	.025	.187	1.000 (8x)	3	1/8	2-1/2	840208	43.00	840208-C3	48.20		
.125 (1/8)	.030	.187	.375 (3x)	3	1/8	2-1/2	827108	42.30	827108-C3	47.50		
.125 (1/8)	.030	.187	.625 (5x)	3	1/8	2-1/2	42208	42.30	42208-C3	47.50	42208-C4	55.40
.125 (1/8)	.030	.187	1.000 (8x)	3	1/8	2-1/2	42408	43.20	42408-C3	48.40		
.125 (1/8)	.030	.187	1.250 (10x)	3	1/8	2-1/2	921508	46.50	921508-C3	51.70		
.125 (1/8)	.030	.187	1.500 (12x)	3	1/8	3	42608	46.50	42608-C3	51.70		
.125 (1/8)	.030	.187	1.875 (15x)	3	1/8	3	919708	52.50	919708-C3	57.70		
.125 (1/8)	.040	.187	.625 (5x)	3	1/8	2-1/2	930208	42.30	930208-C3	47.50		
.125 (1/8)	.040	.187	1.000 (8x)	3	1/8	2-1/2	924308	43.00	924308-C3	48.20		
.140 (9/64)	.010	.220	.750 (5x)	3	3/16	3	41609	42.30	41609-C3	47.90		
.140 (9/64)	.010	.220	1.125 (8x)	3	3/16	3	41809	43.20	41809-C3	48.80		
.140 (9/64)	.015	.220	.750 (5x)	3	3/16	3	42809	42.30	42809-C3	47.90		
.140 (9/64)	.015	.220	1.125 (8x)	3	3/16	3	43009	44.00	43009-C3	49.60		
.156 (5/32)	.010	.234	.750 (5x)	3	3/16	3	41610	46.50	41610-C3	52.10		
.156 (5/32)	.010	.234	1.250 (8x)	3	3/16	3	41810	47.40	41810-C3	53.00		
.156 (5/32)	.010	.234	1.570 (10x)	3	3/16	3	953810	50.40	953810-C3	56.00		
.156 (5/32)	.015	.234	.750 (5x)	3	3/16	3	42810	46.50	42810-C3	52.10		
.156 (5/32)	.015	.234	1.250 (8x)	3	3/16	3	43010	47.40	43010-C3	53.00		
.156 (5/32)	.015	.234	1.570 (10x)	3	3/16	3	965710	50.40	965710-C3	56.00		
.156 (5/32)	.020	.234	.750 (5x)	3	3/16	3	953610	46.50	953610-C3	52.10		
.156 (5/32)	.020	.234	1.250 (8x)	3	3/16	3	970210	47.40	970210-C3	53.00		
.156 (5/32)	.030	.234	.750 (5x)	3	3/16	3	42210	46.50	42210-C3	52.10		
.156 (5/32)	.030	.234	1.250 (8x)	3	3/16	3	42410	47.40	42410-C3	53.00		
.187 (3/16)	.005	.281	1.000 (5x)	3	3/16	3	37212	46.50	37212-C3	52.10		
.187 (3/16)	.010	.281	1.000 (5x)	3	3/16	3	41612	46.50	41612-C3	52.10		
.187 (3/16)	.010	.281	1.500 (8x)	3	3/16	3	41812	47.40	41812-C3	53.00		
.187 (3/16)	.015	.281	1.000 (5x)	3	3/16	3	42812	46.50	42812-C3	52.10	42812-C4	64.60
.187 (3/16)	.015	.281	1.500 (8x)	3	3/16	3	43012	47.40	43012-C3	53.00	43012-C4	65.50
.187 (3/16)	.015	.281	1.875 (10x)	3	3/16	4	965712	50.40	965712-C3	58.00		
.187 (3/16)	.015	.281	2.250 (12x)	3	3/16	4	43212	50.60	43212-C3	58.20	43212-C4	69.90
.187 (3/16)	.020	.281	1.000 (5x)	3	3/16	3	953612	46.50	953612-C3	52.10		
.187 (3/16)	.020	.281	1.500 (8x)	3	3/16	3	970212	47.40	970212-C3	53.00		
.187 (3/16)	.030	.281	1.000 (5x)	3	3/16	3	42212	46.50	42212-C3	52.10	42212-C4	64.60
.187 (3/16)	.030	.281	1.156 (6x)	3	3/16	3	766512	47.40	766512-C3	53.00		
.187 (3/16)	.030	.281	1.312 (7x)	3	3/16	3	765712	47.40	765712-C3	53.00		
.187 (3/16)	.030	.281	1.500 (8x)	3	3/16	3	42412	47.40	42412-C3	53.00	42412-C4	65.50
.187 (3/16)	.030	.281	1.875 (10x)	3	3/16	4	921512	50.60	921512-C3	58.20		
.187 (3/16)	.030	.281	2.250 (12x)	3	3/16	4	42612	50.60	42612-C3	58.20		
.187 (3/16)	.045	.281	1.000 (5x)	3	3/16	3	978812	46.50	978812-C3	52.10		
.187 (3/16)	.045	.281	1.500 (8x)	3	3/16	3	961812	47.40	961812-C3	53.00		
.187 (3/16)	.060	.281	1.000 (5x)	3	3/16	3	949112	46.50	949112-C3	52.10		
.187 (3/16)	.060	.281	1.500 (8x)	3	3/16	3	866012	47.20	866012-C3	52.80		

continued on next page

# MINIATURE END MILLS

## Corner Radius – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIA. D <sub>1</sub>	CORNER RADIUS R	LOC L <sub>2</sub>	OVERALL REACH L <sub>3</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OAL L <sub>1</sub>	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.250 (1/4)	.005	.375	1.250 (5x)	3	1/4	4	37216	51.40	37216-C3	57.00		
.250 (1/4)	.005	.375	2.000 (8x)	3	1/4	4	38416	52.70	38416-C3	61.60		
.250 (1/4)	.010	.375	1.250 (5x)	3	1/4	4	41616	51.40	41616-C3	60.30		
.250 (1/4)	.010	.375	2.000 (8x)	3	1/4	4	41816	52.70	41816-C3	61.60		
.250 (1/4)	.015	.375	1.250 (5x)	3	1/4	4	42816	51.40	42816-C3	60.30		
.250 (1/4)	.015	.375	2.000 (8x)	3	1/4	4	43016	52.70	43016-C3	61.60		
.250 (1/4)	.015	.375	3.000 (12x)	3	1/4	6	43216	60.30	43216-C3	70.40		
.250 (1/4)	.020	.375	1.250 (5x)	3	1/4	4	953616	51.40	953616-C3	60.30		
.250 (1/4)	.020	.375	2.000 (8x)	3	1/4	4	970216	53.70	970216-C3	62.60		
.250 (1/4)	.030	.375	1.250 (5x)	3	1/4	4	42216	51.40	42216-C3	60.30	42216-C4	72.00
.250 (1/4)	.030	.375	2.000 (8x)	3	1/4	4	42416	52.70	42416-C3	61.60	42416-C4	73.30
.250 (1/4)	.030	.375	3.000 (12x)	3	1/4	6	42616	60.30	42616-C3	70.40	42616-C4	90.10
.250 (1/4)	.045	.375	1.250 (5x)	3	1/4	4	978816	51.40	978816-C3	60.30		
.250 (1/4)	.060	.375	1.250 (5x)	3	1/4	4	949116	51.40	949116-C3	60.30	949116-C4	72.00
.250 (1/4)	.060	.375	2.000 (8x)	3	1/4	4	866016	53.70	866016-C3	62.60		
.312 (5/16)	.015	.470	1.625 (5x)	3	5/16	4	42820	81.90	42820-C3	92.60		
.312 (5/16)	.015	.470	2.500 (8x)	3	5/16	4	43020	83.40	43020-C3	94.10		
.375 (3/8)	.030	.570	2.000 (5x)	3	3/8	4	42224	86.70	42224-C3	100.50		
.375 (3/8)	.030	.570	3.000 (8x)	3	3/8	6	42424	117.60	42424-C3	133.20		
.375 (3/8)	.060	.570	2.000 (5x)	3	3/8	4	949124	86.70	949124-C3	100.50		
.375 (3/8)	.060	.570	3.000 (8x)	3	3/8	6	866024	119.80	866024-C3	135.40		

CORNER RADIUS

**MACHINING  
ADVISOR PRO**

FREE for desktop,  
tablet, and mobile



Customizable Running Parameters  
For Optimized Machining

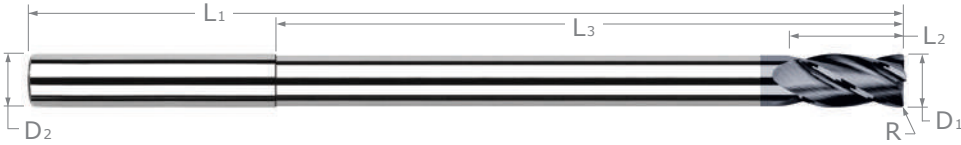


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# MINIATURE END MILLS

## Corner Radius – Extra Long Length



CORNER RADIUS

- Up to 8" overall length
- Longest overall length carbide end mill available in stock
- Extended reach
- 4 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
						4 FL	PRICE	4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.00'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	4 FL	PRICE	4 FL	PRICE
.250 (1/4)	.015	.375	4.375 (17.5x)	1/4	6	24016	96.90	24016-C3	107.00
.312 (5/16)	.015	.470	4.343 (14x)	5/16	6	24020	114.30	24020-C3	129.40
.375 (3/8)	.030	.562	4.312 (11.5x)	3/8	6	24024	129.70	24024-C3	145.30
.500 (1/2)	.030	.750	5.750 (11.5x)	1/2	8	24032	225.80	24032-C3	256.90
.625 (5/8)	.030	.937	5.687 (9x)	5/8	8	24040	377.50	24040-C3	404.80
.750 (3/4)	.030	1.125	5.625 (7.5x)	3/4	8	24048	470.40	24048-C3	502.20



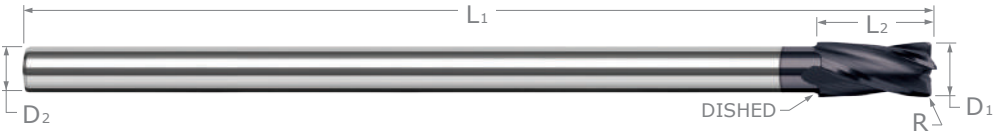
Access Simulation Files in DXF Format for Every Harvey Tool Product

[harveytool.com/resources/simulation-files](http://harveytool.com/resources/simulation-files)



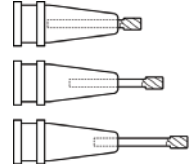
**END MILLS**

**Corner Radius – Reduced Shank**



- Reduced straight shank allows any chucking depth
- Solid carbide construction for maximum rigidity
- Long length design for deep cavity machining
- Corner radius for improved strength
- Length of cut = 1½x diameter
- Center cutting
- 4 flutes
- Solid carbide
- CNC ground in the USA

**Chuck at Any Depth!**



CORNER RADIUS

CUTTER DIAMETER D <sub>1</sub> <small>+ .000" - .002"</small>	CORNER RADIUS R <small>+ .001" - .001"</small>	LENGTH OF CUT L <sub>2</sub> <small>+ .030" - .000"</small>	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	UNCOATED		A1TiN COATED	
					4 FL	PRICE	4 FL	PRICE
<b>1/8</b>	.010	3/16	<b>3 mm</b>	2-1/2	17608	95.20	17608-C3	100.40
<b>1/8</b>	.015	3/16	<b>3 mm</b>	2-1/2	829008	95.20	829008-C3	100.40
<b>5/32</b>	.010	15/64	<b>1/8</b>	2-1/2	17610	95.20	17610-C3	100.80
<b>5/32</b>	.015	15/64	<b>1/8</b>	2-1/2	829010	95.20	829010-C3	100.80
<b>3/16</b>	.015	9/32	<b>1/8</b>	2-1/2	17612	95.20	17612-C3	100.80
<b>3/16</b>	.015	9/32	<b>5/32</b>	2-1/2	17613	98.00	17613-C3	103.60
<b>3/16</b>	.030	9/32	<b>1/8</b>	2-1/2	844912	99.00	844912-C3	104.60
<b>1/4</b>	.015	3/8	<b>3/16</b>	3	17616	103.10	17616-C3	110.70
<b>1/4</b>	.030	3/8	<b>3/16</b>	3	844916	103.10	844916-C3	108.70
<b>5/16</b>	.015	15/32	<b>1/4</b>	4	17620	125.60	17620-C3	136.30
<b>5/16</b>	.030	15/32	<b>1/4</b>	4	844920	125.60	844920-C3	136.30
<b>3/8</b>	.015	9/16	<b>5/16</b>	4	829024	150.80	829024-C3	164.60
<b>3/8</b>	.030	9/16	<b>5/16</b>	4	17624	149.40	17624-C3	163.20
<b>3/8</b>	.060	9/16	<b>5/16</b>	4	766324	152.10	766324-C3	165.90
<b>7/16</b>	.015	21/32	<b>3/8</b>	6	829028	221.60	829028-C3	238.50
<b>7/16</b>	.030	21/32	<b>3/8</b>	6	17628	219.50	17628-C3	236.40
<b>1/2</b>	.015	3/4	<b>7/16</b>	6	829032	231.90	829032-C3	240.40
<b>1/2</b>	.030	3/4	<b>7/16</b>	6	17632	231.90	17632-C3	247.00
<b>1/2</b>	.060	3/4	<b>7/16</b>	6	766332	233.00	766332-C3	248.10
<b>5/8</b>	.030	15/16	<b>1/2</b>	6	17640	301.20	17640-C3	323.70
<b>3/4</b>	.030	1-1/8	<b>5/8</b>	6	17648	371.70	17648-C3	395.30
<b>3/4</b>	.060	1-1/8	<b>5/8</b>	6	766348	374.10	766348-C3	397.70

**For Square Reduced Shank, please see page 42.**

**For Ball Reduced Shank, please see page 67.**

# MINIATURE END MILLS

## Corner Chamfer – Standard



4 Flutes



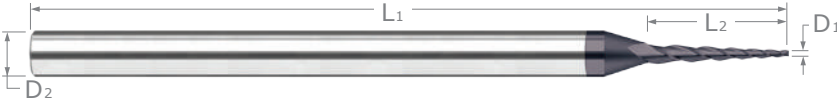
- Chamfered corner creates consistent heat and wear along chamfer by distributing forces evenly
- 45° corner chamfer protects corners on the end mill and can create small chamfers and edge breaks
- Center cutting
- Solid carbide
- CNC ground in the USA

CORNER CHAMFER

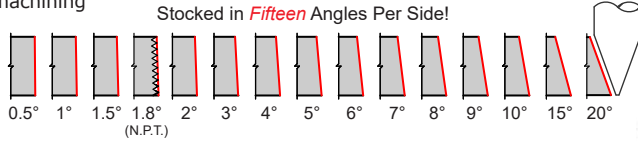
CUTTER DIAMETER	CORNER CHAMFER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED	
					4 FL	PRICE	4 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_4 \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	4 FL	PRICE	4 FL	PRICE
.062 (1/16)	<b>.005</b>	.187 (3x)	1/8	1-1/2	805162	24.40	805162-C3	29.60
.078 (5/64)	<b>.005</b>	.234 (3x)	1/8	1-1/2	805178	24.40	805178-C3	29.60
.093 (3/32)	<b>.005</b>	.279 (3x)	1/8	1-1/2	805193	24.90	805193-C3	30.10
.093 (3/32)	<b>.010</b>	.279 (3x)	1/8	1-1/2	804993	24.40	804993-C3	29.60
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_4 \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	4 FL	PRICE	4 FL	PRICE
.125 (1/8)	<b>.005</b>	.375 (3x)	1/8	1-1/2	805208	24.90	805208-C3	30.10
.125 (1/8)	<b>.010</b>	.375 (3x)	1/8	1-1/2	805008	24.40	805008-C3	29.60
.125 (1/8)	<b>.020</b>	.375 (3x)	1/8	1-1/2	804808	24.40	804808-C3	29.60
.125 (1/8)	<b>.030</b>	.375 (3x)	1/8	1-1/2	751108	24.90	751108-C3	30.10
.187 (3/16)	<b>.005</b>	.570 (3x)	3/16	2	805212	27.10	805212-C3	32.70
.187 (3/16)	<b>.010</b>	.570 (3x)	3/16	2	805012	27.10	805012-C3	32.70
.187 (3/16)	<b>.020</b>	.570 (3x)	3/16	2	804812	27.10	804812-C3	32.70
.187 (3/16)	<b>.030</b>	.570 (3x)	3/16	2	751112	27.10	751112-C3	32.70
.250 (1/4)	<b>.005</b>	.750 (3x)	1/4	2-1/2	805216	33.30	805216-C3	40.90
.250 (1/4)	<b>.010</b>	.750 (3x)	1/4	2-1/2	805016	33.30	805016-C3	40.90
.250 (1/4)	<b>.020</b>	.750 (3x)	1/4	2-1/2	804816	33.30	804816-C3	40.90
.250 (1/4)	<b>.030</b>	.750 (3x)	1/4	2-1/2	751116	33.30	751116-C3	40.90
.375 (3/8)	<b>.005</b>	1.125 (3x)	3/8	2-1/2	805224	48.70	805224-C3	58.80
.375 (3/8)	<b>.010</b>	1.125 (3x)	3/8	2-1/2	805024	48.70	805024-C3	58.80
.375 (3/8)	<b>.020</b>	1.125 (3x)	3/8	2-1/2	804824	48.70	804824-C3	58.80
.375 (3/8)	<b>.030</b>	1.125 (3x)	3/8	2-1/2	751124	48.70	751124-C3	58.80
.500 (1/2)	<b>.005</b>	1.500 (3x)	1/2	3	805232	75.20	805232-C3	90.30
.500 (1/2)	<b>.010</b>	1.500 (3x)	1/2	3	805032	75.20	805032-C3	90.30
.500 (1/2)	<b>.020</b>	1.500 (3x)	1/2	3	804832	75.20	804832-C3	90.30
.500 (1/2)	<b>.030</b>	1.500 (3x)	1/2	3	751132	75.20	751132-C3	90.30

# MINIATURE END MILLS

## Tapered - Square



- Length of cut up to 10x end diameter
- Long length design for deep cavity machining
- 3 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA



ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN NANO COATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
0.5°	D <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
	.015 (1/64)	.078 (5x)	1/8	1-1/2	997015	44.60	997015-C6	52.20		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20515	73.40	20515-C6	81.00		
	.030	.156 (5x)	1/8	1-1/2	997030	37.90	997030-C6	45.50		
	.030	.300 (10x)	3/16	3	20530	65.30	20530-C6	73.50		
	.045	.250 (5x)	1/8	1-1/2	997045	37.90	997045-C6	45.50		
	.045	.450 (10x)	3/16	3	20545	65.30	20545-C6	73.50		
	.060	.312 (5x)	1/8	1-1/2	997060	37.90	997060-C6	45.50		
	.060	.600 (10x)	3/16	3	20560	65.30	20560-C6	73.50		
	.075	.750 (10x)	3/16	3	20575	66.50	20575-C6	74.70		
	.090	.500 (5x)	1/8	1-1/2	997090	37.90	997090-C6	45.50		
	.090	.900 (10x)	1/4	4	20590	72.30	20590-C6	83.50		
.125 (1/8)	.625 (5x)	3/16	2	997099	58.90	997099-C6	67.10			
.125 (1/8)	1.250 (10x)	1/4	4	20599	71.00	20599-C6	82.20			
1°	.015 (1/64)	.078 (5x)	1/8	1-1/2	992715	44.60	992715-C6	52.20		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20615	72.00	20615-C6	79.60		
	.030	.156 (5x)	1/8	1-1/2	992730	37.90	992730-C6	45.50	992730-C8	45.50
	.030	.300 (10x)	3/16	3	20630	65.30	20630-C6	73.50	20630-C8	72.90
	.045	.250 (5x)	1/8	1-1/2	992745	37.90	992745-C6	45.50		
	.045	.450 (10x)	3/16	3	20645	65.30	20645-C6	73.50		
	.060	.312 (5x)	1/8	1-1/2	992760	37.90	992760-C6	45.50		
	.060	.600 (10x)	3/16	3	20660	65.30	20660-C6	73.50		
	.075	.750 (10x)	3/16	3	20675	65.30	20675-C6	73.50		
	.090	.500 (5x)	1/8	1-1/2	992790	37.90	992790-C6	45.50		
	.090	.900 (10x)	1/4	4	20690	71.00	20690-C6	82.20		
	.125 (1/8)	.625 (5x)	3/16	2	992799	58.90	992799-C6	67.10		
.125 (1/8)	1.250 (10x)	1/4	4	20699	71.00	20699-C6	82.20			
1.5°	.015 (1/64)	.078 (5x)	1/8	1-1/2	991815	44.60	991815-C6	52.20		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20715	73.40	20715-C6	81.00		
	.030	.156 (5x)	1/8	1-1/2	991830	38.60	991830-C6	46.20		
	.030	.300 (10x)	3/16	3	20730	66.50	20730-C6	74.70		
	.045	.250 (5x)	1/8	1-1/2	991845	37.90	991845-C6	45.50		
	.045	.450 (10x)	3/16	3	20745	65.30	20745-C6	73.50		
	.060	.312 (5x)	1/8	1-1/2	991860	38.60	991860-C6	46.20		
	.060	.600 (10x)	3/16	3	20760	66.50	20760-C6	74.70		
	.075	.750 (10x)	1/4	4	20775	72.30	20775-C6	83.50		
	.090	.500 (5x)	1/8	1-1/2	991890	38.60	991890-C6	46.20		
	.090	.900 (10x)	1/4	4	20790	71.00	20790-C6	82.20		
	.125 (1/8)	1.250 (10x)	1/4	4	20799	71.00	20799-C6	82.20		

TAPERED

continued on next page

# MINIATURE END MILLS

## Tapered – Square (cont.)

continued from previous page

ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN NANO COATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
1.8° (N.R.T.)	.200	.625 (3x)	1/4	2	912282	61.80	912282-C6	73.00		
	.300	.900 (3x)	3/8	2-1/2	912286	77.10	912286-C6	89.70		
	.400	1.250 (3x)	1/2	3	912292	103.70	912292-C6	120.00		
2°	.015 (1/64)	.078 (5x)	1/8	1-1/2	991015	43.70	991015-C6	51.30		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20815	72.00	20815-C6	79.60		
	.030	.156 (5x)	1/8	1-1/2	991030	37.90	991030-C6	45.50		
	.030	.300 (10x)	3/16	3	20830	65.30	20830-C6	73.50		
	.045	.250 (5x)	1/8	1-1/2	991045	37.90	991045-C6	45.50		
	.045	.450 (10x)	3/16	3	20845	65.30	20845-C6	73.50		
	.060	.312 (5x)	1/8	1-1/2	991060	37.90	991060-C6	45.50		
	.060	.600 (10x)	3/16	3	20860	65.30	20860-C6	73.50		
	.075	.750 (10x)	1/4	4	20875	72.30	20875-C6	83.50		
	.090	.500 (5x)	1/8	1-1/2	991090	37.90	991090-C6	45.50		
	.090	.900 (10x)	1/4	4	20890	71.00	20890-C6	82.20		
	.125 (1/8)	.625 (5x)	3/16	2	991099	58.90	991099-C6	67.10		
.125 (1/8)	1.250 (10x)	1/4	4	20899	71.00	20899-C6	82.20			
3°	.015 (1/64)	.078 (5x)	1/8	1-1/2	990415	43.70	990415-C6	51.30		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20915	72.00	20915-C6	79.60		
	.030	.156 (5x)	1/8	1-1/2	990430	37.90	990430-C6	45.50	990430-C8	45.50
	.030	.300 (10x)	3/16	3	20930	65.30	20930-C6	73.50	20930-C8	72.90
	.045	.250 (5x)	1/8	1-1/2	990445	37.90	990445-C6	45.50		
	.045	.450 (10x)	3/16	3	20945	65.30	20945-C6	73.50		
	.060	.312 (5x)	1/8	1-1/2	990460	37.90	990460-C6	45.50		
	.060	.600 (10x)	3/16	3	20960	65.30	20960-C6	73.50		
	.075	.750 (10x)	1/4	4	20975	72.30	20975-C6	83.50		
	.090	.500 (5x)	3/16	2	990490	58.90	990490-C6	67.10		
	.090	.900 (10x)	1/4	4	20990	71.00	20990-C6	82.20		
	.125 (1/8)	.625 (5x)	1/4	2-1/2	990499	86.70	990499-C6	97.90		
.125 (1/8)	1.192 (10x)	1/4	4	20999	71.00	20999-C6	82.20			
4°	.015 (1/64)	.150 (10x)	1/8	2-1/2	996215	72.00	996215-C6	79.60		
	.030	.300 (10x)	3/16	3	996230	65.30	996230-C6	73.50		
	.045	.450 (10x)	3/16	3	996245	65.30	996245-C6	73.50		
	.060	.600 (10x)	3/16	3	996260	65.30	996260-C6	73.50		
	.075	.750 (10x)	1/4	4	996275	72.30	996275-C6	83.50		
	.090	.900 (10x)	1/4	4	996290	72.30	996290-C6	83.50		
	.125 (1/8)	1.250 (10x)	3/8	4	996299	97.70	996299-C6	110.30		
	5°	.010	.050 (5x)	1/8	1-1/2	989610	51.80	989610-C6	59.40	
.010		.100 (10x)	1/8	2-1/2	27110	79.90	27110-C6	87.50		
.015 (1/64)		.078 (5x)	1/8	1-1/2	989615	43.70	989615-C6	51.30		
.015 (1/64)		.120 (8x)	1/8	1-1/2	761915	46.20	761915-C6	53.80		
.015 (1/64)		.150 (10x)	1/8	2-1/2	27115	72.00	27115-C6	79.60		
.020		.100 (5x)	1/8	1-1/2	989620	42.80	989620-C6	50.40		
.020		.200 (10x)	1/8	2-1/2	27120	70.70	27120-C6	78.30		
.030		.156 (5x)	1/8	1-1/2	989630	37.90	989630-C6	45.50	989630-C8	45.50
.030		.300 (10x)	3/16	3	27130	65.30	27130-C6	73.50	27130-C8	72.90
.045		.250 (5x)	1/8	1-1/2	989645	37.90	989645-C6	45.50		
.045	.450 (10x)	3/16	3	27145	65.30	27145-C6	73.50			

continued on next page

# MINIATURE END MILLS

Tapered – Square (cont.)

continued from previous page

ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN NANO COATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
A <sub>1</sub> <sup>+0°30'</sup> <sub>-0°30'</sub>	D <sub>1</sub> <sup>+ .0005"</sup> <sub>- .0005"</sub>	L <sub>2</sub> <sup>+ .020"</sup> <sub>- .000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
5°	.060	.312 (5x)	1/8	1-1/2	989660	37.90	989660-C6	45.50		
	.060	.600 (10x)	3/16	3	27160	65.30	27160-C6	73.50		
	.062 (1/16)	.312 (5x)	1/8	1-1/2	989662	37.90	989662-C6	45.50		
	.062 (1/16)	.620 (10x)	3/16	3	27162	65.30	27162-C6	73.50		
	.075	.375 (5x)	3/16	2	989675	58.90	989675-C6	67.10		
	.075	.750 (10x)	1/4	4	27175	72.30	27175-C6	83.50		
	.090	.500 (5x)	3/16	2	989690	58.90	989690-C6	67.10		
	.090	.900 (10x)	1/4	4	27190	71.00	27190-C6	82.20		
	.093 (3/32)	.500 (5x)	3/16	2	989693	58.90	989693-C6	67.10		
	.093 (3/32)	.930 (10x)	1/4	4	27193	71.00	27193-C6	82.20		
	.125 (1/8)	.625 (5x)	1/4	2-1/2	989699	86.70	989699-C6	97.90		
	.125 (1/8)	1.250 (10x)	3/8	4	27199	95.80	27199-C6	108.40		
.187 (3/16)	1.000 (5x)	3/8	2-1/2	989681	95.80	989681-C6	108.40			
.250 (1/4)	1.250 (5x)	1/2	3	989684	129.50	989684-C6	145.80			
6°	.015 (1/64)	.150 (10x)	1/8	2-1/2	993315	76.50	993315-C6	84.10		
	.030	.300 (10x)	3/16	3	993330	71.00	993330-C6	79.20		
	.045	.250 (5x)	1/8	1-1/2	904345	62.20	904345-C6	69.80		
	.045	.450 (10x)	3/16	3	993345	71.00	993345-C6	79.20		
	.060	.312 (5x)	3/16	2	904360	60.00	904360-C6	68.20		
	.060	.600 (10x)	3/16	3	993360	71.00	993360-C6	79.20		
	.090	.500 (5x)	1/4	2-1/2	904390	89.70	904390-C6	100.90		
	.125 (1/8)	.625 (5x)	5/16	2-1/2	904399	86.30	904399-C6	98.90		
7°	.015 (1/64)	.078 (5x)	1/8	1-1/2	922615	45.20	922615-C6	52.80		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	28015	74.40	28015-C6	82.00		
	.030	.156 (5x)	1/8	1-1/2	922630	39.10	922630-C6	46.70		
	.030	.300 (10x)	3/16	3	28030	67.50	28030-C6	75.70		
	.045	.250 (5x)	1/8	1-1/2	922645	39.10	922645-C6	46.70		
	.045	.450 (10x)	3/16	3	28045	67.50	28045-C6	75.70		
	.060	.312 (5x)	3/16	2	922660	60.90	922660-C6	69.10		
	.060	.600 (10x)	1/4	4	28060	73.50	28060-C6	84.70		
	.075	.750 (10x)	3/8	4	28075	102.00	28075-C6	114.60		
	.090	.500 (5x)	1/4	2-1/2	922690	73.50	922690-C6	84.70		
	.090	.900 (10x)	3/8	4	28090	100.30	28090-C6	112.90		
.125 (1/8)	.625 (5x)	5/16	2-1/2	922699	86.30	922699-C6	98.90			
8°	.015 (1/64)	.150 (10x)	1/8	2-1/2	995415	76.50	995415-C6	84.10		
	.030	.300 (10x)	3/16	3	995430	71.00	995430-C6	79.20		
	.045	.450 (10x)	3/16	3	995445	71.00	995445-C6	79.20		
	.060	.600 (10x)	1/4	4	995460	75.90	995460-C6	87.10		
	.090	.500 (5x)	1/4	2-1/2	903790	73.50	903790-C6	84.70		
	.125 (1/8)	.625 (5x)	5/16	2-1/2	903799	86.30	903799-C6	98.90		
9°	.015 (1/64)	.150 (10x)	1/8	2-1/2	992115	77.20	992115-C6	84.80		
	.030	.300 (10x)	3/16	3	992130	71.70	992130-C6	79.90		
	.045	.450 (10x)	3/16	3	992145	71.70	992145-C6	79.90		
	.060	.600 (10x)	1/4	4	992160	76.60	992160-C6	87.80		
	.090	.500 (5x)	1/4	2-1/2	902490	73.50	902490-C6	84.70		
	.125 (1/8)	.625 (5x)	3/8	2-1/2	902499	99.20	902499-C6	111.80		

TAPERED

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# MINIATURE END MILLS

## Tapered – Square (cont.)

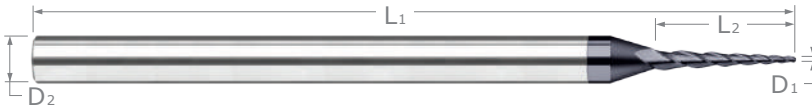
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ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN NANO COATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
10°	A <sub>1</sub> <sup>+0°30'</sup> <sub>-0°30'</sub>	D <sub>1</sub> <sup>+0.0005"</sup> <sub>-0.0005"</sub>	L <sub>2</sub> <sup>+0.020"</sup> <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>					
		.010	.050 (5x)	1/8	1-1/2	988210	51.80	988210-C6	59.40	
		.010	.100 (10x)	1/8	2-1/2	29410	78.40	29410-C6	86.00	
		.015 (1/64)	.078 (5x)	1/8	1-1/2	988215	43.70	988215-C6	51.30	
		.015 (1/64)	.150 (10x)	1/8	2-1/2	29415	72.00	29415-C6	79.60	
		.020	.100 (5x)	1/8	1-1/2	988220	43.70	988220-C6	51.30	
		.020	.200 (10x)	1/8	2-1/2	29420	70.70	29420-C6	78.30	
		.030	.156 (5x)	1/8	1-1/2	988230	37.90	988230-C6	45.50	988230-C8 45.50
		.030	.300 (10x)	3/16	3	29430	65.30	29430-C6	73.50	29430-C8 72.90
		.045	.250 (5x)	3/16	2	988245	65.30	988245-C6	73.50	
		.045	.360 (8x)	3/16	3	760845	66.50	760845-C6	74.70	
		.045	.450 (10x)	1/4	4	29445	72.30	29445-C6	83.50	
		.060	.312 (5x)	3/16	2	988260	65.30	988260-C6	73.50	
		.060	.600 (10x)	3/8	4	29460	95.80	29460-C6	108.40	
		.075	.375 (5x)	1/4	2-1/2	988275	68.70	988275-C6	79.90	
		.075	.750 (10x)	3/8	4	29475	97.70	29475-C6	110.30	
		.090	.500 (5x)	5/16	2-1/2	988290	81.30	988290-C6	93.90	
		.125 (1/8)	.625 (5x)	3/8	2-1/2	988299	95.80	988299-C6	108.40	
	.187 (3/16)	.890 (5x)	1/2	3	988281	129.50	988281-C6	145.80		
	.250 (1/4)	1.065 (5x)	5/8	3-1/2	988284	139.20	988284-C6	158.00		
15°		.015 (1/64)	.031 (3x)	1/8	1-1/2	799415	41.80	799415-C6	49.40	
		.015 (1/64)	.078 (5x)	1/8	1-1/2	919515	43.70	919515-C6	51.30	
		.015 (1/64)	.120 (8x)	1/8	1-1/2	799315	48.40	799315-C6	56.00	
		.015 (1/64)	.150 (10x)	1/8	1-1/2	411115	68.70	411115-C6	76.30	
		.030	.093 (3x)	1/8	1-1/2	799430	41.80	799430-C6	49.40	
		.030	.156 (5x)	1/8	1-1/2	919530	43.70	919530-C6	51.30	
		.030	.240 (8x)	3/16	2	799330	48.40	799330-C6	56.60	
		.030	.294 (10x)	3/16	2	411130	67.10	411130-C6	75.30	
		.045	.250 (5x)	3/16	2	919545	58.90	919545-C6	67.10	
		.045	.383 (8x)	1/4	2-1/2	411145	72.00	411145-C6	83.20	
		.060	.312 (5x)	1/4	2-1/2	919560	70.70	919560-C6	81.90	
		.060	.588 (10x)	3/8	2-1/2	411160	97.70	411160-C6	110.30	
		.075	.750 (10x)	1/2	3	411175	136.00	411175-C6	152.30	
		.090	.765 (8x)	1/2	3	411190	133.40	411190-C6	149.70	
		.125 (1/8)	.700 (5x)	1/2	3	411199	133.40	411199-C6	149.70	
20°		.015	.078 (5x)	1/8	1-1/2	832815	43.70	832815-C6	51.30	
		.015	.120 (8x)	1/8	1-1/2	799215	48.40	799215-C6	56.00	
		.030	.156 (5x)	3/16	2	832830	43.70	832830-C6	51.90	
		.030	.240 (8x)	1/4	2-1/2	799230	72.00	799230-C6	83.20	
		.045	.250 (5x)	1/4	2-1/2	832845	58.90	832845-C6	70.10	
		.045	.360 (8x)	5/16	2-1/2	799245	76.60	799245-C6	89.20	
		.060	.312 (5x)	5/16	2-1/2	832860	63.50	832860-C6	76.10	

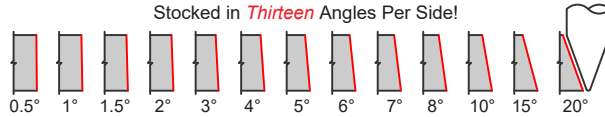
For larger angles, please see Chamfer Cutters on page 293.

# MINIATURE END MILLS

## Tapered – Ball



- Stocked in 0.5° to 20° tapers
- Long length design for deep cavity machining
- 3 flutes • Center cutting
- Solid carbide • CNC ground in the USA



ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN NANO COATED	
					3 FL	PRICE	3 FL	PRICE
$A_1 \begin{matrix} +0^\circ30' \\ -0^\circ30' \end{matrix}$	$D_1 \begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	$L_2 \begin{matrix} +.020'' \\ -.000'' \end{matrix}$	$D_2$ (h6)	$L_1$				
<b>0.5°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21515	78.30	21515-C6	85.90
	.030	<b>.300</b> (10x)	3/16	3	21530	71.70	21530-C6	79.90
	.045	<b>.450</b> (10x)	3/16	3	21545	73.10	21545-C6	81.30
	.060	<b>.600</b> (10x)	3/16	3	21560	71.70	21560-C6	79.90
	.090	<b>.900</b> (10x)	1/4	4	21590	77.10	21590-C6	88.30
	.125 (1/8)	<b>1.250</b> (10x)	1/4	4	21599	77.10	21599-C6	88.30
	<b>1°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21615	78.30	21615-C6
.030		<b>.156</b> (5x)	1/8	1-1/2	879830	42.30	879830-C6	49.90
.030		<b>.300</b> (10x)	3/16	3	21630	71.70	21630-C6	79.90
.045		<b>.450</b> (10x)	3/16	3	21645	73.10	21645-C6	81.30
.060		<b>.312</b> (5x)	1/8	1-1/2	879860	42.30	879860-C6	49.90
.060		<b>.600</b> (10x)	3/16	3	21660	71.70	21660-C6	79.90
.090		<b>.900</b> (10x)	1/4	4	21690	75.70	21690-C6	86.90
.125 (1/8)	<b>1.250</b> (10x)	1/4	4	21699	75.70	21699-C6	86.90	
<b>1.5°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21715	76.80	21715-C6	84.40
	.030	<b>.300</b> (10x)	3/16	3	21730	71.70	21730-C6	79.90
	.045	<b>.450</b> (10x)	3/16	3	21745	74.50	21745-C6	82.70
	.060	<b>.600</b> (10x)	3/16	3	21760	71.70	21760-C6	79.90
	.090	<b>.900</b> (10x)	1/4	4	21790	77.10	21790-C6	88.30
	.125 (1/8)	<b>1.250</b> (10x)	1/4	4	21799	75.70	21799-C6	86.90
	<b>2°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21815	76.80	21815-C6
.030		<b>.300</b> (10x)	3/16	3	21830	71.70	21830-C6	79.90
.045		<b>.450</b> (10x)	3/16	3	21845	73.10	21845-C6	81.30
.060		<b>.600</b> (10x)	3/16	3	21860	71.70	21860-C6	79.90
.090		<b>.900</b> (10x)	1/4	4	21890	75.70	21890-C6	86.90
.125 (1/8)		<b>1.250</b> (10x)	1/4	4	21899	75.70	21899-C6	86.90
<b>3°</b>		.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21915	76.80	21915-C6
	.030	<b>.156</b> (5x)	1/8	1-1/2	880230	42.30	880230-C6	49.90
	.030	<b>.300</b> (10x)	3/16	3	21930	71.70	21930-C6	79.90
	.045	<b>.450</b> (10x)	3/16	3	21945	73.10	21945-C6	81.30
	.060	<b>.312</b> (5x)	1/8	1-1/2	880260	42.30	880260-C6	49.90
	.060	<b>.600</b> (10x)	3/16	3	21960	71.70	21960-C6	79.90
	.090	<b>.900</b> (10x)	1/4	4	21990	75.70	21990-C6	86.90
.125 (1/8)	<b>1.192</b> (10x)	1/4	4	21999	75.70	21999-C6	86.90	

TAPERED

continued on next page

# MINIATURE END MILLS

## Tapered – Ball (cont.)

continued from previous page

ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITiN NANO COATED	
					3 FL	PRICE	3 FL	PRICE
A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
4°	.015 (1/64)	.150 (10x)	1/8	2-1/2	840415	80.20	840415-C6	87.80
	.030	.300 (10x)	3/16	3	840430	74.80	840430-C6	83.00
	.060	.600 (10x)	3/16	3	840460	74.80	840460-C6	83.00
	.090	.900 (10x)	1/4	4	840490	79.00	840490-C6	90.20
5°	.015 (1/64)	.150 (10x)	1/8	2-1/2	32615	76.80	32615-C6	84.40
	.030	.156 (5x)	1/8	1-1/2	880630	42.30	880630-C6	49.90
	.030	.300 (10x)	3/16	3	32630	71.70	32630-C6	79.90
	.045	.250 (5x)	1/8	1-1/2	880645	42.30	880645-C6	49.90
	.045	.450 (10x)	3/16	3	32645	73.10	32645-C6	81.30
	.060	.312 (5x)	1/8	1-1/2	880660	42.30	880660-C6	49.90
	.060	.480 (8x)	3/16	2	761960	65.90	761960-C6	74.10
	.060	.600 (10x)	3/16	3	32660	71.70	32660-C6	79.90
	.090	.900 (10x)	1/4	4	32690	75.70	32690-C6	86.90
.125 (1/8)	1.250 (10x)	3/8	4	32699	100.80	32699-C6	113.40	
6°	.015 (1/64)	.150 (10x)	1/8	2-1/2	835615	80.20	835615-C6	87.80
	.030	.300 (10x)	3/16	3	835630	74.10	835630-C6	82.30
	.060	.600 (10x)	3/16	3	835660	78.30	835660-C6	86.50
	.090	.900 (10x)	3/8	4	835690	104.20	835690-C6	116.80
7°	.015 (1/64)	.150 (10x)	1/8	2-1/2	34415	79.40	34415-C6	87.00
	.030	.300 (10x)	3/16	3	34430	74.10	34430-C6	82.30
	.045	.450 (10x)	3/16	3	34445	75.60	34445-C6	83.80
	.060	.600 (10x)	1/4	4	34460	78.30	34460-C6	89.50
	.090	.900 (10x)	3/8	4	34490	104.20	34490-C6	116.80
8°	.015 (1/64)	.150 (10x)	1/8	2-1/2	853815	80.20	853815-C6	87.80
	.030	.300 (10x)	3/16	3	853830	74.80	853830-C6	83.00
	.060	.600 (10x)	1/4	4	853860	78.30	853860-C6	89.50
	.090	.900 (10x)	3/8	4	853890	104.20	853890-C6	116.80
10°	.015 (1/64)	.078 (5x)	1/8	1-1/2	881015	43.60	881015-C6	51.20
	.015 (1/64)	.150 (10x)	1/8	2-1/2	35315	79.40	35315-C6	87.00
	.030	.156 (5x)	1/8	1-1/2	881030	43.60	881030-C6	51.20
	.030	.300 (10x)	3/16	3	35330	74.10	35330-C6	82.30
	.045	.250 (5x)	3/16	2	881045	71.80	881045-C6	80.00
	.045	.450 (10x)	1/4	4	35345	79.40	35345-C6	90.60
	.060	.312 (5x)	3/16	2	881060	71.80	881060-C6	80.00
	.060	.600 (10x)	3/8	4	35360	104.20	35360-C6	116.80
	.090	.500 (5x)	5/16	2-1/2	881090	115.90	881090-C6	128.50
	.125 (1/8)	.625 (5x)	3/8	2-1/2	881099	142.50	881099-C6	155.10
.187 (3/16)	.937 (5x)	1/2	3	881081	163.30	881081-C6	179.60	
.250 (1/4)	1.177 (5x)	5/8	3-1/2	881084	175.50	881084-C6	192.20	
15°	.015 (1/64)	.078 (5x)	1/8	1-1/2	785915	43.20	785915-C6	50.80
	.015 (1/64)	.150 (10x)	1/8	1-1/2	916115	79.10	916115-C6	86.70
	.030	.156 (5x)	1/8	1-1/2	785930	43.20	785930-C6	50.80
	.030	.300 (10x)	3/16	2	916130	73.70	916130-C6	81.90
	.045	.402 (9x)	1/4	2-1/2	916145	79.10	916145-C6	90.30
	.060	.312 (5x)	1/4	2	785960	75.00	785960-C6	86.20
	.060	.600 (10x)	3/8	2-1/2	916160	104.00	916160-C6	116.60
20°	.015 (1/64)	.078 (5x)	1/8	1-1/2	802115	43.60	802115-C6	51.20
	.030	.156 (5x)	3/16	2	802130	71.10	802130-C6	79.30
	.045	.250 (5x)	1/4	2-1/2	802145	79.90	802145-C6	91.10

TAPERED

NEW

NEW

NEW



## MATERIAL-SPECIFIC END MILLS

### FERROUS MATERIALS

HARDENED STEELS

**End Mills for Hardened Steels** mm & in .....  98

**Recommended Materials:**  
hardened steels up to 68 Rc and high temperature alloys

HIGH TEMP ALLOYS

**End Mills for High Temp Alloys** *New Style and Sizes!* mm & in .....  121

**Recommended Materials:**  
titanium, Inconel, nickel alloys, stainless steels, tool steels, and other difficult-to-machine materials

MEDIUM ALLOYS

**End Mills for Medium Alloy Steels** *New Sizes!* mm & in .....  161

**Recommended Materials:**  
readily machinable medium alloy steels, stainless steels, and tool steels


FREE MACHINING

**End Mills for Free Machining Steels** mm & in .....  183

**Recommended Materials:**  
free machining varieties of carbon steels and stainless steels

### NON-FERROUS MATERIALS

ALUMINUM

**End Mills for Aluminum Alloys** *New Style and Sizes!* mm & in .....  191

**Recommended Materials:**  
aluminum, copper, brass, and bronze alloys, high silicon aluminum, magnesium alloys

DIAMOND TOOLING

**End Mills for Non-Ferrous Materials** *New Sizes!* mm & in .....  217

**Recommended Materials:**  
graphite, composites, green carbides, green ceramics

PLASTICS

**End Mills for Plastics** *New Sizes!* mm & in .....  231

**Recommended Materials:**  
filled and unfilled plastics

COMPOSITES

**End Mills for Composites** *New Sizes!* .....  256

**Recommended Materials:**  
abrasive composites, fiber-reinforced materials, layered composites

WOOD

**End Mills for Wood** .....  263

**Recommended Materials:**  
soft, hard, and engineered woods

# END MILLS FOR HARDENED STEELS

Square – For Steels Up to 55 Rc



5 Flute, Variable Helix Design

HARDENED STEELS

- **Designed to mill hardened tool, die, and mold steels up to 55Rc**
- Also excellent for stainless steel, Inconel, titanium, and other high temperature alloys
- 5 flute, variable helix design (approx. 37°) for improved slotting and roughing
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Increased shank diameter to maintain strength and stiffness • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER			LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
+ .0005"	+ .00mm	decimal	+ .010"				
- .0005"	- .02mm	equivalent	- .000"				
			+ .25mm				
			- .00mm				
.015 (1/64)		.0150	<b>.023</b> (1.5x)	1/4	2-1/2	907415-C6	77.10
.015 (1/64)		.0150	<b>.045</b> (3x)	1/4	2-1/2	915915-C6	77.10
.015 (1/64)		.0150	<b>.078</b> (5x)	1/4	2-1/2	885215-C6	80.80
.020		.0200	<b>.030</b> (1.5x)	1/4	2-1/2	907420-C6	77.10
.020		.0200	<b>.060</b> (3x)	1/4	2-1/2	915920-C6	77.10
.020		.0200	<b>.100</b> (5x)	1/4	2-1/2	885220-C6	80.80
.025		.0250	<b>.038</b> (1.5x)	1/4	2-1/2	907425-C6	77.10
.025		.0250	<b>.075</b> (3x)	1/4	2-1/2	915925-C6	77.10
.030		.0300	<b>.045</b> (1.5x)	1/4	2-1/2	907430-C6	70.00
.030		.0300	<b>.090</b> (3x)	1/4	2-1/2	915930-C6	70.70
.031 (1/32)		.0310	<b>.025</b> (0.8x)	1/4	2-1/2	859431-C6	68.50
.031 (1/32)		.0310	<b>.047</b> (1.5x)	1/4	2-1/2	907431-C6	64.90
.031 (1/32)		.0310	<b>.093</b> (3x)	1/4	2-1/2	915931-C6	64.90
.031 (1/32)		.0310	<b>.125</b> (4x)	1/4	2-1/2	824931-C6	68.50
.031 (1/32)		.0310	<b>.156</b> (5x)	1/4	2-1/2	885231-C6	70.80
.035		.0350	<b>.053</b> (1.5x)	1/4	2-1/2	907435-C6	65.90
.035		.0350	<b>.105</b> (3x)	1/4	2-1/2	915935-C6	65.30
.039		.0390	<b>.059</b> (1.5x)	1/4	2-1/2	907439-C6	65.90
.039		.0390	<b>.117</b> (3x)	1/4	2-1/2	915939-C6	65.30
.039		.0390	<b>.203</b> (5x)	1/4	2-1/2	885239-C6	71.50
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	6 mm	63 mm	897822-C6	71.50
.040		.0400	<b>.060</b> (1.5x)	1/4	2-1/2	907440-C6	64.90
.040		.0400	<b>.120</b> (3x)	1/4	2-1/2	915940-C6	64.90
.040		.0400	<b>.203</b> (5x)	1/4	2-1/2	885240-C6	70.80
.045		.0450	<b>.068</b> (1.5x)	1/4	2-1/2	907445-C6	65.30
.045		.0450	<b>.135</b> (3x)	1/4	2-1/2	915945-C6	65.30
.047 (3/64)		.0470	<b>.071</b> (1.5x)	1/4	2-1/2	907447-C6	64.90
.047 (3/64)		.0470	<b>.141</b> (3x)	1/4	2-1/2	915947-C6	64.90
.047 (3/64)		.0470	<b>.187</b> (4x)	1/4	2-1/2	824947-C6	67.90
.047 (3/64)		.0470	<b>.250</b> (5x)	1/4	2-1/2	885247-C6	70.80
.050		.0500	<b>.075</b> (1.5x)	1/4	2-1/2	907450-C6	65.60
.050		.0500	<b>.150</b> (3x)	1/4	2-1/2	915950-C6	64.90
.055		.0550	<b>.083</b> (1.5x)	1/4	2-1/2	907455-C6	65.90
.055		.0550	<b>.165</b> (3x)	1/4	2-1/2	915955-C6	65.30
.060		.0600	<b>.090</b> (1.5x)	1/4	2-1/2	907460-C6	64.90
.060		.0600	<b>.180</b> (3x)	1/4	2-1/2	915960-C6	64.90

continued on next page

# END MILLS FOR HARDENED STEELS

Square – For Steels Up to 55 Rc (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE	
.062 (1/16)	.0620	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.050</b> (0.8x)	1/4	2-1/2	859462-C6	67.90
.062 (1/16)	.0620	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.093</b> (1.5x)	1/4	2-1/2	907462-C6	64.90
.062 (1/16)	.0620	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.186</b> (3x)	1/4	2-1/2	915962-C6	64.90
.062 (1/16)	.0620	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.250</b> (4x)	1/4	2-1/2	824962-C6	68.50
.062 (1/16)	.0620	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.312</b> (5x)	1/4	2-1/2	885262-C6	70.80
.070	.0700	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.105</b> (1.5x)	1/4	2-1/2	907470-C6	67.90
.070	.0700	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.210</b> (3x)	1/4	2-1/2	915970-C6	67.90
.078 (5/64)	.0780	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.117</b> (1.5x)	1/4	2-1/2	907478-C6	67.90
.078 (5/64)	.0780	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.234</b> (3x)	1/4	2-1/2	915978-C6	67.90
.078 (5/64)	.0780	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.312</b> (4x)	1/4	2-1/2	824978-C6	71.60
.078 (5/64)	.0780	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.406</b> (5x)	1/4	2-1/2	885278-C6	73.90
2.0 mm	.0787	<sup>+.010"</sup> <sub>-.000"</sub>	<b>3.00 mm</b> (1.5x)	6 mm	63 mm	777845-C6	75.60
2.0 mm	.0787	<sup>+.010"</sup> <sub>-.000"</sub>	<b>6.00 mm</b> (3x)	6 mm	63 mm	897845-C6	74.90
.080	.0800	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.120</b> (1.5x)	1/4	2-1/2	907480-C6	68.50
.080	.0800	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.240</b> (3x)	1/4	2-1/2	915980-C6	68.50
.090	.0900	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.135</b> (1.5x)	1/4	2-1/2	907490-C6	68.50
.090	.0900	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.270</b> (3x)	1/4	2-1/2	915990-C6	67.90
.093 (3/32)	.0930	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.074</b> (0.8x)	1/4	2-1/2	859493-C6	71.90
.093 (3/32)	.0930	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.140</b> (1.5x)	1/4	2-1/2	907493-C6	68.90
.093 (3/32)	.0930	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.279</b> (3x)	1/4	2-1/2	915993-C6	68.90
.093 (3/32)	.0930	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.372</b> (4x)	1/4	2-1/2	824993-C6	72.40
.093 (3/32)	.0930	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.500</b> (5x)	1/4	2-1/2	885293-C6	74.70
.100	.1000	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.150</b> (1.5x)	1/4	2-1/2	907500-C6	68.90
.100	.1000	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.300</b> (3x)	1/4	2-1/2	916000-C6	68.90
.109 (7/64)	.1090	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.164</b> (1.5x)	1/4	2-1/2	907502-C6	69.50
.109 (7/64)	.1090	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.327</b> (3x)	1/4	2-1/2	916002-C6	69.50
.118	.1180	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.177</b> (1.5x)	1/4	2-1/2	907505-C6	70.00
.118	.1180	<sup>+.010"</sup> <sub>-.000"</sub>	<b>.354</b> (3x)	1/4	2-1/2	916005-C6	70.00
3.0 mm	.1181	<sup>+.010"</sup> <sub>-.000"</sub>	<b>9.00 mm</b> (3x)	6 mm	63 mm	897857-C6	76.40

CUTTER DIAMETER			LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE	
.125 (1/8)	.1250	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.100</b> (0.8x)	1/4	2-1/2	859508-C6	72.70
.125 (1/8)	.1250	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.187</b> (1.5x)	1/4	2-1/2	907508-C6	69.70
.125 (1/8)	.1250	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.375</b> (3x)	1/4	2-1/2	916008-C6	69.70
.125 (1/8)	.1250	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.500</b> (4x)	1/4	2-1/2	825008-C6	73.20
.125 (1/8)	.1250	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.625</b> (5x)	1/4	2-1/2	885308-C6	75.60
.140 (9/64)	.1406	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.220</b> (1.5x)	1/4	2-1/2	907509-C6	73.30
.140 (9/64)	.1406	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.425</b> (3x)	1/4	2-1/2	916009-C6	73.30
.140 (9/64)	.1406	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.750</b> (5x)	1/4	2-1/2	885309-C6	76.30
.156 (5/32)	.1562	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.235</b> (1.5x)	1/4	2-1/2	907510-C6	69.70
.156 (5/32)	.1562	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.468</b> (3x)	1/4	2-1/2	916010-C6	69.70
.156 (5/32)	.1562	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.625</b> (4x)	1/4	2-1/2	825010-C6	73.20
.156 (5/32)	.1562	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.750</b> (5x)	1/4	3	885310-C6	76.30
.172 (11/64)	.1718	<sup>+.030"</sup> <sub>-.000"</sub>	<b>.516</b> (3x)	1/4	2-1/2	916011-C6	75.40

continued on next page

HARDENED STEELS

## END MILLS FOR HARDENED STEELS

Square – For Steels Up to 55 Rc (cont.)

continued from previous page

HARDENED STEELS

CUTTER DIAMETER			LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
+ .000" - .002"	+ .00mm - .04mm	decimal equivalent	+ .030" - .000" + .75mm - .00mm				
.187 (3/16)		.1875	<b>.150</b> (0.8x)	1/4	2-1/2	859512-C6	74.30
.187 (3/16)		.1875	<b>.285</b> (1.5x)	1/4	2-1/2	907512-C6	72.40
.187 (3/16)		.1875	<b>.562</b> (3x)	1/4	2-1/2	916012-C6	72.40
.187 (3/16)		.1875	<b>1.000</b> (5x)	1/4	3	885312-C6	79.80
.218 (7/32)		.2187	<b>.656</b> (3x)	1/4	2-1/2	916014-C6	75.40
	6.0 mm	.2362	<b>18.00 mm</b> (3x)	6 mm	63 mm	897866-C6	77.40
.250 (1/4)		.2500	<b>.200</b> (0.8x)	1/4	2-1/2	859516-C6	82.60
.250 (1/4)		.2500	<b>.375</b> (1.5x)	1/4	2-1/2	907516-C6	80.70
.250 (1/4)		.2500	<b>.750</b> (3x)	1/4	2-1/2	916016-C6	80.70
.250 (1/4)		.2500	<b>1.250</b> (5x)	1/4	4	885316-C6	87.70
.312 (5/16)		.3125	<b>.470</b> (1.5x)	5/16	2-1/2	907520-C6	87.90
.312 (5/16)		.3125	<b>1.000</b> (3x)	5/16	2-1/2	916020-C6	88.80
.375 (3/8)		.3750	<b>.570</b> (1.5x)	3/8	2-1/2	907524-C6	101.60
.375 (3/8)		.3750	<b>1.125</b> (3x)	3/8	2-1/2	916024-C6	101.60
.500 (1/2)		.5000	<b>.750</b> (1.5x)	1/2	3	907532-C6	122.70
.500 (1/2)		.5000	<b>1.500</b> (3x)	1/2	3	916032-C6	123.90

PLEASE SEE SPEEDS & FEEDS ON PAGE 106

**MACHINING  
ADVISOR PRO**

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Customizable Running Parameters  
For Optimized Machining

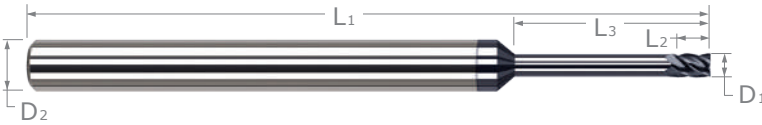


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## END MILLS FOR HARDENED STEELS

Square – For Steels Up to 55 Rc – Long Reach, Stub Flute



5 Flute, Variable Helix Design

HARDENED STEELS

- **Designed to mill hardened tool, die, and mold steels up to 55Rc**
- Also excellent for stainless steel, Inconel, titanium, and other high temperature alloys
- 5 flute, variable helix design (approx. 37°) for improved slotting and roughing
- Stub flute for maximum rigidity
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Increased shank diameter to maintain strength and stiffness • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL REACH L <sub>3</sub>	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AlTiN NANO COATED	
					5 FL	PRICE
D <sub>1</sub> $\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
.031 (1/32)	.047	<b>.156</b> (5x)	1/4	2-1/2	825331-C6	73.20
.031 (1/32)	.047	<b>.250</b> (8x)	1/4	2-1/2	819031-C6	79.00
.047 (3/64)	.071	<b>.250</b> (5x)	1/4	2-1/2	825347-C6	73.20
.047 (3/64)	.071	<b>.375</b> (8x)	1/4	2-1/2	819047-C6	79.00
.062 (1/16)	.093	<b>.312</b> (5x)	1/4	2-1/2	825362-C6	73.20
.062 (1/16)	.093	<b>.500</b> (8x)	1/4	2-1/2	819062-C6	79.00
.078 (5/64)	.117	<b>.406</b> (5x)	1/4	2-1/2	825378-C6	73.20
.078 (5/64)	.117	<b>.625</b> (8x)	1/4	2-1/2	819078-C6	79.80
.093 (3/32)	.140	<b>.500</b> (5x)	1/4	2-1/2	825393-C6	77.20
.093 (3/32)	.140	<b>.750</b> (8x)	1/4	2-1/2	819093-C6	83.00
D <sub>1</sub> $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
.125 (1/8)	.187	<b>.625</b> (5x)	1/4	2-1/2	825408-C6	78.00
.125 (1/8)	.187	<b>1.000</b> (8x)	1/4	2-1/2	819108-C6	83.80
.187 (3/16)	.285	<b>1.000</b> (5x)	1/4	3	825412-C6	82.20
.187 (3/16)	.285	<b>1.500</b> (8x)	1/4	3	819112-C6	87.90
.250 (1/4)	.375	<b>1.250</b> (5x)	1/4	4	825416-C6	86.10
.250 (1/4)	.375	<b>2.000</b> (8x)	1/4	4	819116-C6	92.10

PLEASE SEE SPEEDS & FEEDS ON PAGE 107

# END MILLS FOR HARDENED STEELS

## Ball – For Steels Up to 55 Rc

HARDENED STEELS



6 Flute, Variable Helix Design

- **Designed to mill hardened tool, die, and mold steels up to 55Rc**
- Also excellent for stainless steel, Inconel, titanium, and other high temperature alloys
- 6 flute, variable helix design (approx. 37°) for improved slotting and roughing
- Ball profile for maximum strength
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Increased shank diameter to maintain strength and stiffness • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
				6 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.031 (1/32)	.047 (1.5x)	1/4	2-1/2	798131-C6	47.50
.031 (1/32)	.093 (3x)	1/4	2-1/2	843431-C6	47.50
.039	.059 (1.5x)	1/4	2-1/2	798139-C6	47.50
.039	.117 (3x)	1/4	2-1/2	843439-C6	47.50
.040	.120 (3x)	1/4	2-1/2	843440-C6	47.50
.047 (3/64)	.071 (1.5x)	1/4	2-1/2	798147-C6	47.50
.047 (3/64)	.141 (3x)	1/4	2-1/2	843447-C6	47.50
.062 (1/16)	.093 (1.5x)	1/4	2-1/2	798162-C6	45.00
.062 (1/16)	.186 (3x)	1/4	2-1/2	843462-C6	45.00
.062 (1/16)	.312 (5x)	1/4	2-1/2	789462-C6	50.90
.078 (5/64)	.117 (1.5x)	1/4	2-1/2	798178-C6	45.00
.078 (5/64)	.234 (3x)	1/4	2-1/2	843478-C6	45.00
.093 (3/32)	.140 (1.5x)	1/4	2-1/2	798193-C6	45.00
.093 (3/32)	.279 (3x)	1/4	2-1/2	843493-C6	45.00
.093 (3/32)	.500 (5x)	1/4	2-1/2	789493-C6	50.90
.118	.177 (1.5x)	1/4	2-1/2	798205-C6	45.00
.118	.354 (3x)	1/4	2-1/2	843505-C6	45.00

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
				6 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.125 (1/8)	.187 (1.5x)	1/4	2-1/2	798208-C6	41.30
.125 (1/8)	.375 (3x)	1/4	2-1/2	843508-C6	41.30
.125 (1/8)	.625 (5x)	1/4	2-1/2	789508-C6	47.20
.140 (9/64)	.220 (1.5x)	1/4	2-1/2	798209-C6	45.70
.140 (9/64)	.425 (3x)	1/4	2-1/2	843509-C6	45.70
.156 (5/32)	.235 (1.5x)	1/4	2-1/2	798210-C6	42.60
.156 (5/32)	.468 (3x)	1/4	2-1/2	843510-C6	42.60
.187 (3/16)	.285 (1.5x)	1/4	2-1/2	798212-C6	43.90
.187 (3/16)	.562 (3x)	1/4	2-1/2	843512-C6	43.90
.187 (3/16)	1.000 (5x)	1/4	3	789512-C6	51.10
.250 (1/4)	.375 (1.5x)	1/4	2-1/2	798216-C6	53.20
.250 (1/4)	.750 (3x)	1/4	2-1/2	843516-C6	53.20
.375 (3/8)	1.125 (3x)	3/8	2-1/2	843524-C6	84.00

**PLEASE SEE SPEEDS & FEEDS ON PAGE 103**

# END MILLS FOR HARDENED STEELS

Ball – For Steels Up to 55 Rc – Long Reach, Stub Flute



6 Flute, Variable Helix Design

HARDENED STEELS

- **Designed to mill hardened tool, die, and mold steels up to 55Rc**
- Also excellent for stainless steel, Inconel, titanium, and other high temperature alloys
- 6 flute, variable helix design (approx. 37°) for improved slotting and roughing
- Stub flute for maximum rigidity
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Increased shank diameter to maintain strength and stiffness • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
					6 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2 \text{ (h6)}$	$L_1$		
.031 (1/32)	.047	<b>.156</b> (5x)	1/4	2-1/2	786231-C6	73.90
.031 (1/32)	.047	<b>.250</b> (8x)	1/4	2-1/2	786031-C6	79.80
.047 (3/64)	.071	<b>.250</b> (5x)	1/4	2-1/2	786247-C6	75.30
.047 (3/64)	.071	<b>.375</b> (8x)	1/4	2-1/2	786047-C6	81.40
.062 (1/16)	.093	<b>.312</b> (5x)	1/4	2-1/2	786262-C6	74.60
.062 (1/16)	.093	<b>.500</b> (8x)	1/4	2-1/2	786062-C6	80.60
.078 (5/64)	.117	<b>.406</b> (5x)	1/4	2-1/2	786278-C6	77.40
.078 (5/64)	.117	<b>.625</b> (8x)	1/4	2-1/2	786078-C6	83.50
.093 (3/32)	.140	<b>.500</b> (5x)	1/4	2-1/2	786293-C6	78.70
.093 (3/32)	.140	<b>.750</b> (8x)	1/4	2-1/2	786093-C6	85.50

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
					6 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2 \text{ (h6)}$	$L_1$		
.125 (1/8)	.187	<b>.625</b> (5x)	1/4	2-1/2	786308-C6	79.50
.125 (1/8)	.187	<b>1.000</b> (8x)	1/4	2-1/2	786108-C6	85.40
.187 (3/16)	.285	<b>1.000</b> (5x)	1/4	3	786312-C6	84.60
.187 (3/16)	.285	<b>1.500</b> (8x)	1/4	3	786112-C6	90.60

## SPEEDS & FEEDS (End Mills for Hardened Steels – Ball – For Steels Up to 55Rc)

**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter length of cuts, table values of IPT must be increased (for 1.5x, increase to 112%). For longer lengths of cut, table values of IPT and DOC must be reduced (for 5x, reduce to 85%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter												Depth of Cut		
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	38-44 Rc	100	Slotting	.00003	.00006	.00009	.00012	.00015	.00018	.00024	.00036	.00049	.00061	.00073	.00097	1 x Dia	.30 x Dia
			Profiling	.00004	.00007	.00011	.00015	.00018	.00022	.00029	.00044	.00059	.00073	.00088	.00118	.3 x Dia	.5 x Dia
Titanium Alloys	45-55 Rc	60	Slotting	.00002	.00004	.00006	.00008	.00010	.00012	.00016	.00023	.00031	.00039	.00047	.00062	1 x Dia	.15 x Dia
			Profiling	.00002	.00004	.00006	.00008	.00011	.00013	.00017	.00026	.00034	.00043	.00051	.00068	.15 x Dia	.5 x Dia

## SPEEDS & FEEDS (End Mills for Hardened Steels – Ball – For Steels Up to 55Rc – Long Reach, Stub Flute)

**Important Note:** Values in tables are in inches and are based on reached (8x Dia) end mills. For shorter reaches, tables values of IPT must be increased (for 5x, increase 125%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter												Depth of Cut		
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	38 - 44 Rc	100	Slotting	.00003	.00005	.00008	.00011	.00013	.00016	.00022	.00032	.00043	.00054	.00065	.00086	1 x Dia	.28 x Dia
			Profiling	.00003	.00006	.00010	.00013	.00016	.00019	.00026	.00039	.00052	.00065	.00078	.00105	1 x Dia	.28 x Dia
Titanium Alloys	45 - 55 Rc	60	Slotting	.00002	.00003	.00005	.00007	.00009	.00010	.00014	.00021	.00028	.00035	.00041	.00055	1 x Dia	.14 x Dia
			Profiling	.00002	.00004	.00006	.00008	.00009	.00011	.00015	.00023	.00030	.00038	.00046	.00061	1 x Dia	.14 x Dia

# END MILLS FOR HARDENED STEELS

## Corner Radius – For Steels Up to 55 Rc



5 Flute, Variable Helix Design

HARDENED STEELS

- **Designed to mill hardened tool, die, and mold steels up to 55Rc**
- Also excellent for stainless steel, Inconel, titanium, and other high temperature alloys
- 5 flute, variable helix design (approx. 37°) for improved slotting and roughing
- Corner radius for improved strength
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Increased shank diameter to maintain strength and stiffness • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub>	D <sub>2</sub>	decimal equivalent	R	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
+ .0005" / - .0005"	+ .00mm / - .02mm		+ .001" / - .001" / + .025mm / - .025mm	+ .010" / - .000" / + .25mm / - .00mm				
.015 (1/64)		.0150	<b>.003</b>	.045 (3x)	1/4	2-1/2	760415-C6	66.50
.020		.0200	<b>.005</b>	.030 (1.5x)	1/4	2-1/2	920420-C6	65.60
.020		.0200	<b>.005</b>	.060 (3x)	1/4	2-1/2	933220-C6	65.90
.031 (1/32)		.0310	<b>.005</b>	.047 (1.5x)	1/4	2-1/2	920431-C6	64.90
.031 (1/32)		.0310	<b>.005</b>	.093 (3x)	1/4	2-1/2	933231-C6	64.90
.031 (1/32)		.0310	<b>.005</b>	.156 (5x)	1/4	2-1/2	851731-C6	70.80
.031 (1/32)		.0310	<b>.010</b>	.093 (3x)	1/4	2-1/2	852131-C6	64.90
.039		.0390	<b>.005</b>	.117 (3x)	1/4	2-1/2	933239-C6	65.90
	1.0 mm	.0393	<b>.20 mm</b>	3.00 mm (3x)	6 mm	63 mm	894622-C6	71.50
.040		.0400	<b>.005</b>	.060 (1.5x)	1/4	2-1/2	920440-C6	65.30
.040		.0400	<b>.005</b>	.120 (3x)	1/4	2-1/2	933240-C6	65.30
.047 (3/64)		.0470	<b>.005</b>	.071 (1.5x)	1/4	2-1/2	920447-C6	64.90
.047 (3/64)		.0470	<b>.005</b>	.141 (3x)	1/4	2-1/2	933247-C6	64.90
.047 (3/64)		.0470	<b>.005</b>	.250 (5x)	1/4	2-1/2	851747-C6	70.80
.047 (3/64)		.0470	<b>.010</b>	.141 (3x)	1/4	2-1/2	852147-C6	64.90
.047 (3/64)		.0470	<b>.010</b>	.250 (5x)	1/4	2-1/2	750047-C6	71.50
.050		.0500	<b>.005</b>	.150 (3x)	1/4	2-1/2	933250-C6	65.30
.060		.0600	<b>.005</b>	.090 (1.5x)	1/4	2-1/2	920460-C6	65.60
.060		.0600	<b>.005</b>	.180 (3x)	1/4	2-1/2	933260-C6	65.30
.062 (1/16)		.0620	<b>.005</b>	.093 (1.5x)	1/4	2-1/2	920462-C6	65.60
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	1/4	2-1/2	933262-C6	64.90
.062 (1/16)		.0620	<b>.005</b>	.312 (5x)	1/4	2-1/2	851762-C6	70.80
.062 (1/16)		.0620	<b>.010</b>	.093 (1.5x)	1/4	2-1/2	872762-C6	64.90
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	1/4	2-1/2	852162-C6	64.90
.062 (1/16)		.0620	<b>.010</b>	.312 (5x)	1/4	2-1/2	750062-C6	71.50
.062 (1/16)		.0620	<b>.020</b>	.186 (3x)	1/4	2-1/2	813562-C6	64.90
.070		.0700	<b>.005</b>	.210 (3x)	1/4	2-1/2	933270-C6	68.40
.078 (5/64)		.0780	<b>.005</b>	.117 (1.5x)	1/4	2-1/2	920478-C6	67.90
.078 (5/64)		.0780	<b>.005</b>	.234 (3x)	1/4	2-1/2	933278-C6	67.90
.078 (5/64)		.0780	<b>.005</b>	.406 (5x)	1/4	2-1/2	851778-C6	73.90
.078 (5/64)		.0780	<b>.010</b>	.117 (1.5x)	1/4	2-1/2	872778-C6	67.90
.078 (5/64)		.0780	<b>.010</b>	.234 (3x)	1/4	2-1/2	852178-C6	67.90

continued on next page



# END MILLS FOR HARDENED STEELS

Corner Radius – For Steels Up to 55 Rc (cont.)

continued from previous page

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub> +.0005" -.0005"    +.00mm -.02mm    decimal equivalent			R +.001" -.001" +.025mm -.025mm	L <sub>2</sub> +.010" -.000" +.25mm -.00mm	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
2.0 mm    .0787			<b>.20 mm</b>	6.00 mm (3x)	6 mm	63 mm	894645-C6	75.60
.080    .0800			<b>.005</b>	.240 (3x)	1/4	2-1/2	933280-C6	69.50
.090    .0900			<b>.005</b>	.270 (3x)	1/4	2-1/2	933290-C6	70.10
.093 (3/32)    .0930			<b>.005</b>	.140 (1.5x)	1/4	2-1/2	920493-C6	68.90
.093 (3/32)    .0930			<b>.005</b>	.279 (3x)	1/4	2-1/2	933293-C6	68.90
.093 (3/32)    .0930			<b>.005</b>	.372 (4x)	1/4	2-1/2	750893-C6	72.60
.093 (3/32)    .0930			<b>.005</b>	.500 (5x)	1/4	2-1/2	851793-C6	74.70
.093 (3/32)    .0930			<b>.010</b>	.140 (1.5x)	1/4	2-1/2	872793-C6	68.90
.093 (3/32)    .0930			<b>.010</b>	.279 (3x)	1/4	2-1/2	852193-C6	68.90
.093 (3/32)    .0930			<b>.010</b>	.500 (5x)	1/4	2-1/2	750093-C6	75.40
.093 (3/32)    .0930			<b>.015</b>	.279 (3x)	1/4	2-1/2	852793-C6	68.90
.093 (3/32)    .0930			<b>.020</b>	.279 (3x)	1/4	2-1/2	813593-C6	68.90
.093 (3/32)    .0930			<b>.030</b>	.279 (3x)	1/4	2-1/2	853293-C6	68.90
.100    .1000			<b>.005</b>	.300 (3x)	1/4	2-1/2	933300-C6	70.10
.109 (7/64)    .1090			<b>.005</b>	.327 (3x)	1/4	2-1/2	933302-C6	68.90
.118    .1180			<b>.005</b>	.354 (3x)	1/4	2-1/2	933305-C6	70.00
3.0 mm    .1181			<b>.20 mm</b>	9.00 mm (3x)	6 mm	63 mm	894657-C6	76.40

D <sub>1</sub> +.000" -.002"    +.00mm -.04mm    decimal equivalent			R +.001" -.001" +.025mm -.025mm	L <sub>2</sub> +.030" -.000" +.75mm -.00mm	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
.125 (1/8)    .1250			<b>.005</b>	.187 (1.5x)	1/4	2-1/2	920508-C6	69.70
.125 (1/8)    .1250			<b>.005</b>	.375 (3x)	1/4	2-1/2	933308-C6	69.70
.125 (1/8)    .1250			<b>.005</b>	.500 (4x)	1/4	2-1/2	750908-C6	73.30
.125 (1/8)    .1250			<b>.005</b>	.625 (5x)	1/4	2-1/2	851808-C6	75.60
.125 (1/8)    .1250			<b>.010</b>	.187 (1.5x)	1/4	2-1/2	872808-C6	70.30
.125 (1/8)    .1250			<b>.010</b>	.375 (3x)	1/4	2-1/2	852208-C6	69.70
.125 (1/8)    .1250			<b>.010</b>	.625 (5x)	1/4	2-1/2	781608-C6	75.60
.125 (1/8)    .1250			<b>.015</b>	.187 (1.5x)	1/4	2-1/2	798008-C6	70.30
.125 (1/8)    .1250			<b>.015</b>	.375 (3x)	1/4	2-1/2	852808-C6	69.70
.125 (1/8)    .1250			<b>.020</b>	.375 (3x)	1/4	2-1/2	813608-C6	69.70
.125 (1/8)    .1250			<b>.030</b>	.187 (1.5x)	1/4	2-1/2	761308-C6	70.30
.125 (1/8)    .1250			<b>.030</b>	.375 (3x)	1/4	2-1/2	853308-C6	69.70
.140 (9/64)    .1406			<b>.005</b>	.220 (1.5x)	1/4	2-1/2	920509-C6	70.30
.140 (9/64)    .1406			<b>.005</b>	.425 (3x)	1/4	2-1/2	933309-C6	69.70
.156 (5/32)    .1562			<b>.005</b>	.235 (1.5x)	1/4	2-1/2	920510-C6	69.70
.156 (5/32)    .1562			<b>.005</b>	.468 (3x)	1/4	2-1/2	933310-C6	69.70
.156 (5/32)    .1562			<b>.005</b>	.750 (5x)	1/4	3	851810-C6	75.60
.156 (5/32)    .1562			<b>.010</b>	.468 (3x)	1/4	2-1/2	852210-C6	70.30
.156 (5/32)    .1562			<b>.015</b>	.468 (3x)	1/4	2-1/2	852810-C6	69.70
.156 (5/32)    .1562			<b>.030</b>	.468 (3x)	1/4	2-1/2	853310-C6	69.70

continued on next page

HARDENED STEELS

# END MILLS FOR HARDENED STEELS

## Corner Radius – For Steels Up to 55 Rc (cont.)

continued from previous page

HARDENED STEELS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
+ .000" - .002"	+ .00mm - .04mm	decimal equivalent	+ .001" - .001" + .025mm - .025mm	+ .030" - .000" + .75mm - .00mm				
.187 (3/16)		.1875	<b>.005</b>	.285 (1.5x)	1/4	2-1/2	920512-C6	72.40
.187 (3/16)		.1875	<b>.005</b>	.562 (3x)	1/4	2-1/2	933312-C6	72.40
.187 (3/16)		.1875	<b>.005</b>	1.000 (5x)	1/4	3	851812-C6	79.80
.187 (3/16)		.1875	<b>.010</b>	.562 (3x)	1/4	2-1/2	852212-C6	72.40
.187 (3/16)		.1875	<b>.015</b>	.562 (3x)	1/4	2-1/2	852812-C6	72.40
.187 (3/16)		.1875	<b>.030</b>	.285 (1.5x)	1/4	2-1/2	761312-C6	72.40
.187 (3/16)		.1875	<b>.030</b>	.562 (3x)	1/4	2-1/2	853312-C6	72.40
.187 (3/16)		.1875	<b>.060</b>	.562 (3x)	1/4	2-1/2	800712-C6	72.40
6.0 mm		.2362	<b>.20 mm</b>	18.00 mm (3x)	6 mm	63 mm	894666-C6	77.40
.250 (1/4)		.2500	<b>.005</b>	.375 (1.5x)	1/4	2-1/2	920516-C6	80.70
.250 (1/4)		.2500	<b>.005</b>	.750 (3x)	1/4	2-1/2	933316-C6	80.70
.250 (1/4)		.2500	<b>.005</b>	1.250 (5x)	1/4	4	851816-C6	87.70
.250 (1/4)		.2500	<b>.010</b>	.750 (3x)	1/4	2-1/2	852216-C6	80.70
.250 (1/4)		.2500	<b>.015</b>	.375 (1.5x)	1/4	2-1/2	798016-C6	81.50
.250 (1/4)		.2500	<b>.015</b>	.750 (3x)	1/4	2-1/2	852816-C6	80.70
.250 (1/4)		.2500	<b>.030</b>	.750 (3x)	1/4	2-1/2	853316-C6	80.70
.312 (5/16)		.3125	<b>.015</b>	1.000 (3x)	5/16	2-1/2	852720-C6	94.90
.375 (3/8)		.3750	<b>.015</b>	1.125 (3x)	3/8	2-1/2	852824-C6	104.10
.500 (1/2)		.5000	<b>.015</b>	1.500 (3x)	1/2	3	852832-C6	127.00
.500 (1/2)		.5000	<b>.030</b>	1.500 (3x)	1/2	3	853332-C6	127.00

### SPEEDS & FEEDS (End Mills for Hardened Steels – Square & Corner Radius – For Steels Up to 55Rc)

**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 0.8x, increase to 125%; for 1.5x, increase to 110%). For longer lengths of cut, table values of IPT and DOC must be reduced (for 4x, reduce to 90%; for 5x, reduce to 85%). For complete speeds and feeds charts, please see [www.harveyttool.com](http://www.harveyttool.com).

Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter										Depth of Cut				
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	38-44 Rc	100	Slotting	.00003	.00007	.00010	.00013	.00017	.00020	.00027	.00040	.00054	.00067	.00081	.00108	1 x Dia	.30 x Dia
			Profiling	.00004	.00008	.00012	.00016	.00020	.00024	.00033	.00049	.00065	.00082	.00098	.00131	.3 x Dia	.5 x Dia
Titanium Alloys	45-55 Rc	60	Slotting	.00002	.00004	.00006	.00009	.00011	.00013	.00017	.00026	.00035	.00043	.00052	.00069	1 x Dia	.15 x Dia
			Profiling	.00002	.00005	.00007	.00009	.00012	.00014	.00019	.00028	.00038	.00047	.00057	.00076	.15 x Dia	.5 x Dia



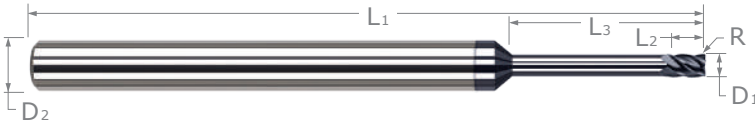
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# END MILLS FOR HARDENED STEELS

## Corner Radius – For Steels Up to 55 Rc – Long Reach, Stub Flute



5 Flute, Variable Helix Design

HARDENED STEELS

- **Designed to mill hardened tool, die, and mold steels up to 55Rc**
- Also excellent for stainless steel, Inconel, titanium, and other high temperature alloys
- 5 flute, variable helix design (approx. 37°) for improved slotting and roughing
- Stub flute for maximum rigidity
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Increased shank diameter to maintain strength and stiffness • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub> <sup>+ .0005"</sup> / <sub>-.0005"</sub>	R <sup>+ .001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+ .010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+ .010"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
.031 (1/32)	.005	.047	.156 (5x)	1/4	2-1/2	812731-C6	73.90
.031 (1/32)	.005	.047	.250 (8x)	1/4	2-1/2	812531-C6	79.00
.047 (3/64)	.005	.071	.250 (5x)	1/4	2-1/2	812747-C6	73.20
.047 (3/64)	.005	.071	.375 (8x)	1/4	2-1/2	812547-C6	79.80
.062 (1/16)	.005	.093	.312 (5x)	1/4	2-1/2	812762-C6	73.20
.062 (1/16)	.005	.093	.500 (8x)	1/4	2-1/2	812562-C6	79.00
.062 (1/16)	.010	.093	.312 (5x)	1/4	2-1/2	761562-C6	73.90
.062 (1/16)	.010	.093	.500 (8x)	1/4	2-1/2	763762-C6	79.80
.078 (5/64)	.005	.117	.406 (5x)	1/4	2-1/2	812778-C6	73.90
.078 (5/64)	.005	.117	.625 (8x)	1/4	2-1/2	812578-C6	79.80
.093 (3/32)	.005	.140	.500 (5x)	1/4	2-1/2	812793-C6	77.20
.093 (3/32)	.005	.140	.750 (8x)	1/4	2-1/2	812593-C6	83.00
.093 (3/32)	.010	.140	.500 (5x)	1/4	2-1/2	761593-C6	78.00
.093 (3/32)	.010	.140	.750 (8x)	1/4	2-1/2	763793-C6	83.00

D <sub>1</sub> <sup>+ .000"</sup> / <sub>-.002"</sub>	R <sup>+ .001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+ .030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+ .030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
.125 (1/8)	.005	.187	.625 (5x)	1/4	2-1/2	812808-C6	78.00
.125 (1/8)	.005	.187	1.000 (8x)	1/4	2-1/2	812608-C6	83.80
.125 (1/8)	.010	.187	.625 (5x)	1/4	2-1/2	761608-C6	78.00
.125 (1/8)	.010	.187	1.000 (8x)	1/4	2-1/2	763808-C6	84.60
.187 (3/16)	.005	.285	1.000 (5x)	1/4	3	812812-C6	82.20
.187 (3/16)	.005	.285	1.500 (8x)	1/4	3	812612-C6	87.90
.250 (1/4)	.005	.375	1.250 (5x)	1/4	4	812816-C6	89.00
.250 (1/4)	.005	.375	2.000 (8x)	1/4	4	812616-C6	95.80

### SPEEDS & FEEDS (End Mills for Hardened Steels – Square & Corner Radius – For Steels Up to 55Rc – Long Reach, Stub Flute)

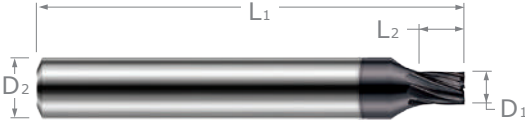
**Important Note:** Values in tables are in inches and are based on reached (8x Dia) end mills. For shorter reaches, tables values of IPT must be increased (for 5x, increase 125%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter											Depth of Cut			
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	38-44 Rc	100	Slotting	.00003	.00006	.00009	.00012	.00015	.00018	.00024	.00036	.00048	.00060	.00072	.00096	1 x Dia	.28 x Dia
			Profiling	.00003	.00007	.00011	.00014	.00018	.00022	.00029	.00043	.00058	.00072	.00087	.00116	1 x Dia	.28 x Dia
Titanium Alloys Nickel Alloys	45-55 Rc	60	Slotting	.00002	.00004	.00006	.00008	.00010	.00011	.00015	.00023	.00031	.00038	.00046	.00061	1 x Dia	.14 x Dia
			Profiling	.00002	.00004	.00006	.00008	.00011	.00013	.00017	.00025	.00034	.00042	.00051	.00068	1 x Dia	.14 x Dia

# END MILLS FOR HARDENED STEELS

Square – For Steels 45 - 68 Rc

HARDENED STEELS



7 Flute, Variable Helix Design

- Designed to mill hardened steels between 45Rc and 68Rc (including stainless, tool, and mold steels)
- 7 flute, variable helix design (approx. 20°) and specialized geometry for improved material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- End cutting (not center cutting)
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	7 FL	PRICE
.031 (1/32)	.047 (1.5x)	1/4	2-1/2	835131-C6	67.80
.031 (1/32)	.093 (3x)	1/4	2-1/2	854831-C6	67.80
.039	.117 (3x)	1/4	2-1/2	854839-C6	68.40
.040	.120 (3x)	1/4	2-1/2	854840-C6	67.80
.047 (3/64)	.071 (1.5x)	1/4	2-1/2	835147-C6	67.80
.047 (3/64)	.141 (3x)	1/4	2-1/2	854847-C6	67.80
.060	.180 (3x)	1/4	2-1/2	854860-C6	68.40
.062 (1/16)	.093 (1.5x)	1/4	2-1/2	835162-C6	67.80
.062 (1/16)	.186 (3x)	1/4	2-1/2	854862-C6	67.80
.062 (1/16)	.312 (5x)	1/4	2-1/2	797762-C6	67.80
.078 (5/64)	.117 (1.5x)	1/4	2-1/2	835178-C6	71.60
.078 (5/64)	.234 (3x)	1/4	2-1/2	854878-C6	71.60
.093 (3/32)	.074 (0.8x)	1/4	2-1/2	749893-C6	74.00
.093 (3/32)	.140 (1.5x)	1/4	2-1/2	835193-C6	72.30
.093 (3/32)	.279 (3x)	1/4	2-1/2	854893-C6	72.30
.093 (3/32)	.500 (5x)	1/4	2-1/2	797793-C6	74.30
.118	.177 (1.5x)	1/4	2-1/2	835205-C6	73.00
.118	.354 (3x)	1/4	2-1/2	854905-C6	73.00

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	7 FL	PRICE
.125 (1/8)	.100 (0.8x)	1/4	2-1/2	749908-C6	75.00
.125 (1/8)	.187 (1.5x)	1/4	2-1/2	835208-C6	73.20
.125 (1/8)	.375 (3x)	1/4	2-1/2	854808-C6	73.20
.125 (1/8)	.625 (5x)	1/4	2-1/2	797808-C6	75.20
.156 (5/32)	.235 (1.5x)	1/4	2-1/2	835210-C6	79.10
.156 (5/32)	.468 (3x)	1/4	2-1/2	854810-C6	79.10
.187 (3/16)	.150 (0.8x)	1/4	2-1/2	749912-C6	78.00
.187 (3/16)	.285 (1.5x)	1/4	2-1/2	835212-C6	76.20
.187 (3/16)	.562 (3x)	1/4	2-1/2	854812-C6	76.20
.250 (1/4)	.375 (1.5x)	1/4	2-1/2	835216-C6	84.80
.250 (1/4)	.750 (3x)	1/4	2-1/2	854816-C6	84.80
.250 (1/4)	1.250 (5x)	1/4	4	797816-C6	88.70
.375 (3/8)	.570 (1.5x)	3/8	2-1/2	835224-C6	105.80
.375 (3/8)	1.125 (3x)	3/8	2-1/2	854824-C6	105.80
.500 (1/2)	.750 (1.5x)	1/2	3	835232-C6	129.90
.500 (1/2)	1.500 (3x)	1/2	3	854832-C6	129.90

PLEASE SEE SPEEDS & FEEDS ON PAGE 111

# END MILLS FOR HARDENED STEELS

Ball - For Steels 45 - 68 Rc



6 Flute, Variable Helix Design

HARDENED STEELS

- **Designed to mill hardened steels between 45Rc and 68Rc (including stainless, tool, and mold steels)**
- 6 flute, variable helix design (approx. 20°) and specialized geometry for improved material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders • Center cutting
- Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
				6 FL	PRICE
D <sub>1</sub> <sup>+ .0005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub> <sup>+ .010"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>		
.031 (1/32)	.093 (3x)	1/4	2-1/2	763431-C6	48.50
.047 (3/64)	.141 (3x)	1/4	2-1/2	763447-C6	48.50
.062 (1/16)	.187 (3x)	1/4	2-1/2	763462-C6	46.00
.078 (5/64)	.234 (3x)	1/4	2-1/2	763478-C6	46.00
.093 (3/32)	.279 (3x)	1/4	2-1/2	763493-C6	46.00
D <sub>1</sub> <sup>+ .000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+ .030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	6 FL	PRICE
.125 (1/8)	.375 (3x)	1/4	2-1/2	763508-C6	42.10
.187 (3/16)	.563 (3x)	1/4	2-1/2	763512-C6	44.80
.250 (1/4)	.750 (3x)	1/4	2-1/2	763516-C6	54.20

## SPEEDS & FEEDS (End Mills for Hardened Steels – Ball - For Steels 45 - 68Rc)

**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter length of cuts, table values of IPT must be increased (for 1.5x, increase to 112%). For longer lengths of cut, table values of IPT and DOC must be reduced (for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter												Depth of Cut	
				.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial
Hardened Steels	45 - 55 Rc	60	Semi-Roughing	.00004	.00009	.00013	.00017	.00021	.00026	.00034	.00051	.00069	.00086	.00103	.00137	.15 x Dia	.25 x Dia
			Finishing	.00005	.00010	.00016	.00021	.00026	.00031	.00042	.00062	.00083	.00104	.00125	.00166	.08 x Dia	.5 x Dia
Titanium Alloys	56 - 68 Rc	50	Semi-Roughing	.00003	.00007	.00010	.00014	.00017	.00020	.00027	.00041	.00055	.00069	.00082	.00110	.12 x Dia	.20 x Dia
			Finishing	.00004	.00007	.00011	.00015	.00019	.00022	.00030	.00045	.00060	.00075	.00091	.00121	.08 x Dia	.5 x Dia



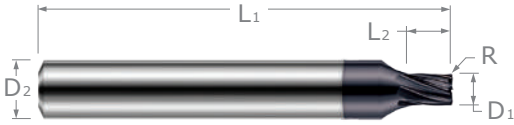
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# END MILLS FOR HARDENED STEELS

## Corner Radius – For Steels 45 - 68 Rc

HARDENED STEELS



7 Flute, Variable Helix Design

- **Designed to mill hardened steels between 45Rc and 68Rc (including stainless, tool, and mold steels)**
- 7 flute, variable helix design (approx. 20°) and specialized geometry for improved material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Corner radius for improved strength • h6 shank tolerance for high precision tool holders
- End cutting (not center cutting) • Solid carbide • CNC ground in the USA

CUTTER DIAMETER D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	CORNER RADIUS R <sup>+0.011"</sup> / <sub>-.001"</sub>	LENGTH OF CUT L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AITiN NANO COATED	
					7 FL	PRICE
.030	.005	.045 (1.5x)	1/4	2-1/2	903130-C6	74.80
.030	.005	.090 (3x)	1/4	2-1/2	910830-C6	74.80
.031 (1/32)	.005	.047 (1.5x)	1/4	2-1/2	903131-C6	71.80
.031 (1/32)	.005	.093 (3x)	1/4	2-1/2	910831-C6	72.50
.031 (1/32)	.005	.156 (5x)	1/4	2-1/2	845231-C6	77.70
.040	.005	.120 (3x)	1/4	2-1/2	910840-C6	74.80
.047 (3/64)	.005	.071 (1.5x)	1/4	2-1/2	903147-C6	71.80
.047 (3/64)	.005	.141 (3x)	1/4	2-1/2	910847-C6	71.80
.050	.005	.150 (3x)	1/4	2-1/2	910850-C6	74.80
.060	.005	.180 (3x)	1/4	2-1/2	910860-C6	74.80
.062 (1/16)	.005	.093 (1.5x)	1/4	2-1/2	903162-C6	71.80
.062 (1/16)	.005	.186 (3x)	1/4	2-1/2	910862-C6	71.80
.062 (1/16)	.005	.312 (5x)	1/4	2-1/2	845262-C6	77.70
.062 (1/16)	.010	.186 (3x)	1/4	2-1/2	850562-C6	71.80
.070	.005	.210 (3x)	1/4	2-1/2	910870-C6	74.10
.078 (5/64)	.005	.117 (1.5x)	1/4	2-1/2	903178-C6	75.30
.078 (5/64)	.005	.234 (3x)	1/4	2-1/2	910878-C6	75.30
.080	.005	.240 (3x)	1/4	2-1/2	910880-C6	77.80
.090	.005	.270 (3x)	1/4	2-1/2	910890-C6	78.50
.093 (3/32)	.005	.140 (1.5x)	1/4	2-1/2	903193-C6	76.00
.093 (3/32)	.005	.279 (3x)	1/4	2-1/2	910893-C6	76.00
.093 (3/32)	.005	.500 (5x)	1/4	2-1/2	845293-C6	81.90
.093 (3/32)	.010	.279 (3x)	1/4	2-1/2	850593-C6	76.00
.100	.005	.300 (3x)	1/4	2-1/2	910900-C6	78.50
.109 (7/64)	.005	.327 (3x)	1/4	2-1/2	910902-C6	77.80
.118	.005	.354 (3x)	1/4	2-1/2	910905-C6	77.80
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	R <sup>+0.011"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	7 FL	PRICE
.125 (1/8)	.005	.187 (1.5x)	1/4	2-1/2	903208-C6	77.10
.125 (1/8)	.005	.375 (3x)	1/4	2-1/2	910908-C6	77.10
.125 (1/8)	.005	.625 (5x)	1/4	2-1/2	845308-C6	77.10
.125 (1/8)	.010	.375 (3x)	1/4	2-1/2	850608-C6	77.90
.125 (1/8)	.015	.187 (1.5x)	1/4	2-1/2	879108-C6	77.10
.125 (1/8)	.015	.375 (3x)	1/4	2-1/2	882308-C6	77.10
.125 (1/8)	.030	.375 (3x)	1/4	2-1/2	883508-C6	77.10

continued on next page

# END MILLS FOR HARDENED STEELS

Corner Radius – For Steels 45 - 68 Rc (cont.)

continued from previous page

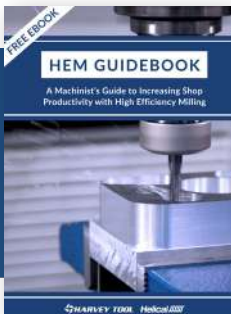
CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
					7 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>		
.140 (9/64)	.005	.425 (3x)	1/4	2-1/2	910909-C6	79.50
.156 (5/32)	.005	.235 (1.5x)	1/4	2-1/2	903210-C6	77.10
.156 (5/32)	.005	.468 (3x)	1/4	2-1/2	910910-C6	77.10
.187 (3/16)	.005	.285 (1.5x)	1/4	2-1/2	903212-C6	80.30
.187 (3/16)	.005	.562 (3x)	1/4	2-1/2	910912-C6	80.30
.187 (3/16)	.010	.562 (3x)	1/4	2-1/2	850612-C6	80.30
.187 (3/16)	.015	.285 (1.5x)	1/4	2-1/2	879112-C6	80.30
.187 (3/16)	.015	.562 (3x)	1/4	2-1/2	882312-C6	80.30
.250 (1/4)	.005	.375 (1.5x)	1/4	2-1/2	903216-C6	89.30
.250 (1/4)	.005	.750 (3x)	1/4	2-1/2	910916-C6	90.20
.250 (1/4)	.010	.750 (3x)	1/4	2-1/2	850616-C6	89.30
.250 (1/4)	.015	.375 (1.5x)	1/4	2-1/2	879116-C6	89.30
.250 (1/4)	.015	.750 (3x)	1/4	2-1/2	882316-C6	89.30
.250 (1/4)	.030	.750 (3x)	1/4	2-1/2	883516-C6	89.30
.312 (5/16)	.015	1.000 (3x)	5/16	2-1/2	882320-C6	92.90
.312 (5/16)	.030	1.000 (3x)	5/16	2-1/2	883520-C6	93.80
.375 (3/8)	.015	.570 (1.5x)	3/8	2-1/2	879124-C6	100.40
.375 (3/8)	.015	1.125 (3x)	3/8	2-1/2	882324-C6	100.40
.375 (3/8)	.030	.570 (1.5x)	3/8	2-1/2	868024-C6	100.40
.375 (3/8)	.030	1.125 (3x)	3/8	2-1/2	883524-C6	101.40
.500 (1/2)	.015	.750 (1.5x)	1/2	3	879132-C6	112.30
.500 (1/2)	.015	1.500 (3x)	1/2	3	882332-C6	112.30
.500 (1/2)	.030	.750 (1.5x)	1/2	3	868032-C6	112.30
.500 (1/2)	.030	1.500 (3x)	1/2	3	883532-C6	112.30

HARDENED STEELS

## SPEEDS & FEEDS (End Mills for Hardened Steels – Square & Corner Radius For Steels 45 - 68Rc)

**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 0.8x, increase to 114%; for 1.5x, increase to 110%). For longer lengths of cut, table values of IPT and DOC must be reduced (for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter											Depth of Cut			
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	45 - 55 Rc	60	Semi-Roughing	.00004	.00008	.00012	.00015	.00019	.00023	.00031	.00047	.00062	.00078	.00094	.00125	.15 x Dia	25 x Dia
			Finishing	.00005	.00009	.00014	.00019	.00024	.00028	.00038	.00056	.00076	.00094	.00113	.00151	.08 x Dia	.5 x Dia
Titanium Alloys	56 - 68 Rc	50	Semi-Roughing	.00003	.00006	.00009	.00012	.00016	.00019	.00025	.00037	.00050	.00062	.00075	.00100	.12 x Dia	.20 x Dia
Nickel Alloys			Finishing	.00003	.00007	.00010	.00014	.00017	.00020	.00027	.00041	.00055	.00069	.00082	.00110	.08 x Dia	.5 x Dia



Your Free Guide to Increasing Shop Productivity With High Efficiency Milling

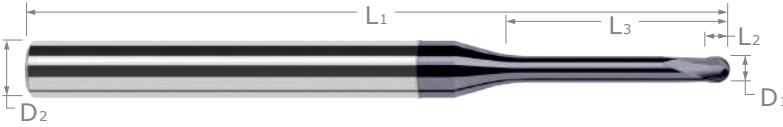
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# END MILLS FOR HARDENED STEELS

## Finishers – Ball

HARDENED STEELS



Stub Flute and Large Rigid Core

- **Designed to profile and finish hardened tool, die, and mold steels 46Rc to 68Rc**
- Select carbide grade for improved edge retention
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Geometry includes stub flute, large rigid core diameter, and eccentric relief
- Increased shank diameter to maintain strength and stiffness
- h6 shank tolerance for high precision tool holders
- Center cutting
- Reduced neck diameter to avoid heeling
- CNC ground in the USA

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO 2 FLUTE		AlTiN NANO 3 FLUTE	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	3 FL	PRICE
+0.000"	+0.000mm	decimal	+0.010"	+0.010"						
-0.006"	-0.14mm	equivalent	-0.000"	-0.000"						
			+0.125mm	+0.125mm						
			-0.000mm	-0.000mm						
.008	.0080	.0080	.006	<b>.012</b> (1.5x)	1/4	2-1/2	37808-C6	106.80		
.008	.0080	.0080	.006	<b>.025</b> (3x)	1/4	2-1/2	31408-C6	106.80		
.008	.0080	.0080	.006	<b>.040</b> (5x)	1/4	2-1/2	38708-C6	112.00		
.010	.0100	.0100	.008	<b>.015</b> (1.5x)	1/4	2-1/2	37810-C6	96.90		
.010	.0100	.0100	.008	<b>.031</b> (3x)	1/4	2-1/2	31410-C6	96.90		
.010	.0100	.0100	.008	<b>.050</b> (5x)	1/4	2-1/2	38710-C6	101.50		
.015 (1/64)	.0150	.0150	.012	-	1/4	2-1/2	958315-C6	81.80		
.015 (1/64)	.0150	.0150	.012	<b>.023</b> (1.5x)	1/4	2-1/2	37815-C6	76.70		
.015 (1/64)	.0150	.0150	.012	<b>.047</b> (3x)	1/4	2-1/2	31415-C6	76.70	813115-C6	82.50
.015 (1/64)	.0150	.0150	.012	<b>.062</b> (4x)	1/4	2-1/2	881515-C6	79.50		
.015 (1/64)	.0150	.0150	.012	<b>.078</b> (5x)	1/4	2-1/2	38715-C6	79.50	812915-C6	85.30
.015 (1/64)	.0150	.0150	.012	<b>.125</b> (8x)	1/4	2-1/2	32015-C6	85.00		
.015 (1/64)	.0150	.0150	.012	<b>.187</b> (12x)	1/4	2-1/2	33815-C6	104.50		
.020	.0200	.0200	.016	-	1/4	2-1/2	958320-C6	81.00		
.020	.0200	.0200	.016	<b>.031</b> (1.5x)	1/4	2-1/2	37820-C6	76.70		
.020	.0200	.0200	.016	<b>.062</b> (3x)	1/4	2-1/2	31420-C6	76.70		
.020	.0200	.0200	.016	<b>.080</b> (4x)	1/4	2-1/2	881520-C6	79.50		
.020	.0200	.0200	.016	<b>.100</b> (5x)	1/4	2-1/2	38720-C6	79.50		
.020	.0200	.0200	.016	<b>.160</b> (8x)	1/4	2-1/2	32020-C6	80.30		
.020	.0200	.0200	.016	<b>.200</b> (10x)	1/4	2-1/2	919120-C6	93.50		
.025	.0250	.0250	.020	<b>.038</b> (1.5x)	1/4	2-1/2	37825-C6	76.70		
.025	.0250	.0250	.020	<b>.075</b> (3x)	1/4	2-1/2	31425-C6	76.70		
.025	.0250	.0250	.020	<b>.125</b> (5x)	1/4	2-1/2	38725-C6	80.30		
.031 (1/32)	.0310	.0310	.025	-	1/4	2-1/2	958331-C6	69.70		
.031 (1/32)	.0310	.0310	.025	<b>.047</b> (1.5x)	1/4	2-1/2	37831-C6	65.60		
.031 (1/32)	.0310	.0310	.025	<b>.093</b> (3x)	1/4	2-1/2	31431-C6	65.60	813131-C6	70.60
.031 (1/32)	.0310	.0310	.025	<b>.125</b> (4x)	1/4	2-1/2	881531-C6	69.70		
.031 (1/32)	.0310	.0310	.025	<b>.156</b> (5x)	1/4	2-1/2	38731-C6	71.80	812931-C6	77.40
.031 (1/32)	.0310	.0310	.025	<b>.187</b> (6x)	1/4	2-1/2	858031-C6	73.20		
.031 (1/32)	.0310	.0310	.025	<b>.218</b> (7x)	1/4	2-1/2	863231-C6	74.40		
.031 (1/32)	.0310	.0310	.025	<b>.250</b> (8x)	1/4	2-1/2	32031-C6	75.70		
.031 (1/32)	.0310	.0310	.025	<b>.312</b> (10x)	1/4	2-1/2	919131-C6	89.60		
.031 (1/32)	.0310	.0310	.025	<b>.375</b> (12x)	1/4	2-1/2	33831-C6	89.60		
.031 (1/32)	.0310	.0310	.025	<b>.470</b> (15x)	1/4	2-1/2	973231-C6	103.00		

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# END MILLS FOR HARDENED STEELS

## Finishers – Ball (cont.)

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CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 3 FLUTE				
D <sub>1</sub>	+ .0000" - .0006"	+ .000mm - .014mm	decimal equivalent	L <sub>2</sub>	+ .010" - .000" + .125mm - .000mm	L <sub>3</sub>	+ .010" - .000" + .125mm - .000mm	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	3 FL	PRICE
.039			.0390	.031	-			1/4	2-1/2	958339-C6	70.30		
.039			.0390	.031	<b>.062</b>	(1.5x)		1/4	2-1/2	37839-C6	65.60		
.039			.0390	.031	<b>.117</b>	(3x)		1/4	2-1/2	31439-C6	65.60		
.039			.0390	.031	<b>.156</b>	(4x)		1/4	2-1/2	881539-C6	71.80		
.039			.0390	.031	<b>.203</b>	(5x)		1/4	2-1/2	38739-C6	71.80		
.039			.0390	.031	<b>.312</b>	(8x)		1/4	2-1/2	32039-C6	75.70		
.039			.0390	.031	<b>.468</b>	(12x)		1/4	2-1/2	33839-C6	89.60		
	1.0 mm		.0393	.80 mm	<b>3.00 mm</b>	(3x)		6 mm	63 mm	882922-C6	71.80		
	1.0 mm		.0393	.80 mm	<b>5.00 mm</b>	(5x)		6 mm	63 mm	881722-C6	78.50		
.040			.0400	.032	<b>.062</b>	(1.5x)		1/4	2-1/2	37840-C6	65.60		
.040			.0400	.032	<b>.125</b>	(3x)		1/4	2-1/2	31440-C6	66.20		
.047 (3/64)			.0470	.038	-			1/4	2-1/2	958347-C6	69.70		
.047 (3/64)			.0470	.038	<b>.071</b>	(1.5x)		1/4	2-1/2	37847-C6	65.60		
.047 (3/64)			.0470	.038	<b>.141</b>	(3x)		1/4	2-1/2	31447-C6	65.60	813147-C6	71.30
.047 (3/64)			.0470	.038	<b>.187</b>	(4x)		1/4	2-1/2	881547-C6	71.80		
.047 (3/64)			.0470	.038	<b>.250</b>	(5x)		1/4	2-1/2	38747-C6	71.80	812947-C6	77.40
.047 (3/64)			.0470	.038	<b>.375</b>	(8x)		1/4	2-1/2	32047-C6	75.70		
.047 (3/64)			.0470	.038	<b>.470</b>	(10x)		1/4	2-1/2	919147-C6	89.60		
.047 (3/64)			.0470	.038	<b>.564</b>	(12x)		1/4	2-1/2	33847-C6	89.60		
.047 (3/64)			.0470	.038	<b>.710</b>	(15x)		1/4	2-1/2	973247-C6	103.00		
.050			.0500	.040	<b>.078</b>	(1.5x)		1/4	2-1/2	37850-C6	65.60		
.050			.0500	.040	<b>.150</b>	(3x)		1/4	2-1/2	31450-C6	66.20		
.060			.0600	.048	<b>.093</b>	(1.5x)		1/4	2-1/2	37860-C6	65.60		
.060			.0600	.048	<b>.180</b>	(3x)		1/4	2-1/2	31460-C6	66.20		
.062 (1/16)			.0620	.050	-			1/4	2-1/2	958362-C6	69.70		
.062 (1/16)			.0620	.050	<b>.093</b>	(1.5x)		1/4	2-1/2	37862-C6	65.60		
.062 (1/16)			.0620	.050	<b>.187</b>	(3x)		1/4	2-1/2	31462-C6	65.60	813162-C6	70.60
.062 (1/16)			.0620	.050	<b>.250</b>	(4x)		1/4	2-1/2	881562-C6	69.70		
.062 (1/16)			.0620	.050	<b>.312</b>	(5x)		1/4	2-1/2	38762-C6	71.80	812962-C6	76.70
.062 (1/16)			.0620	.050	<b>.375</b>	(6x)		1/4	2-1/2	858062-C6	73.20		
.062 (1/16)			.0620	.050	<b>.437</b>	(7x)		1/4	2-1/2	863262-C6	74.40		
.062 (1/16)			.0620	.050	<b>.500</b>	(8x)		1/4	2-1/2	32062-C6	75.70		
.062 (1/16)			.0620	.050	<b>.625</b>	(10x)		1/4	2-1/2	919162-C6	97.60		
.062 (1/16)			.0620	.050	<b>.750</b>	(12x)		1/4	4	33862-C6	97.60		
.062 (1/16)			.0620	.050	<b>.950</b>	(15x)		1/4	4	973262-C6	111.30		
.078 (5/64)			.0780	.062	-			1/4	2-1/2	958378-C6	70.30		
.078 (5/64)			.0780	.062	<b>.117</b>	(1.5x)		1/4	2-1/2	37878-C6	65.60		
.078 (5/64)			.0780	.062	<b>.234</b>	(3x)		1/4	2-1/2	31478-C6	65.60	813178-C6	70.60
.078 (5/64)			.0780	.062	<b>.312</b>	(4x)		1/4	2-1/2	881578-C6	72.50		
.078 (5/64)			.0780	.062	<b>.406</b>	(5x)		1/4	2-1/2	38778-C6	71.80	812978-C6	77.40
.078 (5/64)			.0780	.062	<b>.625</b>	(8x)		1/4	2-1/2	32078-C6	75.70		
.078 (5/64)			.0780	.062	<b>.781</b>	(10x)		1/4	2-1/2	919178-C6	97.60		
.078 (5/64)			.0780	.062	<b>.937</b>	(12x)		1/4	4	33878-C6	97.60		
.078 (5/64)			.0780	.062	<b>1.187</b>	(15x)		1/4	4	973278-C6	111.30		

HARDENED STEELS

continued on next page

# END MILLS FOR HARDENED STEELS

## Finishers – Ball (cont.)

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HARDENED STEELS

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 3 FLUTE	
D <sub>1</sub> +.0000" -.0006"	+.000mm -.014mm	decimal equivalent	L <sub>2</sub> +.010" -.000" +.125mm -.000mm	L <sub>3</sub> +.010" -.000" +.125mm -.000mm	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	3 FL	PRICE
			2.0 mm	.0787						
2.0 mm	.0787	1.60 mm	<b>10.00 mm</b> (5x)	6 mm	63 mm	881745-C6	77.80			
.093 (3/32)	.0930	.074	-	1/4	2-1/2	958393-C6	69.70			
.093 (3/32)	.0930	.074	<b>.140</b> (1.5x)	1/4	2-1/2	37893-C6	65.60			
.093 (3/32)	.0930	.074	<b>.281</b> (3x)	1/4	2-1/2	31493-C6	65.60	813193-C6	70.60	
.093 (3/32)	.0930	.074	<b>.375</b> (4x)	1/4	2-1/2	881593-C6	69.70			
.093 (3/32)	.0930	.074	<b>.500</b> (5x)	1/4	2-1/2	38793-C6	71.80	812993-C6	77.40	
.093 (3/32)	.0930	.074	<b>.585</b> (6x)	1/4	2-1/2	858093-C6	73.90			
.093 (3/32)	.0930	.074	<b>.670</b> (7x)	1/4	2-1/2	863293-C6	75.10			
.093 (3/32)	.0930	.074	<b>.750</b> (8x)	1/4	2-1/2	32093-C6	75.70			
.093 (3/32)	.0930	.074	<b>.937</b> (10x)	1/4	4	919193-C6	97.60			
.093 (3/32)	.0930	.074	<b>1.125</b> (12x)	1/4	4	33893-C6	97.60			
.093 (3/32)	.0930	.074	<b>1.400</b> (15x)	1/4	4	973293-C6	111.30			
.118	.1180	.094	<b>.177</b> (1.5x)	1/4	2-1/2	37905-C6	74.30			
.118	.1180	.094	<b>.354</b> (3x)	1/4	2-1/2	31505-C6	74.30			
.118	.1180	.094	<b>.625</b> (5x)	1/4	2-1/2	38805-C6	83.50			
3.0 mm	.1181	2.40 mm	<b>9.00 mm</b> (3x)	6 mm	63 mm	882957-C6	80.30			
3.0 mm	.1181	2.40 mm	<b>15.00 mm</b> (5x)	6 mm	63 mm	881757-C6	90.60			
.125 (1/8)	.1250	.100	-	1/4	2-1/2	958408-C6	78.50			
.125 (1/8)	.1250	.100	<b>.187</b> (1.5x)	1/4	2-1/2	37908-C6	73.60			
.125 (1/8)	.1250	.100	<b>.375</b> (3x)	1/4	2-1/2	31508-C6	73.60	813208-C6	78.50	
.125 (1/8)	.1250	.100	<b>.500</b> (4x)	1/4	2-1/2	881608-C6	81.50			
.125 (1/8)	.1250	.100	<b>.625</b> (5x)	1/4	2-1/2	38808-C6	83.50	813008-C6	88.60	
.125 (1/8)	.1250	.100	<b>.750</b> (6x)	1/4	2-1/2	858108-C6	85.20			
.125 (1/8)	.1250	.100	<b>.875</b> (7x)	1/4	2-1/2	863308-C6	87.70			
.125 (1/8)	.1250	.100	<b>1.000</b> (8x)	1/4	2-1/2	32108-C6	88.60			
.125 (1/8)	.1250	.100	<b>1.250</b> (10x)	1/4	4	919208-C6	105.50			
.125 (1/8)	.1250	.100	<b>1.500</b> (12x)	1/4	4	33908-C6	105.50			
.125 (1/8)	.1250	.100	<b>1.875</b> (15x)	1/4	4	973308-C6	119.10			
D <sub>1</sub> +.000" -.001"	+.000mm -.018mm	decimal equivalent	L <sub>2</sub> +.020" -.000" +.500mm -.000mm	L <sub>3</sub> +.020" -.000" +.500mm -.000mm	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	3 FL	PRICE
.140 (9/64)	.1406	.112	<b>.220</b> (1.5x)	1/4	2-1/2	37909-C6	77.60			
.140 (9/64)	.1406	.112	<b>.425</b> (3x)	1/4	2-1/2			813209-C6	77.60	
.156 (5/32)	.1560	.125	<b>.235</b> (1.5x)	1/4	2-1/2	37910-C6	73.60			
.156 (5/32)	.1560	.125	<b>.470</b> (3x)	1/4	2-1/2	31510-C6	73.60			
.156 (5/32)	.1560	.125	<b>.750</b> (5x)	1/4	2-1/2	38810-C6	83.50			
.187 (3/16)	.1870	.150	-	1/4	2-1/2	958412-C6	78.50			
.187 (3/16)	.1870	.150	<b>.285</b> (1.5x)	1/4	2-1/2	37912-C6	73.60			
.187 (3/16)	.1870	.150	<b>.570</b> (3x)	1/4	2-1/2	31512-C6	73.60	813212-C6	79.20	
.187 (3/16)	.1870	.150	<b>.750</b> (4x)	1/4	2-1/2	881612-C6	84.30			
.187 (3/16)	.1870	.150	<b>1.000</b> (5x)	1/4	2-1/2	38812-C6	83.50	813012-C6	89.40	
.187 (3/16)	.1870	.150	<b>1.500</b> (8x)	1/4	4	32112-C6	97.80			
.187 (3/16)	.1870	.150	<b>2.250</b> (12x)	1/4	4	33912-C6	119.10			
6.0 mm	.2362	4.80 mm	<b>18.00 mm</b> (3x)	6 mm	63 mm	882966-C6	79.50			
6.0 mm	.2362	4.80 mm	<b>30.00 mm</b> (5x)	6 mm	63 mm	881766-C6	90.60			

continued on next page

# END MILLS FOR HARDENED STEELS

## Finishers – Ball (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 3 FLUTE	
D <sub>1</sub>	+ .000" / - .001" / +.000mm / -.018mm	decimal equivalent	L <sub>2</sub>	L <sub>3</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	3 FL	PRICE
							+ .020" / - .000" / +.000mm / -.000mm	+ .020" / - .000" / +.000mm / -.000mm		
.250 (1/4)		.2500	.200	-	1/4	2-1/2	958416-C6	78.50		
.250 (1/4)		.2500	.200	.375 (1.5x)	1/4	2-1/2	37916-C6	73.60		
.250 (1/4)		.2500	.200	.750 (3x)	1/4	2-1/2	31516-C6	83.50	813216-C6	89.40
.250 (1/4)		.2500	.200	1.000 (4x)	1/4	2-1/2	881616-C6	84.30		
.250 (1/4)		.2500	.200	1.250 (5x)	1/4	2-1/2	38816-C6	83.50	813016-C6	89.40
.250 (1/4)		.2500	.200	1.500 (6x)	1/4	3	858116-C6	90.70		
.250 (1/4)		.2500	.200	1.750 (7x)	1/4	3	863316-C6	91.50		
.250 (1/4)		.2500	.200	2.000 (8x)	1/4	4	32116-C6	98.70		
.312 (5/16)		.3120	.250	.470 (1.5x)	5/16	2-1/2	37920-C6	97.30		
.312 (5/16)		.3120	.250	1.000 (3x)	5/16	2-1/2	31520-C6	102.90		
.375 (3/8)		.3750	.300	.570 (1.5x)	3/8	2-1/2	37924-C6	103.70		
.375 (3/8)		.3750	.300	1.125 (3x)	3/8	2-1/2	31524-C6	109.40		
.375 (3/8)		.3750	.300	2.000 (5x)	3/8	4	38824-C6	123.50		

HARDENED STEELS

### GUIDELINES FOR MILLING HARDENED STEELS

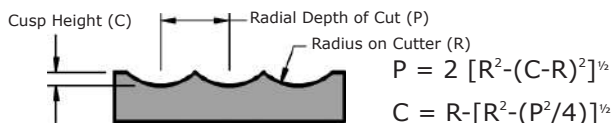
- Rigid machining enhances tool life by centering and balancing tool holders, which minimizes vibration.
- Mist or air coolant is recommended for material hardness of 45RC or more.
- Enter workpiece slowly by ramping or helical interpolation to avoid potential chipping or breakage.
- Climb Milling will extend tool life and improve workpiece finish.

### SPEEDS & FEEDS (End Mills for Hardened Steels – Ball)

**Important Note:** Values in table are in inches and are based on 2 flute end mills. For end mills with more flutes, table values of IPT must be reduced (for 3 Flutes, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter										Depth of Cut				
		.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial*	Axial	
45-55 Rc	700	Finishing (.8x Reach)	.00028	.00058	.00088	.00116	.00146	.00174	.00234	.00350	.00468	.00584	.00702	.00936	.10 x Dia	.04 x Dia
		Finishing (1.5x Reach)	.00027	.00056	.00084	.00111	.00140	.00167	.00224	.00335	.00449	.00560	.00673	.00897	.10 x Dia	.04 x Dia
		Finishing (3x Reach)	.00026	.00053	.00081	.00106	.00134	.00160	.00215	.00321	.00429	.00535	.00644	.00858	.10 x Dia	.04 x Dia
		Finishing (4x Reach)	.00025	.00051	.00077	.00102	.00128	.00152	.00205	.00306	.00410	.00511	.00614	.00819	.10 x Dia	.04 x Dia
		Finishing (5x Reach)	.00023	.00048	.00073	.00097	.00122	.00145	.00195	.00292	.00390	.00487	.00585	.00780	.10 x Dia	.04 x Dia
		Finishing (6x Reach)	.00022	.00046	.00070	.00093	.00117	.00139	.00187	.00280	.00374	.00467	.00562	.00749	.10 x Dia	.03 x Dia
		Finishing (7x Reach)	.00022	.00044	.00067	.00089	.00112	.00133	.00179	.00268	.00359	.00448	.00538	.00718	.10 x Dia	.03 x Dia
		Finishing (8x Reach)	.00021	.00043	.00065	.00085	.00107	.00128	.00172	.00257	.00343	.00428	.00515	.00686	.10 x Dia	.03 x Dia
		Finishing (10x Reach)	.00019	.00039	.00059	.00077	.00097	.00116	.00156	.00233	.00312	.00389	.00468	.00624	.10 x Dia	.02 x Dia
		Finishing (12x Reach)	.00016	.00034	.00051	.00068	.00085	.00102	.00137	.00204	.00273	.00341	.00410	.00546	.08 x Dia	.02 x Dia
Finishing (15x Reach)	.00015	.00031	.00048	.00063	.00079	.00094	.00127	.00190	.00254	.00316	.00380	.00507	.08 x Dia	.01 x Dia		
56-68 Rc	600	Finishing (.8x Reach)	.00022	.00046	.00070	.00093	.00117	.00139	.00187	.00280	.00374	.00467	.00562	.00749	.07 x Dia	.04 x Dia
		Finishing (1.5x Reach)	.00022	.00044	.00067	.00089	.00112	.00133	.00179	.00268	.00359	.00448	.00538	.00718	.07 x Dia	.04 x Dia
		Finishing (3x Reach)	.00021	.00043	.00065	.00085	.00107	.00128	.00172	.00257	.00343	.00428	.00515	.00686	.07 x Dia	.04 x Dia
		Finishing (4x Reach)	.00020	.00041	.00062	.00081	.00102	.00122	.00164	.00245	.00328	.00409	.00491	.00655	.07 x Dia	.04 x Dia
		Finishing (5x Reach)	.00019	.00039	.00059	.00077	.00097	.00116	.00156	.00233	.00312	.00389	.00468	.00624	.07 x Dia	.04 x Dia
		Finishing (6x Reach)	.00018	.00037	.00056	.00074	.00093	.00111	.00150	.00224	.00300	.00374	.00449	.00599	.07 x Dia	.03 x Dia
		Finishing (7x Reach)	.00017	.00036	.00054	.00071	.00090	.00107	.00144	.00215	.00287	.00358	.00431	.00574	.07 x Dia	.03 x Dia
		Finishing (8x Reach)	.00016	.00034	.00052	.00068	.00086	.00102	.00137	.00205	.00275	.00343	.00412	.00549	.07 x Dia	.03 x Dia
		Finishing (10x Reach)	.00015	.00031	.00047	.00062	.00078	.00093	.00125	.00187	.00250	.00312	.00374	.00499	.07 x Dia	.02 x Dia
		Finishing (12x Reach)	.00013	.00027	.00041	.00054	.00068	.00081	.00109	.00163	.00218	.00273	.00328	.00437	.06 x Dia	.02 x Dia
Finishing (15x Reach)	.00012	.00025	.00038	.00050	.00063	.00075	.00101	.00152	.00203	.00253	.00304	.00406	.06 x Dia	.01 x Dia		

\* Operator must consider proper Radial Depth of Cut since it relates directly to cusp height and part finish



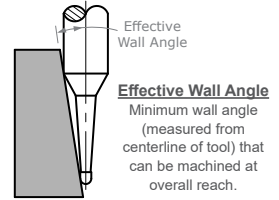
# END MILLS FOR HARDENED STEELS

## Finishers – Ball – Tapered Reach

HARDENED STEELS

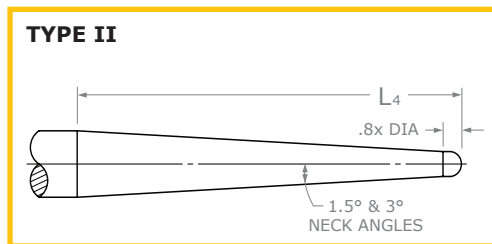
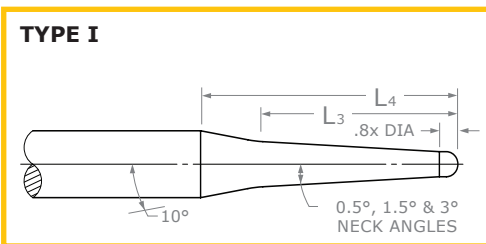


- **Designed to profile and finish hardened tool, die, and mold steels 46Rc to 68Rc**
- Solid tapered neck for increased rigidity and strength
- Select carbide grade for improved edge retention
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Geometry includes stub flute, large rigid core diameter, and eccentric relief
- Increased shank diameter to maintain strength and stiffness
- h6 shank tolerance for high precision tool holders
- 2 flutes
- Center cutting
- CNC ground in the USA



NECK ANGLE	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
									2 FL	PRICE
	$D_1 \begin{smallmatrix} +.0000'' \\ -.0006'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$L_3$	$L_4$		$D_2$ (h6)	$L_1$		
<b>0.5°</b>	.031 (1/32)	.025	I	<b>.093</b>	<b>.757</b>	8.4°	1/4	2-1/2	998703-C6	68.50
	.031 (1/32)	.025	I	<b>.156</b>	<b>.817</b>	7.8°	1/4	2-1/2	998706-C6	75.70
	.031 (1/32)	.025	I	<b>.250</b>	<b>.906</b>	7.0°	1/4	2-1/2	998709-C6	78.70
	.047 (3/64)	.038	I	<b>.156</b>	<b>.772</b>	7.7°	1/4	2-1/2	998712-C6	69.80
	.047 (3/64)	.038	I	<b>.250</b>	<b>.862</b>	6.9°	1/4	2-1/2	998715-C6	75.70
	.047 (3/64)	.038	I	<b>.375</b>	<b>.981</b>	6.1°	1/4	2-1/2	998718-C6	78.70
	.062 (1/16)	.050	I	<b>.312</b>	<b>.879</b>	6.4°	1/4	2-1/2	998721-C6	68.50
	.062 (1/16)	.050	I	<b>.500</b>	<b>1.057</b>	5.3°	1/4	2-1/2	998724-C6	75.70
	.062 (1/16)	.050	I	<b>.750</b>	<b>1.295</b>	4.3°	1/4	2-1/2	998727-C6	78.00
	.078 (5/64)	.062	I	<b>.437</b>	<b>.953</b>	5.4°	1/4	2-1/2	998730-C6	69.80
	.078 (5/64)	.062	I	<b>.625</b>	<b>1.131</b>	4.5°	1/4	2-1/2	998733-C6	75.70
	.078 (5/64)	.062	I	<b>1.000</b>	<b>1.488</b>	3.4°	1/4	3	998736-C6	86.30
	.093 (3/32)	.074	I	<b>.500</b>	<b>.971</b>	4.9°	1/4	2-1/2	998739-C6	68.50
	.093 (3/32)	.074	I	<b>.750</b>	<b>1.208</b>	3.9°	1/4	2-1/2	998742-C6	74.30
	.093 (3/32)	.074	I	<b>1.125</b>	<b>1.565</b>	3.0°	1/4	3	998745-C6	86.30
	.125 (1/8)	.100	I	<b>.625</b>	<b>1.000</b>	3.9°	1/4	2-1/2	998748-C6	74.00
.125 (1/8)	.100	I	<b>1.000</b>	<b>1.357</b>	2.8°	1/4	2-1/2	998751-C6	74.80	
.125 (1/8)	.100	I	<b>1.500</b>	<b>1.832</b>	2.1°	1/4	3	998754-C6	87.50	

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## END MILLS FOR HARDENED STEELS

Finishers – Ball – Tapered Reach (cont.)

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NECK ANGLE	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
									2 FL	PRICE
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.0006"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		L <sub>3</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>		
1.5°	.031 (1/32)	.025	I	.250	.875	7.3°	1/4	2-1/2	997407-C6	75.70
	.031 (1/32)	.025	I	.500	1.088	5.9°	1/4	2-1/2	997414-C6	78.70
	.047 (3/64)	.038	I	.375	.938	6.4°	1/4	2-1/2	997421-C6	74.30
	.062 (1/16)	.050	I	.500	1.004	5.6°	1/4	2-1/2	997428-C6	74.30
	.062 (1/16)	.050	I	1.000	1.429	3.9°	1/4	3	997435-C6	86.30
	.078 (5/64)	.062	I	.625	1.066	4.8°	1/4	2-1/2	997442-C6	75.70
	.078 (5/64)	.062	I	1.250	1.599	3.2°	1/4	3	997449-C6	86.30
	.093 (3/32)	.074	I	.750	1.132	4.2°	1/4	2-1/2	997456-C6	74.30
	.093 (3/32)	.074	I	1.500	1.771	2.7°	1/4	3	997463-C6	86.30
	.125 (1/8)	.100	I	1.000	1.258	3.0°	1/4	2-1/2	997470-C6	76.30
	.125 (1/8)	.100	II	2.487	2.487	1.5°	1/4	4	997477-C6	86.70
3.0°	.031 (1/32)	.025	I	.312	.714	8.9°	1/4	2-1/2	994907-C6	78.30
	.031 (1/32)	.025	I	.750	1.067	6.0°	1/4	2-1/2	994914-C6	79.80
	.047 (3/64)	.038	I	.875	1.140	5.2°	1/4	2-1/2	994921-C6	78.30
	.047 (3/64)	.038	I	1.250	1.442	4.1°	1/4	3	994928-C6	87.10
	.062 (1/16)	.050	I	.875	1.114	5.0°	1/4	2-1/2	994935-C6	77.50
	.062 (1/16)	.050	II	1.844	1.844	3.0°	1/4	3	994942-C6	87.10
	.078 (5/64)	.062	I	1.125	1.288	4.0°	1/4	2-1/2	994949-C6	77.50
	.078 (5/64)	.062	II	1.703	1.703	3.0°	1/4	3	994956-C6	86.30
	.093 (3/32)	.074	I	1.000	1.162	4.1°	1/4	2-1/2	994963-C6	77.50
	.093 (3/32)	.074	II	1.572	1.572	3.0°	1/4	3	994970-C6	87.10
	.125 (1/8)	.100	II	1.293	1.293	2.9°	1/4	2-1/2	994977-C6	85.90
	.125 (1/8)	.100	II	2.485	2.485	3.0°	3/8	4	994984-C6	124.70

HARDENED STEELS



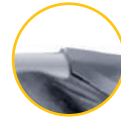
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# END MILLS FOR HARDENED STEELS

## Finishers – Corner Radius

HARDENED STEELS



Reduced Neck Diameter to Avoid Heeling

- **Designed to profile and finish hardened tool, die, and mold steels 46Rc to 68Rc**
- Select carbide grade for improved edge retention
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Geometry includes stub flute, large rigid core diameter, and eccentric relief
- Increased shank diameter to maintain strength and stiffness
- h6 shank tolerance for high precision tool holders • Center cutting
- CNC ground in the USA

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 4 FLUTE	
						2 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.0006"</sub>	R <sup>+0.0002"</sup> / <sub>-.0002"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>				
.010	.002	.008	.015 (1.5x)	1/4	2-1/2	40210-C6	93.90		
.010	.002	.008	.031 (3x)	1/4	2-1/2	30610-C6	93.90		
.015 (1/64)	.002	.012	.023 (1.5x)	1/4	2-1/2	40215-C6	74.30	951415-C6	75.40
.015 (1/64)	.002	.012	.047 (3x)	1/4	2-1/2	30615-C6	74.30		
.015 (1/64)	.002	.012	.078 (5x)	1/4	2-1/2	40615-C6	83.00		
.015 (1/64)	.002	.012	.125 (8x)	1/4	2-1/2	31015-C6	84.30		
.015 (1/64)	.002	.012	.187 (12x)	1/4	2-1/2	33015-C6	99.30		
.020	.004	.016	.031 (1.5x)	1/4	2-1/2	40220-C6	74.30	951420-C6	75.40
.020	.004	.016	.062 (3x)	1/4	2-1/2	30620-C6	74.30	938720-C6	75.40
.020	.004	.016	.100 (5x)	1/4	2-1/2	40620-C6	80.30	996320-C6	81.50
.025	.004	.020	.038 (1.5x)	1/4	2-1/2	40225-C6	74.30		
.025	.004	.020	.075 (3x)	1/4	2-1/2	30625-C6	74.30		
.025	.004	.020	.125 (5x)	1/4	2-1/2	40625-C6	79.50		
.031 (1/32)	.005	.025	.047 (1.5x)	1/4	2-1/2	40231-C6	65.60	951431-C6	66.80
.031 (1/32)	.005	.025	.093 (3x)	1/4	2-1/2	30631-C6	64.90	938731-C6	66.20
.031 (1/32)	.005	.025	.156 (5x)	1/4	2-1/2	40631-C6	71.00	996331-C6	71.80
.031 (1/32)	.005	.025	.250 (8x)	1/4	2-1/2	31031-C6	75.10	999031-C6	76.40
.031 (1/32)	.005	.025	.375 (12x)	1/4	2-1/2	33031-C6	85.00		
.031 (1/32)	.005	.025	.470 (15x)	1/4	2-1/2	942431-C6	99.50		
.031 (1/32)	.010	.025	.093 (3x)	1/4	2-1/2	982631-C6	67.90		
.031 (1/32)	.010	.025	.156 (5x)	1/4	2-1/2	957431-C6	73.50		
.039 (1 mm)	.005	.031	.062 (1.5x)	1/4	2-1/2	40239-C6	64.90	951439-C6	66.80
.039 (1 mm)	.005	.031	.117 (3x)	1/4	2-1/2	30639-C6	65.60	938739-C6	66.80
.039 (1 mm)	.005	.031	.203 (5x)	1/4	2-1/2	40639-C6	70.30	996339-C6	71.80
.039 (1 mm)	.005	.031	.312 (8x)	1/4	2-1/2	31039-C6	75.10		
.039 (1 mm)	.005	.031	.468 (12x)	1/4	2-1/2	33039-C6	85.00		
.047 (3/64)	.008	.038	.071 (1.5x)	1/4	2-1/2	40247-C6	64.90		
.047 (3/64)	.008	.038	.141 (3x)	1/4	2-1/2	30647-C6	64.90	938747-C6	66.80
.047 (3/64)	.008	.038	.250 (5x)	1/4	2-1/2	40647-C6	70.30	996347-C6	71.80
.047 (3/64)	.008	.038	.375 (8x)	1/4	2-1/2	31047-C6	74.40	999047-C6	75.70
.047 (3/64)	.008	.038	.564 (12x)	1/4	2-1/2	33047-C6	85.00		
.047 (3/64)	.008	.038	.710 (15x)	1/4	2-1/2	942447-C6	99.50		

continued on next page

# END MILLS FOR HARDENED STEELS

## Finishers – Corner Radius (cont.)

continued from previous page

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 4 FLUTE	
						2 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.006"</sub>	R <sup>+0.002"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>				
.062 (1/16)	<b>.005</b>	.050	<b>.187</b> (3x)	1/4	2-1/2	893162-C6	64.90		
.062 (1/16)	<b>.010</b>	.050	-	1/4	2-1/2	870362-C6	64.00	862262-C6	65.10
.062 (1/16)	<b>.010</b>	.050	<b>.093</b> (1.5x)	1/4	2-1/2	40262-C6	64.90	951462-C6	66.20
.062 (1/16)	<b>.010</b>	.050	<b>.187</b> (3x)	1/4	2-1/2	30662-C6	64.90	938762-C6	66.20
.062 (1/16)	<b>.010</b>	.050	<b>.250</b> (4x)	1/4	2-1/2	784162-C6	67.90	783762-C6	69.30
.062 (1/16)	<b>.010</b>	.050	<b>.312</b> (5x)	1/4	2-1/2	40662-C6	70.30	996362-C6	71.80
.062 (1/16)	<b>.010</b>	.050	<b>.375</b> (6x)	1/4	2-1/2	783362-C6	72.30	782562-C6	73.80
.062 (1/16)	<b>.010</b>	.050	<b>.437</b> (7x)	1/4	2-1/2	782962-C6	73.60	782162-C6	74.90
.062 (1/16)	<b>.010</b>	.050	<b>.500</b> (8x)	1/4	2-1/2	31062-C6	74.40	999062-C6	75.70
.062 (1/16)	<b>.010</b>	.050	<b>.750</b> (12x)	1/4	4	33062-C6	95.50	924162-C6	96.70
.062 (1/16)	<b>.010</b>	.050	<b>.950</b> (15x)	1/4	4	942462-C6	109.60		
.062 (1/16)	<b>.020</b>	.050	<b>.187</b> (3x)	1/4	2-1/2	991562-C6	67.90		
.062 (1/16)	<b>.020</b>	.050	<b>.312</b> (5x)	1/4	2-1/2	953162-C6	72.80		
.078 (5/64)	<b>.010</b>	.062	<b>.117</b> (1.5x)	1/4	2-1/2	40278-C6	65.60		
.078 (5/64)	<b>.010</b>	.062	<b>.234</b> (3x)	1/4	2-1/2	30678-C6	64.90	938778-C6	66.80
.078 (5/64)	<b>.010</b>	.062	<b>.406</b> (5x)	1/4	2-1/2	40678-C6	70.30	996378-C6	71.80
.078 (5/64)	<b>.010</b>	.062	<b>.625</b> (8x)	1/4	2-1/2	31078-C6	75.10	999078-C6	75.70
.078 (5/64)	<b>.010</b>	.062	<b>.937</b> (12x)	1/4	4	33078-C6	95.50		
.093 (3/32)	<b>.005</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	893193-C6	65.60		
.093 (3/32)	<b>.010</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	982693-C6	65.60		
.093 (3/32)	<b>.015</b>	.074	-	1/4	2-1/2	850893-C6	64.00		
.093 (3/32)	<b>.015</b>	.074	<b>.140</b> (1.5x)	1/4	2-1/2	40293-C6	64.90	951493-C6	66.80
.093 (3/32)	<b>.015</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	30693-C6	64.90	938793-C6	66.20
.093 (3/32)	<b>.015</b>	.074	<b>.375</b> (4x)	1/4	2-1/2	783993-C6	67.90	783593-C6	69.30
.093 (3/32)	<b>.015</b>	.074	<b>.500</b> (5x)	1/4	2-1/2	40693-C6	70.30	996393-C6	71.80
.093 (3/32)	<b>.015</b>	.074	<b>.585</b> (6x)	1/4	2-1/2	783193-C6	72.30	782393-C6	73.80
.093 (3/32)	<b>.015</b>	.074	<b>.670</b> (7x)	1/4	2-1/2	782793-C6	73.60	781993-C6	74.90
.093 (3/32)	<b>.015</b>	.074	<b>.750</b> (8x)	1/4	2-1/2	31093-C6	75.10	999093-C6	75.70
.093 (3/32)	<b>.015</b>	.074	<b>1.125</b> (12x)	1/4	4	33093-C6	95.50	924193-C6	96.70
.093 (3/32)	<b>.030</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	963393-C6	67.90		
.093 (3/32)	<b>.030</b>	.074	<b>.500</b> (5x)	1/4	2-1/2	946393-C6	72.80		
.118 (3 mm)	<b>.015</b>	.094	<b>.177</b> (1.5x)	1/4	2-1/2	40305-C6	70.30		
.118 (3 mm)	<b>.015</b>	.094	<b>.354</b> (3x)	1/4	2-1/2	30705-C6	70.30		
.125 (1/8)	<b>.005</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	893208-C6	70.30		
.125 (1/8)	<b>.010</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	982708-C6	70.30		
.125 (1/8)	<b>.015</b>	.100	-	1/4	2-1/2	850908-C6	68.60		
.125 (1/8)	<b>.015</b>	.100	<b>.187</b> (1.5x)	1/4	2-1/2	40308-C6	69.70	951508-C6	70.80
.125 (1/8)	<b>.015</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	30708-C6	69.70	938808-C6	70.80
.125 (1/8)	<b>.015</b>	.100	<b>.500</b> (4x)	1/4	2-1/2	784008-C6	73.70	783608-C6	76.30
.125 (1/8)	<b>.015</b>	.100	<b>.625</b> (5x)	1/4	2-1/2	40708-C6	76.40	996408-C6	83.50
.125 (1/8)	<b>.015</b>	.100	<b>.750</b> (6x)	1/4	2-1/2	783208-C6	78.80	782408-C6	85.80
.125 (1/8)	<b>.015</b>	.100	<b>.875</b> (7x)	1/4	2-1/2	782808-C6	80.40	782008-C6	87.10
.125 (1/8)	<b>.015</b>	.100	<b>1.000</b> (8x)	1/4	2-1/2	31108-C6	81.00	999108-C6	88.80
.125 (1/8)	<b>.015</b>	.100	<b>1.500</b> (12x)	1/4	4	33108-C6	102.20	924208-C6	110.10
.125 (1/8)	<b>.030</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	963408-C6	72.00		
.125 (1/8)	<b>.030</b>	.100	<b>.625</b> (5x)	1/4	2-1/2	946408-C6	79.00	781808-C6	87.00

HARDENED STEELS

continued on next page

# END MILLS FOR HARDENED STEELS

## Finishers – Corner Radius (cont.)

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HARDENED STEELS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 4 FLUTE	
						2 FL	PRICE	4 FL	PRICE
D1 $\begin{matrix} +.000" \\ -.001" \end{matrix}$	R $\begin{matrix} +.0005" \\ -.0005" \end{matrix}$	L2 $\begin{matrix} +.020" \\ -.000" \end{matrix}$	L3 $\begin{matrix} +.020" \\ -.000" \end{matrix}$	D2 (h6)	L1				
.156 (5/32)	<b>.015</b>	.125	<b>.235</b> (1.5x)	1/4	2-1/2	40310-C6	70.30		
.156 (5/32)	<b>.015</b>	.125	<b>.470</b> (3x)	1/4	2-1/2	30710-C6	69.70		
.187 (3/16)	<b>.015</b>	.150	<b>.285</b> (1.5x)	1/4	2-1/2	40312-C6	69.70	951512-C6	70.80
.187 (3/16)	<b>.015</b>	.150	<b>.570</b> (3x)	1/4	2-1/2	30712-C6	69.70	938812-C6	70.80
.187 (3/16)	<b>.015</b>	.150	<b>1.000</b> (5x)	1/4	2-1/2	40712-C6	76.40	996412-C6	83.50
.187 (3/16)	<b>.015</b>	.150	<b>1.500</b> (8x)	1/4	4	31112-C6	92.20		
.187 (3/16)	<b>.015</b>	.150	<b>2.250</b> (12x)	1/4	4	33112-C6	109.60		
.187 (3/16)	<b>.060</b>	.150	<b>.570</b> (3x)	1/4	2-1/2	939212-C6	80.70	934412-C6	86.90
.250 (1/4)	<b>.015</b>	.200	<b>.375</b> (1.5x)	1/4	2-1/2	40316-C6	69.70	951516-C6	70.80
.250 (1/4)	<b>.015</b>	.200	<b>.750</b> (3x)	1/4	2-1/2	30716-C6	73.00	938816-C6	79.80
.250 (1/4)	<b>.015</b>	.200	<b>1.000</b> (4x)	1/4	2-1/2	784016-C6	75.40	783616-C6	82.10
.250 (1/4)	<b>.015</b>	.200	<b>1.250</b> (5x)	1/4	2-1/2	40716-C6	76.40	996416-C6	83.80
.250 (1/4)	<b>.015</b>	.200	<b>2.000</b> (8x)	1/4	4	31116-C6	92.20		
.250 (1/4)	<b>.030</b>	.200	<b>1.000</b> (3x)	1/4	2-1/2			750716-C6	82.10
.250 (1/4)	<b>.060</b>	.200	<b>.750</b> (3x)	1/4	2-1/2	939216-C6	80.70	934416-C6	86.90
.312 (5/16)	<b>.030</b>	.250	<b>1.000</b> (3x)	5/16	2-1/2			938820-C6	87.90
.375 (3/8)	<b>.030</b>	.300	<b>.570</b> (1.5x)	3/8	2-1/2			951524-C6	98.50
.375 (3/8)	<b>.030</b>	.300	<b>1.125</b> (3x)	3/8	2-1/2			938824-C6	101.60
.375 (3/8)	<b>.030</b>	.300	<b>2.000</b> (5x)	3/8	4			996424-C6	106.50
.500 (1/2)	<b>.030</b>	.400	<b>1.500</b> (3x)	1/2	3			938832-C6	128.20

### GUIDELINES FOR MILLING HARDENED STEELS

- Rigid machining centers and balanced tool holders that minimize vibration and TIR will enhance tool life.
- Mist or air coolant is recommended for material hardness of 45Rc or more.
- Enter workpiece slowly by ramping or helical interpolation to avoid potential chipping or breakage.
- Climb Milling will extend tool life and improve workpiece finish.

### SPEEDS & FEEDS (End Mills for Hardened Steels – Corner Radius)

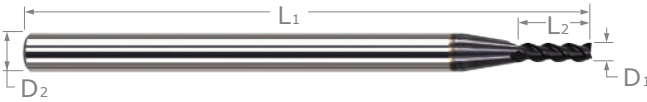
**Important Note:** Values in table are in inches and based on 2 flute end mills. For end mills with more flutes, table values of IPT must be reduced (for 4 flutes, reduce to 80%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material Hardness	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter											Depth of Cut		
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial
45-55 Rc	700	Finishing (0.8x Reach)	.00014	.00029	.00044	.00058	.00073	.00087	.00117	.00175	.00234	.00292	.00351	.00468	.35 x Dia	.02 x Dia
		Finishing (1.5x Reach)	.00013	.00028	.00042	.00056	.00070	.00083	.00112	.00168	.00224	.00280	.00336	.00449	.35 x Dia	.02 x Dia
		Finishing (3x Reach)	.00013	.00027	.00040	.00053	.00067	.00080	.00107	.00160	.00215	.00268	.00322	.00429	.35 x Dia	.02 x Dia
		Finishing (4x Reach)	.00013	.00025	.00039	.00050	.00064	.00077	.00103	.00153	.00205	.00255	.00308	.00410	.35 x Dia	.02 x Dia
		Finishing (5x Reach)	.00012	.00024	.00037	.00048	.00061	.00073	.00098	.00146	.00195	.00243	.00293	.00390	.35 x Dia	.02 x Dia
		Finishing (6x Reach)	.00012	.00023	.00036	.00046	.00059	.00070	.00094	.00140	.00187	.00233	.00281	.00374	.35 x Dia	.02 x Dia
		Finishing (7x Reach)	.00011	.00022	.00034	.00044	.00056	.00067	.00090	.00134	.00179	.00224	.00270	.00359	.35 x Dia	.02 x Dia
		Finishing (8x Reach)	.00010	.00021	.00032	.00043	.00054	.00064	.00086	.00128	.00172	.00214	.00257	.00343	.35 x Dia	.02 x Dia
		Finishing (12x Reach)	.00008	.00017	.00026	.00034	.00043	.00051	.00068	.00102	.00137	.00170	.00205	.00273	.35 x Dia	.01 x Dia
		Finishing (15x Reach)	.00008	.00016	.00024	.00031	.00040	.00047	.00063	.00095	.00127	.00158	.00190	.00254	.35 x Dia	.01 x Dia
56-68 Rc	600	Finishing (0.8x Reach)	.00011	.00023	.00035	.00046	.00058	.00070	.00094	.00140	.00187	.00234	.00281	.00374	.25 x Dia	.02 x Dia
		Finishing (1.5x Reach)	.00011	.00022	.00034	.00044	.00056	.00067	.00090	.00134	.00179	.00224	.00269	.00359	.25 x Dia	.02 x Dia
		Finishing (3x Reach)	.00010	.00021	.00032	.00043	.00054	.00064	.00086	.00128	.00172	.00214	.00257	.00343	.25 x Dia	.02 x Dia
		Finishing (4x Reach)	.00009	.00020	.00030	.00041	.00051	.00061	.00082	.00123	.00164	.00205	.00246	.00328	.25 x Dia	.02 x Dia
		Finishing (5x Reach)	.00009	.00019	.00029	.00039	.00049	.00058	.00078	.00117	.00156	.00195	.00234	.00312	.25 x Dia	.02 x Dia
		Finishing (6x Reach)	.00009	.00018	.00028	.00037	.00047	.00056	.00075	.00112	.00150	.00187	.00225	.00300	.25 x Dia	.02 x Dia
		Finishing (7x Reach)	.00008	.00017	.00027	.00036	.00045	.00053	.00072	.00108	.00144	.00179	.00215	.00287	.25 x Dia	.02 x Dia
		Finishing (8x Reach)	.00008	.00017	.00026	.00034	.00043	.00051	.00069	.00103	.00137	.00171	.00206	.00275	.25 x Dia	.02 x Dia
		Finishing (12x Reach)	.00007	.00014	.00021	.00027	.00034	.00041	.00055	.00082	.00109	.00136	.00164	.00218	.25 x Dia	.01 x Dia
		Finishing (15x Reach)	.00006	.00013	.00019	.00025	.00032	.00038	.00051	.00076	.00101	.00127	.00152	.00203	.25 x Dia	.01 x Dia



# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Square



- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders • Suitable for steels up to 45Rc
- Center cutting • Solid carbide • CNC ground in the USA

HIGH TEMP ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .010"					
- .0005"	- .02mm	equivalent	- .000"					
			- .00mm					
	.2 mm	.0078	<b>.60 mm</b> (3x)	3	4 mm	50 mm	942804-C6	61.40
.010		.0100	<b>.015</b> (1.5x)	3	1/8	1-1/2	973710-C6	57.40
.010		.0100	<b>.030</b> (3x)	3	1/8	1-1/2	967010-C6	56.80
.010		.0100	<b>.050</b> (5x)	3	1/8	2-1/2	990710-C6	66.90
.015 (1/64)		.0150	<b>.012</b> (0.8x)	3	1/8	1-1/2	888015-C6	48.10
.015 (1/64)		.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	973715-C6	47.10
.015 (1/64)		.0150	<b>.023</b> (1.5x)	4	1/8	1-1/2	841615-C6	49.00
.015 (1/64)		.0150	<b>.045</b> (3x)	3	1/8	1-1/2	967015-C6	46.50
.015 (1/64)		.0150	<b>.045</b> (3x)	4	1/8	1-1/2	875415-C6	48.50
.015 (1/64)		.0150	<b>.062</b> (4x)	3	1/8	2-1/2	886215-C6	55.00
.015 (1/64)		.0150	<b>.078</b> (5x)	3	1/8	2-1/2	990715-C6	57.20
	.4 mm	.0157	<b>1.20 mm</b> (3x)	3	4 mm	50 mm	942809-C6	45.30
	.5 mm	.0196	<b>.40 mm</b> (0.8x)	3	4 mm	50 mm	848011-C6	47.10
	.5 mm	.0196	<b>.75 mm</b> (1.5x)	3	4 mm	50 mm	954511-C6	45.30
	.5 mm	.0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	942811-C6	45.30
.020		.0200	<b>.016</b> (0.8x)	3	1/8	1-1/2	888020-C6	42.30
.020		.0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	973720-C6	41.20
.020		.0200	<b>.030</b> (1.5x)	4	1/8	1-1/2	841620-C6	44.00
.020		.0200	<b>.060</b> (3x)	3	1/8	1-1/2	967020-C6	40.80
.020		.0200	<b>.060</b> (3x)	4	1/8	1-1/2	875420-C6	42.80
.020		.0200	<b>.080</b> (4x)	3	1/8	2-1/2	886220-C6	46.20
.020		.0200	<b>.100</b> (5x)	3	1/8	2-1/2	990720-C6	48.50
.020		.0200	<b>.100</b> (5x)	4	1/8	2-1/2	852920-C6	51.50
	.6 mm	.0236	<b>1.80 mm</b> (3x)	3	4 mm	50 mm	942813-C6	44.10
.025		.0250	<b>.038</b> (1.5x)	3	1/8	1-1/2	973725-C6	39.80
.025		.0250	<b>.075</b> (3x)	3	1/8	1-1/2	967025-C6	39.40
.025		.0250	<b>.075</b> (3x)	4	1/8	1-1/2	875425-C6	41.20
.025		.0250	<b>.100</b> (4x)	3	1/8	2-1/2	886225-C6	47.80
.025		.0250	<b>.125</b> (5x)	3	1/8	2-1/2	990725-C6	46.90
NEW .025		.0250	<b>.125</b> (5x)	4	1/8	2-1/2	852925-C6	48.70
.030		.0300	<b>.024</b> (0.8x)	3	1/8	1-1/2	888030-C6	39.60
.030		.0300	<b>.045</b> (1.5x)	3	1/8	1-1/2	973730-C6	39.80
.030		.0300	<b>.045</b> (1.5x)	4	1/8	1-1/2	841630-C6	41.80
.030		.0300	<b>.090</b> (3x)	3	1/8	1-1/2	967030-C6	39.40
.030		.0300	<b>.090</b> (3x)	4	1/8	1-1/2	875430-C6	41.20
.030		.0300	<b>.125</b> (4x)	3	1/8	2-1/2	886230-C6	47.80
.030		.0300	<b>.156</b> (5x)	3	1/8	2-1/2	990730-C6	46.90

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

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HIGH TEMP ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm					
.031 (1/32)		.0310	<b>.025</b> (0.8x)	3	1/8	1-1/2	888031-C6	35.80
.031 (1/32)		.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	973731-C6	34.00
.031 (1/32)		.0310	<b>.047</b> (1.5x)	4	1/8	1-1/2	841631-C6	35.50
.031 (1/32)		.0310	<b>.093</b> (3x)	3	1/8	1-1/2	967031-C6	33.50
.031 (1/32)		.0310	<b>.093</b> (3x)	4	1/8	1-1/2	875431-C6	35.50
.031 (1/32)		.0310	<b>.125</b> (4x)	3	1/8	2-1/2	886231-C6	40.30
.031 (1/32)		.0310	<b>.125</b> (4x)	4	1/8	2-1/2	790731-C6	42.20
.031 (1/32)		.0310	<b>.156</b> (5x)	3	1/8	2-1/2	990731-C6	42.60
.031 (1/32)		.0310	<b>.156</b> (5x)	4	1/8	2-1/2	852931-C6	44.50
	.8 mm	.0314	<b>2.40 mm</b> (3x)	3	4 mm	50 mm	942818-C6	38.50
	.8 mm	.0314	<b>4.00 mm</b> (5x)	3	4 mm	50 mm	910518-C6	40.50
.035		.0350	<b>.028</b> (0.8x)	3	1/8	1-1/2	888035-C6	34.80
.035		.0350	<b>.053</b> (1.5x)	3	1/8	1-1/2	973735-C6	34.00
.035		.0350	<b>.053</b> (1.5x)	4	1/8	1-1/2	841635-C6	35.90
.035		.0350	<b>.105</b> (3x)	3	1/8	1-1/2	967035-C6	33.50
.035		.0350	<b>.105</b> (3x)	4	1/8	1-1/2	875435-C6	35.50
.035		.0350	<b>.140</b> (4x)	3	1/8	2-1/2	886235-C6	41.10
.035		.0350	<b>.187</b> (5x)	3	1/8	2-1/2	990735-C6	42.60
	1.0 mm	.0393	<b>.80 mm</b> (0.8x)	3	4 mm	50 mm	848022-C6	39.40
	1.0 mm	.0393	<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	954522-C6	38.90
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	942822-C6	38.20
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	4	4 mm	50 mm	821322-C6	40.20
	1.0 mm	.0393	<b>4.00 mm</b> (4x)	3	4 mm	50 mm	820722-C6	43.10
	1.0 mm	.0393	<b>5.00 mm</b> (5x)	3	4 mm	50 mm	910522-C6	47.20
.039		.0390	<b>.117</b> (3x)	3	1/8	1-1/2	967039-C6	35.80
.040		.0400	<b>.032</b> (0.8x)	3	1/8	1-1/2	888040-C6	34.50
.040		.0400	<b>.060</b> (1.5x)	3	1/8	1-1/2	973740-C6	34.00
.040		.0400	<b>.060</b> (1.5x)	4	1/8	1-1/2	841640-C6	35.90
.040		.0400	<b>.120</b> (3x)	3	1/8	1-1/2	967040-C6	33.50
.040		.0400	<b>.120</b> (3x)	4	1/8	1-1/2	875440-C6	35.50
.040		.0400	<b>.160</b> (4x)	3	1/8	2-1/2	886240-C6	40.50
.040		.0400	<b>.203</b> (5x)	3	1/8	2-1/2	990740-C6	42.60
.040		.0400	<b>.203</b> (5x)	4	1/8	2-1/2	852940-C6	45.40
.045		.0450	<b>.068</b> (1.5x)	3	1/8	1-1/2	973745-C6	34.00
.045		.0450	<b>.135</b> (3x)	3	1/8	1-1/2	967045-C6	33.50
.045		.0450	<b>.135</b> (3x)	4	1/8	1-1/2	875445-C6	35.50
.045		.0450	<b>.225</b> (5x)	3	1/8	2-1/2	990745-C6	42.60
.047 (3/64)		.0470	<b>.038</b> (0.8x)	3	1/8	1-1/2	888047-C6	37.40
.047 (3/64)		.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	973747-C6	34.00
.047 (3/64)		.0470	<b>.071</b> (1.5x)	4	1/8	1-1/2	841647-C6	35.70
.047 (3/64)		.0470	<b>.141</b> (3x)	3	1/8	1-1/2	967047-C6	33.50
.047 (3/64)		.0470	<b>.141</b> (3x)	4	1/8	1-1/2	875447-C6	35.50
.047 (3/64)		.0470	<b>.187</b> (4x)	3	1/8	2-1/2	886247-C6	40.30
.047 (3/64)		.0470	<b>.187</b> (4x)	4	1/8	2-1/2	790747-C6	42.20
.047 (3/64)		.0470	<b>.250</b> (5x)	3	1/8	2-1/2	990747-C6	42.60
.047 (3/64)		.0470	<b>.250</b> (5x)	4	1/8	2-1/2	852947-C6	44.50

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

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CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .010" - .000" +.25mm - .00mm					
1.2 mm		.0472	<b>3.50 mm</b> (3x)	3	4 mm	50 mm	942827-C6	38.50
.050		.0500	<b>.040</b> (0.8x)	3	1/8	1-1/2	888050-C6	33.10
.050		.0500	<b>.075</b> (1.5x)	3	1/8	1-1/2	973750-C6	34.00
.050		.0500	<b>.150</b> (3x)	3	1/8	1-1/2	967050-C6	33.50
.050		.0500	<b>.150</b> (3x)	4	1/8	1-1/2	875450-C6	35.50
.050		.0500	<b>.203</b> (4x)	3	1/8	1-1/2	886250-C6	41.10
.050		.0500	<b>.250</b> (5x)	3	1/8	2-1/2	990750-C6	42.60
.055		.0550	<b>.083</b> (1.5x)	3	1/8	1-1/2	973755-C6	34.00
.055		.0550	<b>.165</b> (3x)	3	1/8	1-1/2	967055-C6	33.50
.055		.0550	<b>.165</b> (3x)	4	1/8	1-1/2	875455-C6	36.20
.055		.0550	<b>.275</b> (5x)	3	1/8	2-1/2	990755-C6	42.60
1.4 mm		.0551	<b>4.00 mm</b> (3x)	3	4 mm	50 mm	942831-C6	36.20
1.5 mm		.0590	<b>2.20 mm</b> (1.5x)	3	4 mm	50 mm	954533-C6	36.50
1.5 mm		.0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	942833-C6	35.90
1.5 mm		.0590	<b>4.50 mm</b> (3x)	4	4 mm	50 mm	821333-C6	38.20
1.5 mm		.0590	<b>7.50 mm</b> (5x)	3	4 mm	50 mm	910533-C6	45.20
.060		.0600	<b>.048</b> (0.8x)	3	1/8	1-1/2	888060-C6	33.80
.060		.0600	<b>.090</b> (1.5x)	3	1/8	1-1/2	973760-C6	34.00
.060		.0600	<b>.180</b> (3x)	3	1/8	1-1/2	967060-C6	33.50
.060		.0600	<b>.180</b> (3x)	4	1/8	1-1/2	875460-C6	35.50
.060		.0600	<b>.312</b> (5x)	3	1/8	2-1/2	990760-C6	42.60
.062 (1/16)		.0620	<b>.050</b> (0.8x)	3	1/8	1-1/2	888062-C6	35.20
.062 (1/16)		.0620	<b>.050</b> (0.8x)	4	1/8	1-1/2	790562-C6	37.10
.062 (1/16)		.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	973762-C6	31.70
.062 (1/16)		.0620	<b>.093</b> (1.5x)	4	1/8	1-1/2	841662-C6	33.40
.062 (1/16)		.0620	<b>.186</b> (3x)	3	1/8	1-1/2	967062-C6	31.40
.062 (1/16)		.0620	<b>.186</b> (3x)	4	1/8	1-1/2	875462-C6	33.30
.062 (1/16)		.0620	<b>.250</b> (4x)	3	1/8	2-1/2	886262-C6	38.60
.062 (1/16)		.0620	<b>.250</b> (4x)	4	1/8	2-1/2	790762-C6	40.60
.062 (1/16)		.0620	<b>.312</b> (5x)	3	1/8	2-1/2	990762-C6	40.80
.062 (1/16)		.0620	<b>.312</b> (5x)	4	1/8	2-1/2	852962-C6	42.80
1.6 mm		.0629	<b>5.00 mm</b> (3x)	3	4 mm	50 mm	942836-C6	36.90
.065		.0650	<b>.195</b> (3x)	3	1/8	1-1/2	967065-C6	36.10
.070		.0700	<b>.105</b> (1.5x)	3	1/8	1-1/2	973770-C6	31.70
.070		.0700	<b>.210</b> (3x)	3	1/8	1-1/2	967070-C6	31.40
.070		.0700	<b>.210</b> (3x)	4	1/8	1-1/2	875470-C6	33.30
.070		.0700	<b>.375</b> (5x)	3	1/8	2-1/2	990770-C6	40.80
1.8 mm		.0708	<b>5.50 mm</b> (3x)	3	4 mm	50 mm	942840-C6	36.90
.075		.0750	<b>.225</b> (3x)	3	1/8	1-1/2	967075-C6	36.10
.078 (5/64)		.0780	<b>.062</b> (0.8x)	3	1/8	1-1/2	888078-C6	35.20
.078 (5/64)		.0780	<b>.118</b> (1.5x)	3	1/8	1-1/2	973778-C6	31.70
.078 (5/64)		.0780	<b>.118</b> (1.5x)	4	1/8	1-1/2	841678-C6	33.40
.078 (5/64)		.0780	<b>.234</b> (3x)	3	1/8	1-1/2	967078-C6	31.40
.078 (5/64)		.0780	<b>.234</b> (3x)	4	1/8	1-1/2	875478-C6	33.30
.078 (5/64)		.0780	<b>.312</b> (4x)	3	1/8	2-1/2	886278-C6	38.60
.078 (5/64)		.0780	<b>.406</b> (5x)	3	1/8	2-1/2	990778-C6	40.80
.078 (5/64)		.0780	<b>.406</b> (5x)	4	1/8	2-1/2	852978-C6	42.80

HIGH TEMP ALLOYS

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

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HIGH TEMP ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm					
2.0 mm	.0787	<b>3.00 mm</b> (1.5x)	3	4 mm	50 mm	954545-C6	36.50	
2.0 mm	.0787	<b>6.00 mm</b> (3x)	3	4 mm	50 mm	942845-C6	35.90	
2.0 mm	.0787	<b>6.00 mm</b> (3x)	4	4 mm	50 mm	821345-C6	38.20	
2.0 mm	.0787	<b>10.00 mm</b> (5x)	3	4 mm	50 mm	910545-C6	45.20	
.080	.0800	<b>.120</b> (1.5x)	3	1/8	1-1/2	973780-C6	31.70	
.080	.0800	<b>.240</b> (3x)	3	1/8	1-1/2	967080-C6	31.40	
.080	.0800	<b>.406</b> (5x)	3	1/8	2-1/2	990780-C6	41.60	
.085	.0850	<b>.255</b> (3x)	3	1/8	1-1/2	967085-C6	36.10	
.090	.0900	<b>.135</b> (1.5x)	3	1/8	1-1/2	973790-C6	31.70	
.090	.0900	<b>.135</b> (1.5x)	4	1/8	1-1/2	841690-C6	33.40	
.090	.0900	<b>.270</b> (3x)	3	1/8	1-1/2	967090-C6	31.40	
.090	.0900	<b>.450</b> (5x)	3	1/8	2-1/2	990790-C6	40.80	
.093 (3/32)	.0930	<b>.074</b> (0.8x)	3	1/8	1-1/2	888093-C6	35.20	
.093 (3/32)	.0930	<b>.074</b> (0.8x)	4	1/8	1-1/2	790593-C6	37.60	
.093 (3/32)	.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	973793-C6	31.70	
.093 (3/32)	.0930	<b>.140</b> (1.5x)	4	1/8	1-1/2	841693-C6	33.40	
.093 (3/32)	.0930	<b>.279</b> (3x)	3	1/8	1-1/2	967093-C6	31.40	
.093 (3/32)	.0930	<b>.279</b> (3x)	4	1/8	1-1/2	875493-C6	33.30	
.093 (3/32)	.0930	<b>.375</b> (4x)	3	1/8	2-1/2	886293-C6	38.60	
.093 (3/32)	.0930	<b>.375</b> (4x)	4	1/8	2-1/2	790793-C6	40.60	
.093 (3/32)	.0930	<b>.500</b> (5x)	3	1/8	2-1/2	990793-C6	40.80	
.093 (3/32)	.0930	<b>.500</b> (5x)	4	1/8	2-1/2	852993-C6	42.80	
.095	.0950	<b>.285</b> (3x)	3	1/8	1-1/2	967095-C6	36.00	
2.5 mm	.0984	<b>3.70 mm</b> (1.5x)	3	4 mm	50 mm	954551-C6	36.50	
2.5 mm	.0984	<b>7.50 mm</b> (3x)	3	4 mm	50 mm	942851-C6	35.90	
2.5 mm	.0984	<b>7.50 mm</b> (3x)	4	4 mm	50 mm	821351-C6	38.20	
2.5 mm	.0984	<b>12.00 mm</b> (5x)	3	4 mm	50 mm	910551-C6	45.20	
.100	.1000	<b>.150</b> (1.5x)	3	1/8	1-1/2	973800-C6	31.70	
.100	.1000	<b>.300</b> (3x)	3	1/8	1-1/2	967100-C6	31.40	
.100	.1000	<b>.500</b> (5x)	3	1/8	2-1/2	990800-C6	40.80	
.109 (7/64)	.1090	<b>.164</b> (1.5x)	3	1/8	1-1/2	973802-C6	31.70	
.109 (7/64)	.1090	<b>.327</b> (3x)	3	1/8	1-1/2	967102-C6	31.40	
.109 (7/64)	.1090	<b>.327</b> (3x)	4	1/8	1-1/2	875502-C6	33.30	
.109 (7/64)	.1090	<b>.570</b> (5x)	3	1/8	2-1/2	990802-C6	40.80	
.118	.1180	<b>.354</b> (3x)	3	1/8	1-1/2	967105-C6	33.40	
3.0 mm	.1181	<b>2.40 mm</b> (0.8x)	3	4 mm	50 mm	848057-C6	36.40	
3.0 mm	.1181	<b>4.50 mm</b> (1.5x)	3	4 mm	50 mm	954557-C6	36.50	
3.0 mm	.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	942857-C6	35.90	
3.0 mm	.1181	<b>15.00 mm</b> (5x)	3	4 mm	50 mm	910557-C6	45.20	
.125 (1/8)	.1250	<b>.100</b> (0.8x)	4	1/8	1-1/2	888108-C6	35.20	

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

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CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITiN NANO COATED	
D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE		
+0.000" / -0.002"	+0.00mm / -0.04mm	+0.030" / -0.000" / +0.75mm / -0.00mm						
.125 (1/8)	.1250	.187 (1.5x)	4	1/8	1-1/2	973808-C6	29.50	
.125 (1/8)	.1250	.187 (1.5x)	5	1/8	1-1/2	747108-C6	32.40	
.125 (1/8)	.1250	.375 (3x)	4	1/8	1-1/2	967108-C6	29.50	
.125 (1/8)	.1250	.375 (3x)	5	1/8	1-1/2	747308-C6	32.40	
.125 (1/8)	.1250	.500 (4x)	4	1/8	2-1/2	886308-C6	38.60	
.125 (1/8)	.1250	.625 (5x)	4	1/8	2-1/2	990808-C6	40.80	
.140 (9/64)	.1406	.220 (1.5x)	4	3/16	2	973809-C6	34.20	
.140 (9/64)	.1406	.425 (3x)	4	3/16	2	967109-C6	34.20	
.140 (9/64)	.1406	.750 (5x)	4	3/16	3	990809-C6	43.30	
.156 (5/32)	.1562	.125 (0.8x)	4	3/16	2	888110-C6	33.50	
.156 (5/32)	.1562	.235 (1.5x)	4	3/16	2	973810-C6	34.20	
.156 (5/32)	.1562	.470 (3x)	4	3/16	2	967110-C6	34.20	
.156 (5/32)	.1562	.625 (4x)	4	3/16	3	886310-C6	36.10	
.156 (5/32)	.1562	.750 (5x)	4	3/16	3	990810-C6	43.30	
4.0 mm	.1574	12.00 mm (3x)	4	6 mm	63 mm	942861-C6	45.30	
.172 (11/64)	.1718	.505 (3x)	4	3/16	2	967111-C6	36.80	
.187 (3/16)	.1875	.150 (0.8x)	4	3/16	2	888112-C6	38.00	
.187 (3/16)	.1875	.285 (1.5x)	4	3/16	2	973812-C6	32.10	
.187 (3/16)	.1875	.285 (1.5x)	5	3/16	2	747112-C6	35.00	
.187 (3/16)	.1875	.562 (3x)	4	3/16	2	967112-C6	32.40	
.187 (3/16)	.1875	.562 (3x)	5	3/16	2	747312-C6	35.00	
.187 (3/16)	.1875	.750 (4x)	4	3/16	3	886312-C6	41.40	
.187 (3/16)	.1875	1.000 (5x)	4	3/16	3	990812-C6	43.30	
5.0 mm	.1968	15.00 mm (3x)	4	6 mm	63 mm	821364-C6	45.70	
.218 (7/32)	.2187	.330 (1.5x)	4	1/4	2-1/2	973814-C6	44.70	
.218 (7/32)	.2187	.660 (3x)	4	1/4	2-1/2	967114-C6	44.70	
6.0 mm	.2362	18.00 mm (3x)	4	6 mm	63 mm	942866-C6	45.30	
.250 (1/4)	.2500	.200 (0.8x)	4	1/4	2-1/2	888116-C6	47.00	
.250 (1/4)	.2500	.375 (1.5x)	4	1/4	2-1/2	973816-C6	40.20	
.250 (1/4)	.2500	.375 (1.5x)	5	1/4	2-1/2	747116-C6	43.40	
.250 (1/4)	.2500	.750 (3x)	4	1/4	2-1/2	967116-C6	40.60	
.250 (1/4)	.2500	.750 (3x)	5	1/4	2-1/2	747316-C6	43.40	
.250 (1/4)	.2500	1.000 (4x)	4	1/4	4	886316-C6	49.90	
.250 (1/4)	.2500	1.250 (5x)	4	1/4	4	990816-C6	51.80	
.312 (5/16)	.3125	1.000 (3x)	4	5/16	2-1/2	967120-C6	56.60	
.375 (3/8)	.3750	.570 (1.5x)	4	3/8	2-1/2	973824-C6	64.90	
.375 (3/8)	.3750	1.125 (3x)	4	3/8	2-1/2	967124-C6	65.60	
10.0 mm	.3937	30.0 mm (3x)	4	10 mm	75 mm	942873-C6	72.80	
.500 (1/2)	.5000	.750 (1.5x)	4	1/2	3	973832-C6	84.70	
.500 (1/2)	.5000	1.500 (3x)	4	1/2	3	967132-C6	84.70	

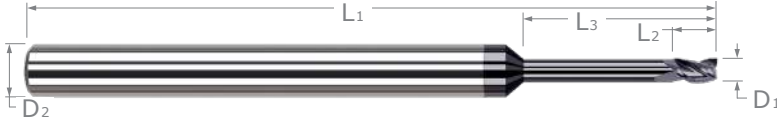
HIGH TEMP ALLOYS

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PLEASE SEE SPEEDS & FEEDS ON PAGE 144

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Square – Long Reach, Stub Flute



HIGH TEMP ALLOYS

- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Long reach design for deep cavities • Reduced neck diameter to avoid heeling
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders • Suitable for steels up to 45Rc
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.005"	+0.00mm	decimal	+0.010"	+0.010"					
-0.005"	-0.02mm	equivalent	-0.000"	-0.000"					
			+0.25mm	+0.25mm					
			-0.00mm	-0.00mm					
.010		.0100	.015	<b>.050</b> (5x)	3	1/8	2-1/2	985310-C6	71.30
.010		.0100	.015	<b>.080</b> (8x)	3	1/8	2-1/2	978210-C6	72.00
.015 (1/64)		.0150	.023	<b>.078</b> (5x)	3	1/8	2-1/2	985315-C6	61.00
.015 (1/64)		.0150	.023	<b>.125</b> (8x)	3	1/8	2-1/2	978215-C6	62.10
.020		.0200	.030	<b>.060</b> (3x)	3	1/8	1-1/2	940520-C6	57.10
.020		.0200	.030	<b>.100</b> (5x)	3	1/8	2-1/2	985320-C6	58.30
.020		.0200	.030	<b>.100</b> (5x)	4	1/8	2-1/2	791320-C6	60.40
.020		.0200	.030	<b>.120</b> (6x)	3	1/8	2-1/2	895520-C6	58.30
.020		.0200	.030	<b>.140</b> (7x)	3	1/8	2-1/2	880720-C6	60.10
.020		.0200	.030	<b>.160</b> (8x)	3	1/8	2-1/2	978220-C6	59.50
.020		.0200	.030	<b>.200</b> (10x)	3	1/8	2-1/2	935720-C6	65.10
.025		.0250	.038	<b>.125</b> (5x)	3	1/8	2-1/2	985325-C6	58.30
.025		.0250	.038	<b>.203</b> (8x)	3	1/8	2-1/2	978225-C6	59.50
.030		.0300	.045	<b>.156</b> (5x)	3	1/8	2-1/2	985330-C6	58.30
.030		.0300	.045	<b>.250</b> (8x)	3	1/8	2-1/2	978230-C6	59.50
.031 (1/32)		.0310	.047	<b>.093</b> (3x)	3	1/8	1-1/2	940531-C6	52.90
.031 (1/32)		.0310	.047	<b>.156</b> (5x)	3	1/8	2-1/2	985331-C6	54.00
.031 (1/32)		.0310	.047	<b>.187</b> (6x)	3	1/8	2-1/2	895531-C6	54.00
.031 (1/32)		.0310	.047	<b>.218</b> (7x)	3	1/8	2-1/2	880731-C6	55.30
.031 (1/32)		.0310	.047	<b>.250</b> (8x)	3	1/8	2-1/2	978231-C6	55.30
.031 (1/32)		.0310	.047	<b>.250</b> (8x)	4	1/8	2-1/2	812331-C6	57.40
.031 (1/32)		.0310	.047	<b>.312</b> (10x)	3	1/8	2-1/2	935731-C6	60.60
.031 (1/32)		.0310	.047	<b>.375</b> (12x)	3	1/8	2-1/2	901331-C6	62.50
.031 (1/32)		.0310	.047	<b>.470</b> (15x)	3	1/8	2-1/2	851531-C6	63.80
.035		.0350	.053	<b>.187</b> (5x)	3	1/8	2-1/2	985335-C6	52.90
	1.0 mm	.0393	1.50 mm	<b>5.0 mm</b> (5x)	3	4 mm	50 mm	905022-C6	60.10
	1.0 mm	.0393	1.50 mm	<b>8.0 mm</b> (8x)	3	4 mm	50 mm	911422-C6	60.40
.040		.0400	.060	<b>.203</b> (5x)	3	1/8	2-1/2	985340-C6	52.90
.040		.0400	.060	<b>.203</b> (5x)	4	1/8	2-1/2	791340-C6	55.00
.040		.0400	.060	<b>.325</b> (8x)	3	1/8	2-1/2	978240-C6	54.00
.045		.0450	.068	<b>.225</b> (5x)	3	1/8	2-1/2	985345-C6	52.90

NEW

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Square – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000"	+ .010" - .000"					
			+ .25mm - .00mm	+ .25mm - .00mm					
.047 (3/64)		.0470	.071	<b>.250</b> (5x)	3	1/8	2-1/2	985347-C6	52.90
.047 (3/64)		.0470	.071	<b>.250</b> (5x)	4	1/8	2-1/2	791347-C6	55.50
.047 (3/64)		.0470	.071	<b>.281</b> (6x)	3	1/8	2-1/2	895547-C6	53.40
.047 (3/64)		.0470	.071	<b>.328</b> (7x)	3	1/8	2-1/2	880747-C6	54.50
.047 (3/64)		.0470	.071	<b>.375</b> (8x)	3	1/8	2-1/2	978247-C6	54.00
.047 (3/64)		.0470	.071	<b>.375</b> (8x)	4	1/8	2-1/2	812347-C6	56.10
.047 (3/64)		.0470	.071	<b>.480</b> (10x)	3	1/8	2-1/2	935747-C6	59.00
.050		.0500	.075	<b>.250</b> (5x)	3	1/8	2-1/2	985350-C6	52.90
.055		.0550	.083	<b>.275</b> (5x)	3	1/8	2-1/2	985355-C6	52.90
.060		.0600	.090	<b>.312</b> (5x)	3	1/8	2-1/2	985360-C6	52.90
.060		.0600	.090	<b>.500</b> (8x)	3	1/8	2-1/2	978260-C6	54.00
.062 (1/16)		.0620	.093	<b>.186</b> (3x)	3	1/8	1-1/2	940562-C6	52.90
.062 (1/16)		.0620	.093	<b>.312</b> (5x)	3	1/8	2-1/2	985362-C6	54.00
.062 (1/16)		.0620	.093	<b>.312</b> (5x)	4	1/8	2-1/2	791362-C6	56.10
.062 (1/16)		.0620	.093	<b>.375</b> (6x)	3	1/8	2-1/2	895562-C6	54.00
.062 (1/16)		.0620	.093	<b>.437</b> (7x)	3	1/8	2-1/2	880762-C6	55.30
.062 (1/16)		.0620	.093	<b>.500</b> (8x)	3	1/8	2-1/2	978262-C6	55.30
.062 (1/16)		.0620	.093	<b>.500</b> (8x)	4	1/8	2-1/2	812362-C6	57.40
.062 (1/16)		.0620	.093	<b>.625</b> (10x)	3	1/8	2-1/2	935762-C6	60.60
.062 (1/16)		.0620	.093	<b>.750</b> (12x)	3	1/8	2-1/2	901362-C6	62.50
.062 (1/16)		.0620	.093	<b>.950</b> (15x)	3	1/8	2-1/2	851562-C6	63.80
.070		.0700	.105	<b>.375</b> (5x)	3	1/8	2-1/2	985370-C6	57.30
.078 (5/64)		.0780	.118	<b>.406</b> (5x)	3	1/8	2-1/2	985378-C6	52.90
.078 (5/64)		.0780	.118	<b>.625</b> (8x)	3	1/8	2-1/2	978278-C6	54.00
.078 (5/64)		.0780	.118	<b>.625</b> (8x)	4	1/8	2-1/2	812378-C6	56.10
.078 (5/64)		.0780	.118	<b>.800</b> (10x)	3	1/8	2-1/2	935778-C6	59.00
	2.0 mm	.0787	3.00 mm	<b>10.0 mm</b> (5x)	3	4 mm	50 mm	905045-C6	60.90
	2.0 mm	.0787	3.00 mm	<b>16.0 mm</b> (8x)	3	4 mm	50 mm	911445-C6	61.50
.080		.0800	.120	<b>.406</b> (5x)	3	1/8	2-1/2	985380-C6	57.80
.090		.0900	.135	<b>.450</b> (5x)	3	1/8	2-1/2	985390-C6	57.30
.093 (3/32)		.0930	.140	<b>.279</b> (3x)	3	1/8	1-1/2	940593-C6	52.90
.093 (3/32)		.0930	.140	<b>.500</b> (5x)	3	1/8	2-1/2	985393-C6	54.00
.093 (3/32)		.0930	.140	<b>.500</b> (5x)	4	1/8	2-1/2	791393-C6	56.70
.093 (3/32)		.0930	.140	<b>.585</b> (6x)	3	1/8	2-1/2	895593-C6	54.00
.093 (3/32)		.0930	.140	<b>.670</b> (7x)	3	1/8	2-1/2	880793-C6	55.30
.093 (3/32)		.0930	.140	<b>.750</b> (8x)	3	1/8	2-1/2	978293-C6	55.30
.093 (3/32)		.0930	.140	<b>.750</b> (8x)	4	1/8	2-1/2	812393-C6	57.40
.093 (3/32)		.0930	.140	<b>.950</b> (10x)	3	1/8	2-1/2	935793-C6	60.60
.093 (3/32)		.0930	.140	<b>1.125</b> (12x)	3	1/8	2-1/2	901393-C6	62.50
.093 (3/32)		.0930	.140	<b>1.400</b> (15x)	3	1/8	3	851593-C6	63.80
.100		.1000	.150	<b>.500</b> (5x)	3	1/8	2-1/2	985400-C6	52.90
.100		.1000	.150	<b>.800</b> (8x)	3	1/8	2-1/2	978300-C6	54.50
.109 (7/64)		.1090	.164	<b>.570</b> (5x)	3	1/8	2-1/2	985402-C6	52.90
.109 (7/64)		.1090	.164	<b>.900</b> (8x)	3	1/8	2-1/2	978302-C6	54.00
	3.0 mm	.1181	4.50 mm	<b>15.0 mm</b> (5x)	3	4 mm	50 mm	905057-C6	54.90
	3.0 mm	.1181	4.50 mm	<b>24.0 mm</b> (8x)	3	4 mm	50 mm	911457-C6	55.10

HIGH TEMP ALLOYS

continued on next page

## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

### Square – Long Reach, Stub Flute (cont.)

continued from previous page

HIGH TEMP ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED		
D <sub>1</sub>	+ .000" / - .002"	+ .00mm / - .04mm	decimal equivalent	L <sub>2</sub>	+ .030" / - .000"	L <sub>3</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)			.1250	.187	<b>.375</b> (3x)	4	1/8	1-1/2	940608-C6	52.90
.125 (1/8)			.1250	.187	<b>.625</b> (5x)	4	1/8	2-1/2	985408-C6	54.00
.125 (1/8)			.1250	.187	<b>.750</b> (6x)	4	1/8	2-1/2	895608-C6	54.00
.125 (1/8)			.1250	.187	<b>.875</b> (7x)	4	1/8	2-1/2	880808-C6	55.30
.125 (1/8)			.1250	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	978308-C6	55.30
.125 (1/8)			.1250	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	935808-C6	60.60
.125 (1/8)			.1250	.187	<b>1.500</b> (12x)	4	1/8	3	901408-C6	64.60
.140 (9/64)			.1406	.220	<b>.750</b> (5x)	4	3/16	3	985409-C6	61.80
.140 (9/64)			.1406	.220	<b>1.125</b> (8x)	4	3/16	3	978309-C6	63.90
.156 (5/32)			.1562	.235	<b>.750</b> (5x)	4	3/16	3	985410-C6	58.30
.156 (5/32)			.1562	.235	<b>1.250</b> (8x)	4	3/16	3	978310-C6	59.50
.156 (5/32)			.1562	.235	<b>1.570</b> (10x)	4	3/16	3	935810-C6	64.60
.187 (3/16)			.1875	.285	<b>1.000</b> (5x)	4	3/16	3	985412-C6	58.30
.187 (3/16)			.1875	.285	<b>1.500</b> (8x)	4	3/16	3	978312-C6	59.50
.187 (3/16)			.1875	.285	<b>1.875</b> (10x)	4	3/16	4	935812-C6	64.60
6.0 mm	.2362		9.00mm		<b>30.0mm</b> (5x)	4	6 mm	63 mm	905066-C6	69.70
.250 (1/4)			.2500	.375	<b>1.250</b> (5x)	4	1/4	4	985416-C6	65.10
.250 (1/4)			.2500	.375	<b>2.000</b> (8x)	4	1/4	4	978316-C6	66.50
.375 (3/8)			.3750	.570	<b>2.000</b> (5x)	4	3/8	4	985424-C6	74.10

NEW

PLEASE SEE SPEEDS & FEEDS ON PAGE 136



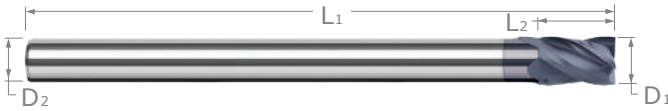
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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Square – Reduced Shank

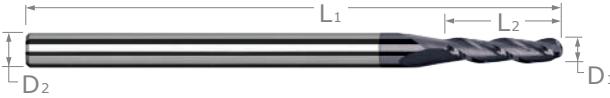


- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Reduced straight shank allows any chucking depth
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- Suitable for steels up to 45Rc
- Center cutting
- Solid carbide
- CNC ground in the USA

	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$	TOOL #	PRICE
NEW	.125 (1/8)	<b>.187</b> (1.5x)	4	3 mm	2-1/2	740108-C6	109.30
NEW	.156 (5/32)	<b>.235</b> (1.5x)	4	1/8	2-1/2	740110-C6	109.30
NEW	.187 (3/16)	<b>.285</b> (1.5x)	4	5/32	2-1/2	740112-C6	111.70
NEW	.250 (1/4)	<b>.375</b> (1.5x)	4	3/16	3	740116-C6	121.40
NEW	.312 (5/16)	<b>.470</b> (1.5x)	4	1/4	4	740120-C6	146.10
NEW	.375 (3/8)	<b>.570</b> (1.5x)	4	5/16	4	740124-C6	163.90
NEW	.500 (1/2)	<b>.750</b> (1.5x)	4	7/16	6	740132-C6	177.30

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Ball



HIGH TEMP ALLOYS

- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders • Suitable for steels up to 45Rc
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .010"					
- .0005"	- .02mm	equivalent	- .000"					
			+ .25mm					
			- .00mm					
.2 mm	.0078		<b>.60 mm</b> (3x)	3	4 mm	50 mm	975304-C6	70.00
.010	.0100		<b>.015</b> (1.5x)	3	1/8	1-1/2	944210-C6	65.10
.010	.0100		<b>.030</b> (3x)	3	1/8	1-1/2	970510-C6	65.10
.010	.0100		<b>.050</b> (5x)	3	1/8	2-1/2	930610-C6	75.30
.015 (1/64)	.0150		<b>.023</b> (1.5x)	3	1/8	1-1/2	944215-C6	55.30
.015 (1/64)	.0150		<b>.045</b> (3x)	3	1/8	1-1/2	970515-C6	55.30
.015 (1/64)	.0150		<b>.078</b> (5x)	3	1/8	2-1/2	930615-C6	65.90
.4 mm	.0157		<b>1.20 mm</b> (3x)	3	4 mm	50 mm	975309-C6	57.80
.5 mm	.0196		<b>1.50 mm</b> (3x)	3	4 mm	50 mm	975311-C6	52.00
.020	.0200		<b>.016</b> (0.8x)	3	1/8	1-1/2	848120-C6	50.70
.020	.0200		<b>.030</b> (1.5x)	3	1/8	1-1/2	944220-C6	49.40
.020	.0200		<b>.060</b> (3x)	3	1/8	1-1/2	970520-C6	49.40
.020	.0200		<b>.060</b> (3x)	4	1/8	1-1/2	893020-C6	51.80
.020	.0200		<b>.080</b> (4x)	3	1/8	2-1/2	811220-C6	54.30
.020	.0200		<b>.100</b> (5x)	3	1/8	2-1/2	930620-C6	54.30
.6 mm	.0236		<b>1.80 mm</b> (3x)	3	4 mm	50 mm	975313-C6	50.50
.025	.0250		<b>.038</b> (1.5x)	3	1/8	1-1/2	944225-C6	47.80
.025	.0250		<b>.075</b> (3x)	3	1/8	1-1/2	970525-C6	47.80
.025	.0250		<b>.125</b> (5x)	3	1/8	2-1/2	930625-C6	52.90
.030	.0300		<b>.045</b> (1.5x)	3	1/8	1-1/2	944230-C6	42.30
.030	.0300		<b>.090</b> (3x)	3	1/8	1-1/2	970530-C6	42.30
.030	.0300		<b>.156</b> (5x)	3	1/8	2-1/2	930630-C6	47.70
.031 (1/32)	.0310		<b>.025</b> (0.8x)	3	1/8	1-1/2	848131-C6	43.20
.031 (1/32)	.0310		<b>.047</b> (1.5x)	3	1/8	1-1/2	944231-C6	42.10
.031 (1/32)	.0310		<b>.047</b> (1.5x)	4	1/8	1-1/2	814531-C6	44.50
.031 (1/32)	.0310		<b>.093</b> (3x)	3	1/8	1-1/2	970531-C6	42.10
.031 (1/32)	.0310		<b>.093</b> (3x)	4	1/8	1-1/2	893031-C6	44.50
.031 (1/32)	.0310		<b>.125</b> (4x)	3	1/8	2-1/2	811231-C6	50.90
.031 (1/32)	.0310		<b>.156</b> (5x)	3	1/8	2-1/2	930631-C6	50.90
.8 mm	.0314		<b>1.20 mm</b> (1.5x)	3	4 mm	50 mm	968018-C6	44.70
.8 mm	.0314		<b>2.40 mm</b> (3x)	3	4 mm	50 mm	975318-C6	44.30
.035	.0350		<b>.105</b> (3x)	3	1/8	1-1/2	970535-C6	42.30
1.0 mm	.0393		<b>.80 mm</b> (0.8x)	3	4 mm	50 mm	872422-C6	44.90
1.0 mm	.0393		<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	968022-C6	44.30
1.0 mm	.0393		<b>3.00 mm</b> (3x)	3	4 mm	50 mm	975322-C6	44.30
1.0 mm	.0393		<b>3.00 mm</b> (3x)	4	4 mm	50 mm	793822-C6	47.20
1.0 mm	.0393		<b>4.00 mm</b> (4x)	3	4 mm	50 mm	790122-C6	53.60
1.0 mm	.0393		<b>5.00 mm</b> (5x)	3	4 mm	50 mm	911322-C6	53.10

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Ball (cont.)

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CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>	decimal equivalent	L <sub>2</sub>					D <sub>2</sub> (h6)	L <sub>1</sub>
+0.0005" -0.0005"	+0.02mm -0.02mm		+0.10" -0.000" +0.25mm -0.00mm					
.040	.0400	<b>.060</b>	(1.5x)	3	1/8	1-1/2	944240-C6	42.10
.040	.0400	<b>.060</b>	(1.5x)	4	1/8	1-1/2	814540-C6	44.90
.040	.0400	<b>.120</b>	(3x)	3	1/8	1-1/2	970540-C6	42.10
.040	.0400	<b>.120</b>	(3x)	4	1/8	1-1/2	893040-C6	44.50
.040	.0400	<b>.160</b>	(4x)	3	1/8	2-1/2	811240-C6	51.60
.040	.0400	<b>.203</b>	(5x)	3	1/8	2-1/2	930640-C6	51.10
.045	.0450	<b>.135</b>	(3x)	3	1/8	1-1/2	970545-C6	42.70
.047 (3/64)	.0470	<b>.038</b>	(0.8x)	3	1/8	1-1/2	848147-C6	42.40
.047 (3/64)	.0470	<b>.071</b>	(1.5x)	3	1/8	1-1/2	944247-C6	42.10
.047 (3/64)	.0470	<b>.141</b>	(3x)	3	1/8	1-1/2	970547-C6	42.10
.047 (3/64)	.0470	<b>.141</b>	(3x)	4	1/8	1-1/2	893047-C6	44.50
.047 (3/64)	.0470	<b>.250</b>	(5x)	3	1/8	2-1/2	930647-C6	51.10
1.2 mm	.0472	<b>1.80 mm</b>	(1.5x)	3	4 mm	50 mm	968027-C6	44.70
1.2 mm	.0472	<b>3.50 mm</b>	(3x)	3	4 mm	50 mm	975327-C6	44.70
.050	.0500	<b>.075</b>	(1.5x)	3	1/8	1-1/2	944250-C6	42.10
.050	.0500	<b>.150</b>	(3x)	3	1/8	1-1/2	970550-C6	42.10
.050	.0500	<b>.250</b>	(5x)	3	1/8	2-1/2	930650-C6	51.10
.055	.0550	<b>.165</b>	(3x)	3	1/8	1-1/2	970555-C6	42.30
1.4 mm	.0551	<b>2.10 mm</b>	(1.5x)	3	4 mm	50 mm	968031-C6	44.70
1.4 mm	.0551	<b>4.00 mm</b>	(3x)	3	4 mm	50 mm	975331-C6	44.30
1.5 mm	.0590	<b>2.20 mm</b>	(1.5x)	3	4 mm	50 mm	968033-C6	44.70
1.5 mm	.0590	<b>4.50 mm</b>	(3x)	3	4 mm	50 mm	975333-C6	44.30
1.5 mm	.0590	<b>7.50 mm</b>	(5x)	3	4 mm	50 mm	911333-C6	53.10
.060	.0600	<b>.090</b>	(1.5x)	3	1/8	1-1/2	944260-C6	42.10
.060	.0600	<b>.180</b>	(3x)	3	1/8	1-1/2	970560-C6	42.10
.060	.0600	<b>.312</b>	(5x)	3	1/8	2-1/2	930660-C6	51.10
.062 (1/16)	.0620	<b>.050</b>	(0.8x)	3	1/8	1-1/2	848162-C6	40.80
.062 (1/16)	.0620	<b>.050</b>	(0.8x)	4	1/8	1-1/2	787162-C6	43.20
.062 (1/16)	.0620	<b>.093</b>	(1.5x)	3	1/8	1-1/2	944262-C6	39.60
.062 (1/16)	.0620	<b>.093</b>	(1.5x)	4	1/8	1-1/2	814562-C6	42.10
.062 (1/16)	.0620	<b>.186</b>	(3x)	3	1/8	1-1/2	970562-C6	39.60
.062 (1/16)	.0620	<b>.186</b>	(3x)	4	1/8	1-1/2	893062-C6	42.10
.062 (1/16)	.0620	<b>.250</b>	(4x)	3	1/8	2-1/2	811262-C6	48.80
.062 (1/16)	.0620	<b>.312</b>	(5x)	3	1/8	2-1/2	930662-C6	48.80
.062 (1/16)	.0620	<b>.312</b>	(5x)	4	1/8	2-1/2	778862-C6	51.20
1.6 mm	.0629	<b>2.40 mm</b>	(1.5x)	3	4 mm	50 mm	968036-C6	41.60
1.6 mm	.0629	<b>5.00 mm</b>	(3x)	3	4 mm	50 mm	975336-C6	42.00
.070	.0700	<b>.105</b>	(1.5x)	3	1/8	1-1/2	944270-C6	40.20
.070	.0700	<b>.210</b>	(3x)	3	1/8	1-1/2	970570-C6	40.20
.070	.0700	<b>.210</b>	(3x)	4	1/8	1-1/2	893070-C6	43.00
.070	.0700	<b>.375</b>	(5x)	3	1/8	2-1/2	930670-C6	48.20
1.8 mm	.0708	<b>2.70 mm</b>	(1.5x)	3	4 mm	50 mm	968040-C6	42.00
1.8 mm	.0708	<b>5.50 mm</b>	(3x)	3	4 mm	50 mm	975340-C6	41.60
.078 (5/64)	.0780	<b>.062</b>	(0.8x)	3	1/8	1-1/2	848178-C6	40.80
.078 (5/64)	.0780	<b>.118</b>	(1.5x)	3	1/8	1-1/2	944278-C6	39.60
.078 (5/64)	.0780	<b>.234</b>	(3x)	3	1/8	1-1/2	970578-C6	39.60
.078 (5/64)	.0780	<b>.234</b>	(3x)	4	1/8	1-1/2	893078-C6	42.10
.078 (5/64)	.0780	<b>.406</b>	(5x)	3	1/8	2-1/2	930678-C6	48.30

HIGH TEMP ALLOYS

continued on next page

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Ball (cont.)

continued from previous page

HIGH TEMP ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm					
2.0 mm	.0787		<b>3.00 mm</b> (1.5x)	3	4 mm	50 mm	968045-C6	42.00
2.0 mm	.0787		<b>6.00 mm</b> (3x)	3	4 mm	50 mm	975345-C6	41.60
2.0 mm	.0787		<b>10.00 mm</b> (5x)	3	4 mm	50 mm	911345-C6	50.50
.080	.0800		<b>.120</b> (1.5x)	3	1/8	1-1/2	944280-C6	40.50
.080	.0800		<b>.240</b> (3x)	3	1/8	1-1/2	970580-C6	40.20
.090	.0900		<b>.135</b> (1.5x)	3	1/8	1-1/2	944290-C6	40.50
.090	.0900		<b>.270</b> (3x)	3	1/8	1-1/2	970590-C6	40.50
.093 (3/32)	.0930		<b>.074</b> (0.8x)	3	1/8	1-1/2	848193-C6	40.80
.093 (3/32)	.0930		<b>.140</b> (1.5x)	3	1/8	1-1/2	944293-C6	39.60
.093 (3/32)	.0930		<b>.140</b> (1.5x)	4	1/8	1-1/2	814593-C6	42.10
.093 (3/32)	.0930		<b>.279</b> (3x)	3	1/8	1-1/2	970593-C6	39.60
.093 (3/32)	.0930		<b>.279</b> (3x)	4	1/8	1-1/2	893093-C6	42.10
.093 (3/32)	.0930		<b>.375</b> (4x)	3	1/8	2-1/2	811293-C6	48.80
.093 (3/32)	.0930		<b>.500</b> (5x)	3	1/8	2-1/2	930693-C6	48.80
2.5 mm	.0984		<b>3.70 mm</b> (1.5x)	3	4 mm	50 mm	968051-C6	44.30
2.5 mm	.0984		<b>7.50 mm</b> (3x)	3	4 mm	50 mm	975351-C6	43.80
.100	.1000		<b>.150</b> (1.5x)	3	1/8	1-1/2	944300-C6	39.90
.100	.1000		<b>.300</b> (3x)	3	1/8	1-1/2	970600-C6	39.90
.100	.1000		<b>.500</b> (5x)	3	1/8	2-1/2	930700-C6	49.30
.109 (7/64)	.1090		<b>.327</b> (3x)	3	1/8	1-1/2	970602-C6	42.30
3.0 mm	.1181		<b>4.50 mm</b> (1.5x)	3	4 mm	50 mm	968057-C6	42.00
3.0 mm	.1181		<b>9.00 mm</b> (3x)	3	4 mm	50 mm	975357-C6	41.60
3.0 mm	.1181		<b>9.00 mm</b> (3x)	4	4 mm	50 mm	793857-C6	44.50
3.0 mm	.1181		<b>15.00 mm</b> (5x)	3	4 mm	50 mm	911357-C6	50.50

D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" - .002"	+ .00mm - .04mm	decimal equivalent	+ .030" - .000" + .75mm - .00mm					
.125 (1/8)	.1250		<b>.100</b> (0.8x)	4	1/8	1-1/2	848208-C6	40.80
.125 (1/8)	.1250		<b>.187</b> (1.5x)	4	1/8	1-1/2	944308-C6	36.70
.125 (1/8)	.1250		<b>.375</b> (3x)	4	1/8	1-1/2	970608-C6	36.70
.125 (1/8)	.1250		<b>.500</b> (4x)	4	1/8	2-1/2	811308-C6	48.80
.125 (1/8)	.1250		<b>.625</b> (5x)	4	1/8	2-1/2	930708-C6	48.80
.140 (9/64)	.1406		<b>.220</b> (1.5x)	4	3/16	2	944309-C6	51.10
.140 (9/64)	.1406		<b>.425</b> (3x)	4	3/16	2	970609-C6	51.10
.140 (9/64)	.1406		<b>.750</b> (5x)	4	3/16	3	930709-C6	57.70
.156 (5/32)	.1562		<b>.235</b> (1.5x)	4	3/16	2	944310-C6	42.30
.156 (5/32)	.1562		<b>.470</b> (3x)	4	3/16	2	970610-C6	42.70
.156 (5/32)	.1562		<b>.750</b> (5x)	4	3/16	3	930710-C6	51.50
.187 (3/16)	.1875		<b>.150</b> (0.8x)	4	3/16	2	848212-C6	43.40
.187 (3/16)	.1875		<b>.285</b> (1.5x)	4	3/16	2	944312-C6	39.00
.187 (3/16)	.1875		<b>.562</b> (3x)	4	3/16	2	970612-C6	39.40
.187 (3/16)	.1875		<b>.750</b> (4x)	4	3/16	3	811312-C6	43.40
.187 (3/16)	.1875		<b>1.000</b> (5x)	4	3/16	3	930712-C6	51.50
6.0 mm	.2362		<b>18.00 mm</b> (3x)	4	6 mm	63 mm	975372-C6	55.70

continued on next page

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Ball (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>		decimal equivalent					L <sub>2</sub>	D <sub>2</sub> (h6)
+ .000" - .002"	+ .00mm - .04mm		+ .030" - .000" + .75mm - .00mm					
.250 (1/4)		.2500	<b>.200</b> (0.8x)	4	1/4	2-1/2	848216-C6	52.50
.250 (1/4)		.2500	<b>.375</b> (1.5x)	4	1/4	2-1/2	944316-C6	47.20
.250 (1/4)		.2500	<b>.750</b> (3x)	4	1/4	2-1/2	970616-C6	47.70
.250 (1/4)		.2500	<b>1.000</b> (4x)	4	1/4	4	811316-C6	57.90
.250 (1/4)		.2500	<b>1.250</b> (5x)	4	1/4	4	930716-C6	60.90
.375 (3/8)		.3750	<b>.570</b> (1.5x)	4	3/8	2-1/2	944324-C6	75.80
.375 (3/8)		.3750	<b>1.125</b> (3x)	4	3/8	2-1/2	970624-C6	75.10
.500 (1/2)		.5000	<b>.750</b> (1.5x)	4	1/2	3	944332-C6	91.40
.500 (1/2)		.5000	<b>1.500</b> (3x)	4	1/2	3	970632-C6	91.40

HIGH TEMP ALLOYS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 144**

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Customizable Running Parameters  
For Optimized Machining

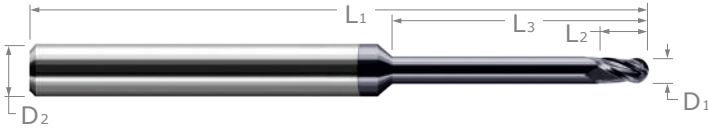


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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Ball – Long Reach, Stub Flute



HIGH TEMP ALLOYS

- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Suitable for steels up to 45Rc
- h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

**Improves Performance**

Contour Profiling      Tipped Multi-Axis Machining

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITiN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
+ .0005"	+ .00mm	decimal	+ .010"	+ .010"					
- .0005"	- .02mm	equivalent	- .000"	- .000"					
			+ .25mm	+ .25mm					
			- .00mm	- .00mm					
.015 (1/64)		.0150	.022	<b>.078</b> (5x)	4	1/8	2-1/2	63615-C6	69.70
.015 (1/64)		.0150	.022	<b>.125</b> (8x)	4	1/8	2-1/2	56115-C6	71.00
.015 (1/64)		.0150	.022	<b>.187</b> (12x)	4	1/8	2-1/2	64815-C6	75.60
.4 mm		.0157	.60 mm	<b>2.0 mm</b> (5x)	4	4 mm	50 mm	988709-C6	75.20
.4 mm		.0157	.60 mm	<b>3.2 mm</b> (8x)	4	4 mm	50 mm	974009-C6	77.10
.4 mm		.0157	.60 mm	<b>4.8 mm</b> (12x)	4	4 mm	50 mm	981309-C6	82.70
.5 mm		.0196	.75 mm	<b>2.5 mm</b> (5x)	4	4 mm	50 mm	988711-C6	73.50
.5 mm		.0196	.75 mm	<b>4.0 mm</b> (8x)	4	4 mm	50 mm	974011-C6	73.90
.5 mm		.0196	.75 mm	<b>6.0 mm</b> (12x)	4	4 mm	50 mm	981311-C6	79.90
.5 mm		.0196	.75 mm	<b>8.0 mm</b> (16x)	4	4 mm	50 mm	976511-C6	83.50
.020		.0200	.030	<b>.100</b> (5x)	4	1/8	2-1/2	63620-C6	65.90
.020		.0200	.030	<b>.160</b> (8x)	4	1/8	2-1/2	56120-C6	67.30
.020		.0200	.030	<b>.250</b> (12x)	4	1/8	2-1/2	64820-C6	72.80
.6 mm		.0236	.90 mm	<b>3.0 mm</b> (5x)	4	4 mm	50 mm	988713-C6	70.90
.6 mm		.0236	.90 mm	<b>4.8 mm</b> (8x)	4	4 mm	50 mm	974013-C6	72.50
.6 mm		.0236	.90 mm	<b>7.2 mm</b> (12x)	4	4 mm	50 mm	981313-C6	78.10
.025		.0250	.037	<b>.125</b> (5x)	4	1/8	2-1/2	63625-C6	64.20
.025		.0250	.037	<b>.203</b> (8x)	4	1/8	2-1/2	56125-C6	65.60
.025		.0250	.037	<b>.312</b> (12x)	4	1/8	2-1/2	64825-C6	71.30
.031 (1/32)		.0310	.047	<b>.093</b> (3x)	4	1/8	1-1/2	929031-C6	58.80
.031 (1/32)		.0310	.047	<b>.156</b> (5x)	4	1/8	2-1/2	63631-C6	60.30
.031 (1/32)		.0310	.047	<b>.187</b> (6x)	4	1/8	2-1/2	797531-C6	60.90
.031 (1/32)		.0310	.047	<b>.250</b> (8x)	4	1/8	2-1/2	56131-C6	61.80
.031 (1/32)		.0310	.047	<b>.312</b> (10x)	4	1/8	2-1/2	887231-C6	63.60
.031 (1/32)		.0310	.047	<b>.375</b> (12x)	4	1/8	2-1/2	64831-C6	64.30
.031 (1/32)		.0310	.047	<b>.470</b> (15x)	4	1/8	2-1/2	953331-C6	66.80
.8 mm		.0314	1.20 mm	<b>4.0 mm</b> (5x)	4	4 mm	50 mm	988718-C6	66.80
.8 mm		.0314	1.20 mm	<b>6.5 mm</b> (8x)	4	4 mm	50 mm	974018-C6	67.70
.8 mm		.0314	1.20 mm	<b>9.5 mm</b> (12x)	4	4 mm	50 mm	981318-C6	70.00
.035		.0350	.052	<b>.187</b> (5x)	4	1/8	2-1/2	63635-C6	60.30

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Ball – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
+ .0005"	+ .00mm	decimal equivalent	+ .010" - .000"	+ .010" - .000"					
- .0005"	- .02mm		+ .25mm - .00mm	+ .25mm - .00mm					
1.0 mm	.0393		1.50 mm	<b>5.0 mm</b> (5x)	4	4 mm	50 mm	988722-C6	66.20
1.0 mm	.0393		1.50 mm	<b>8.0 mm</b> (8x)	4	4 mm	50 mm	974022-C6	67.70
1.0 mm	.0393		1.50 mm	<b>12.0 mm</b> (12x)	4	4 mm	50 mm	981322-C6	69.40
1.0 mm	.0393		1.50 mm	<b>16.0 mm</b> (16x)	4	4 mm	50 mm	976522-C6	72.80
.040	.0400		.060	<b>.203</b> (5x)	4	1/8	2-1/2	63640-C6	60.30
.040	.0400		.060	<b>.325</b> (8x)	4	1/8	2-1/2	56140-C6	61.80
.045	.0450		.067	<b>.225</b> (5x)	4	1/8	2-1/2	63645-C6	60.30
.047 (3/64)	.0470		.070	<b>.250</b> (5x)	4	1/8	2-1/2	63647-C6	60.30
.047 (3/64)	.0470		.070	<b>.375</b> (8x)	4	1/8	2-1/2	56147-C6	61.80
.047 (3/64)	.0470		.070	<b>.480</b> (10x)	4	1/8	2-1/2	887247-C6	63.00
.047 (3/64)	.0470		.070	<b>.570</b> (12x)	4	1/8	2-1/2	64847-C6	63.70
.050	.0500		.075	<b>.250</b> (5x)	4	1/8	2-1/2	63650-C6	60.30
.050	.0500		.075	<b>.400</b> (8x)	4	1/8	2-1/2	56150-C6	61.80
.055	.0550		.082	<b>.275</b> (5x)	4	1/8	2-1/2	63655-C6	60.90
1.5 mm	.0590		2.20 mm	<b>7.5 mm</b> (5x)	4	4 mm	50 mm	988733-C6	66.20
1.5 mm	.0590		2.20 mm	<b>12.0 mm</b> (8x)	4	4 mm	50 mm	974033-C6	67.70
1.5 mm	.0590		2.20 mm	<b>18.0 mm</b> (12x)	4	4 mm	50 mm	981333-C6	69.40
1.5 mm	.0590		2.20 mm	<b>24.0 mm</b> (16x)	4	4 mm	63 mm	976533-C6	73.50
.060	.0600		.090	<b>.312</b> (5x)	4	1/8	2-1/2	63660-C6	60.30
.060	.0600		.090	<b>.500</b> (8x)	4	1/8	2-1/2	56160-C6	61.80
.062 (1/16)	.0620		.093	<b>.186</b> (3x)	4	1/8	1-1/2	929062-C6	58.80
.062 (1/16)	.0620		.093	<b>.312</b> (5x)	4	1/8	2-1/2	63662-C6	60.30
.062 (1/16)	.0620		.093	<b>.375</b> (6x)	4	1/8	2-1/2	797562-C6	60.30
.062 (1/16)	.0620		.093	<b>.500</b> (8x)	4	1/8	2-1/2	56162-C6	61.80
.062 (1/16)	.0620		.093	<b>.625</b> (10x)	4	1/8	2-1/2	887262-C6	63.00
.062 (1/16)	.0620		.093	<b>.750</b> (12x)	4	1/8	2-1/2	64862-C6	63.70
.062 (1/16)	.0620		.093	<b>.950</b> (15x)	4	1/8	2-1/2	953362-C6	66.80
.070	.0700		.105	<b>.375</b> (5x)	4	1/8	2-1/2	63670-C6	60.90
.070	.0700		.105	<b>.570</b> (8x)	4	1/8	2-1/2	56170-C6	62.40
.078 (5/64)	.0780		.117	<b>.406</b> (5x)	4	1/8	2-1/2	63678-C6	60.30
.078 (5/64)	.0780		.117	<b>.625</b> (8x)	4	1/8	2-1/2	56178-C6	61.80
.078 (5/64)	.0780		.117	<b>.940</b> (12x)	4	1/8	2-1/2	64878-C6	63.70
2.0 mm	.0787		3.00 mm	<b>10.0 mm</b> (5x)	4	4 mm	50 mm	988745-C6	66.00
2.0 mm	.0787		3.00 mm	<b>12.0 mm</b> (6x)	4	4 mm	50 mm	749245-C6	67.40
2.0 mm	.0787		3.00 mm	<b>16.0 mm</b> (8x)	4	4 mm	50 mm	974045-C6	67.50
2.0 mm	.0787		3.00 mm	<b>24.0 mm</b> (12x)	4	4 mm	63 mm	981345-C6	69.40
2.0 mm	.0787		3.00 mm	<b>32.0 mm</b> (16x)	4	4 mm	63 mm	976545-C6	73.50
.093 (3/32)	.0930		.139	<b>.279</b> (3x)	4	1/8	1-1/2	929093-C6	58.80
.093 (3/32)	.0930		.139	<b>.500</b> (5x)	4	1/8	2-1/2	63693-C6	60.30
.093 (3/32)	.0930		.139	<b>.585</b> (6x)	4	1/8	2-1/2	797593-C6	60.30
.093 (3/32)	.0930		.139	<b>.750</b> (8x)	4	1/8	2-1/2	56193-C6	61.80
.093 (3/32)	.0930		.139	<b>.950</b> (10x)	4	1/8	2-1/2	887293-C6	63.00
.093 (3/32)	.0930		.139	<b>1.125</b> (12x)	4	1/8	2-1/2	64893-C6	64.30
.093 (3/32)	.0930		.139	<b>1.400</b> (15x)	4	1/8	3	953393-C6	66.80

HIGH TEMP ALLOYS

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Ball – Long Reach, Stub Flute (cont.)

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HIGH TEMP ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITiN NANO COATED	
D <sub>1</sub> +.0005" -.0005"	+.00mm -.02mm	decimal equivalent	L <sub>2</sub> +.010" -.000" +.25mm -.00mm	L <sub>3</sub> +.010" -.000" +.25mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.100		.1000	.150	<b>.500</b> (5x)	4	1/8	2-1/2	63700-C6	59.70
.100		.1000	.150	<b>.800</b> (8x)	4	1/8	2-1/2	56200-C6	61.50
	3.0 mm	.1181	4.50 mm	<b>15.0 mm</b> (5x)	4	4 mm	50 mm	988757-C6	62.60
	3.0 mm	.1181	4.50 mm	<b>24.0 mm</b> (8x)	4	4 mm	50 mm	974057-C6	64.10

D <sub>1</sub> +.000" -.002"	decimal equivalent	L <sub>2</sub> +.030" -.000"	L <sub>3</sub> +.030" -.000"		D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.125 (1/8)	.1250	.187	<b>.375</b> (3x)	4	1/8	1-1/2	929108-C6	58.80
.125 (1/8)	.1250	.187	<b>.625</b> (5x)	4	1/8	2-1/2	63708-C6	59.90
.125 (1/8)	.1250	.187	<b>.750</b> (6x)	4	1/8	2-1/2	797608-C6	59.90
.125 (1/8)	.1250	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	56208-C6	61.20
.125 (1/8)	.1250	.187	<b>1.250</b> (10x)	4	1/8	3	887308-C6	63.00
.125 (1/8)	.1250	.187	<b>1.500</b> (12x)	4	1/8	3	64908-C6	63.70
.140 (9/64)	.1406	.220	<b>.750</b> (5x)	4	3/16	3	63709-C6	65.60
.156 (5/32)	.1562	.234	<b>.750</b> (5x)	4	3/16	3	63710-C6	64.90
.156 (5/32)	.1562	.234	<b>1.250</b> (8x)	4	3/16	3	56210-C6	66.20
.156 (5/32)	.1562	.234	<b>1.570</b> (10x)	4	3/16	4	887310-C6	69.30
.187 (3/16)	.1875	.281	<b>1.000</b> (5x)	4	3/16	3	63712-C6	65.90
.187 (3/16)	.1875	.281	<b>1.500</b> (8x)	4	3/16	3	56212-C6	67.40
.187 (3/16)	.1875	.281	<b>1.875</b> (10x)	4	3/16	4	887312-C6	70.50
.250 (1/4)	.2500	.375	<b>1.250</b> (5x)	4	1/4	4	63716-C6	73.00
.250 (1/4)	.2500	.375	<b>2.000</b> (8x)	4	1/4	4	56216-C6	74.40
.250 (1/4)	.2500	.375	<b>2.500</b> (10x)	4	1/4	6	887316-C6	87.40
.375 (3/8)	.3750	.570	<b>2.000</b> (5x)	4	3/8	4	63724-C6	91.00

### SPEEDS & FEEDS (Variable Helix – Long Reach, Stub Flute for High Temp Alloys)

**Important Note:** Values in table are in inches and are based on 4 flute, reached (8x Dia) end mills. For 3 flutes, table values of IPT must be increased to 105% before adjustments for different reaches. For shorter reaches, table values of IPT must be increased (for 3x, increase to 135%; for 5x, increase to 125%; for 6x, increase to 120%; for 7x, increase to 110%). For longer reaches, table values of IPT and DOC must be reduced (for 10x, reduce to 90%; for 12x, reduce to 80%; for 15x, reduce to 75%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter											
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500
<b>Stainless Steels:</b> 40x, 41x, 42x, 43x, 44x, 13-8, 15-5, 15-7, 17-4, 17-7	275 - 300	160												
	300 - 350	140												
	350 - 400	100												
<b>Tool Steels:</b> D, H, M, T, S series	400 - 425	80												
<b>Titanium:</b> All alloys	275 - 300	200												
	300 - 350	125												
	350 - 400	75												
	400 - 425	75												
<b>Nickel Alloys:</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy	275 - 300	80												
	300 - 350	60												
	350 - 400	50												
	400 - 425	40												
			<b>Radial Depth of Cut*:</b>						<b>Axial Depth of Cut*:</b>					
			Slotting: 1x Dia						Slotting: .28x Dia					
			Roughing: .28x Dia						Roughing: .5x - .7x Dia					
			Finishing: .1x Dia						Finishing: .5x - 1x Dia					

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.



# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius



- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- Suitable for steels up to 45Rc
- Center cutting • Solid carbide • CNC ground in the USA

HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal equivalent	+ .001"	+ .010"					
- .0005"	- .02mm		- .001"	- .000"					
			+ .025mm	+ .25mm					
			- .025mm	- .00mm					
	.2 mm	.0078	<b>.05 mm</b>	.30 mm (1.5x)	3	4 mm	50 mm	984104-C6	62.10
	.2 mm	.0078	<b>.05 mm</b>	.60 mm (3x)	3	4 mm	50 mm	979304-C6	62.10
.010		.0100	<b>.003</b>	.015 (1.5x)	3	1/8	1-1/2	52210-C6	58.50
.010		.0100	<b>.003</b>	.030 (3x)	3	1/8	1-1/2	46810-C6	58.90
	.3 mm	.0118	<b>.08 mm</b>	.45 mm (1.5x)	3	4 mm	50 mm	984106-C6	60.50
	.3 mm	.0118	<b>.08 mm</b>	.90 mm (3x)	3	4 mm	50 mm	979306-C6	60.50
.015 (1/64)		.0150	<b>.003</b>	.012 (0.8x)	3	1/8	1-1/2	954215-C6	51.40
.015 (1/64)		.0150	<b>.003</b>	.022 (1.5x)	3	1/8	1-1/2	52215-C6	47.60
.015 (1/64)		.0150	<b>.003</b>	.045 (3x)	3	1/8	1-1/2	46815-C6	47.60
.015 (1/64)		.0150	<b>.003</b>	.078 (5x)	3	1/8	2-1/2	53615-C6	58.20
.015 (1/64)		.0150	<b>.005</b>	.045 (3x)	3	1/8	1-1/2	936415-C6	55.20
	.4 mm	.0157	<b>.08 mm</b>	.60 mm (1.5x)	3	4 mm	50 mm	984109-C6	52.00
	.4 mm	.0157	<b>.08 mm</b>	1.20 mm (3x)	3	4 mm	50 mm	979309-C6	52.00
	.5 mm	.0196	<b>.10 mm</b>	.75 mm (1.5x)	3	4 mm	50 mm	984111-C6	46.50
	.5 mm	.0196	<b>.10 mm</b>	1.50 mm (3x)	3	4 mm	50 mm	979311-C6	46.00
	.5 mm	.0196	<b>.10 mm</b>	2.50 mm (5x)	3	4 mm	50 mm	965811-C6	58.40
.020		.0200	<b>.004</b>	.016 (0.8x)	3	1/8	1-1/2	954220-C6	44.90
.020		.0200	<b>.004</b>	.030 (1.5x)	3	1/8	1-1/2	52220-C6	41.90
.020		.0200	<b>.004</b>	.060 (3x)	3	1/8	1-1/2	46820-C6	41.90
.020		.0200	<b>.004</b>	.060 (3x)	4	1/8	1-1/2	786620-C6	45.10
.020		.0200	<b>.004</b>	.100 (5x)	3	1/8	2-1/2	53620-C6	51.70
	.6 mm	.0236	<b>.10 mm</b>	.90 mm (1.5x)	3	4 mm	50 mm	984113-C6	45.00
	.6 mm	.0236	<b>.10 mm</b>	1.80 mm (3x)	3	4 mm	50 mm	979313-C6	45.00
.025		.0250	<b>.004</b>	.020 (0.8x)	3	1/8	1-1/2	954225-C6	44.20
.025		.0250	<b>.004</b>	.038 (1.5x)	3	1/8	1-1/2	52225-C6	40.60
.025		.0250	<b>.004</b>	.075 (3x)	3	1/8	1-1/2	46825-C6	40.60
.025		.0250	<b>.004</b>	.075 (3x)	4	1/8	1-1/2	786625-C6	43.00
.025		.0250	<b>.004</b>	.125 (5x)	3	1/8	2-1/2	53625-C6	50.00
	.7 mm	.0275	<b>.10 mm</b>	2.10 mm (3x)	3	4 mm	50 mm	979315-C6	44.60
.030		.0300	<b>.004</b>	.045 (1.5x)	3	1/8	1-1/2	52230-C6	41.40
.030		.0300	<b>.004</b>	.090 (3x)	3	1/8	1-1/2	46830-C6	40.60
.030		.0300	<b>.004</b>	.156 (5x)	3	1/8	2-1/2	53630-C6	50.50

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius (cont.)

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HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .001"	+ .010"					
-.0005"	-.02mm	equivalent	-.001"	-.000"					
			+ .025mm	+ .25mm					
			-.025mm	-.00mm					
.031 (1/32)		.0310	.003	.047 (1.5x)	3	1/8	1-1/2	853631-C6	37.30
.031 (1/32)		.0310	.003	.093 (3x)	3	1/8	1-1/2	923631-C6	34.90
.031 (1/32)		.0310	.005	.025 (0.8x)	3	1/8	1-1/2	954231-C6	36.00
.031 (1/32)		.0310	.005	.047 (1.5x)	3	1/8	1-1/2	52231-C6	34.60
.031 (1/32)		.0310	.005	.047 (1.5x)	4	1/8	1-1/2	795531-C6	37.30
.031 (1/32)		.0310	.005	.093 (3x)	3	1/8	1-1/2	46831-C6	34.60
.031 (1/32)		.0310	.005	.093 (3x)	4	1/8	1-1/2	850731-C6	36.90
.031 (1/32)		.0310	.005	.125 (4x)	3	1/8	2-1/2	796731-C6	38.90
.031 (1/32)		.0310	.005	.156 (5x)	3	1/8	2-1/2	53631-C6	43.40
.031 (1/32)		.0310	.005	.156 (5x)	4	1/8	2-1/2	796931-C6	46.50
.031 (1/32)		.0310	.008	.047 (1.5x)	3	1/8	1-1/2	847831-C6	37.50
.031 (1/32)		.0310	.008	.093 (3x)	3	1/8	1-1/2	848431-C6	38.20
.031 (1/32)		.0310	.010	.047 (1.5x)	3	1/8	1-1/2	912931-C6	37.30
.031 (1/32)		.0310	.010	.093 (3x)	3	1/8	1-1/2	950731-C6	37.50
.031 (1/32)		.0310	.010	.093 (3x)	4	1/8	1-1/2	856431-C6	37.30
.031 (1/32)		.0310	.010	.156 (5x)	3	1/8	2-1/2	869831-C6	46.50
.8 mm		.0314	.10 mm	1.20 mm (1.5x)	3	4 mm	50 mm	984118-C6	39.10
.8 mm		.0314	.10 mm	2.40 mm (3x)	3	4 mm	50 mm	979318-C6	39.10
.035		.0350	.005	.053 (1.5x)	3	1/8	1-1/2	52235-C6	34.60
.035		.0350	.005	.105 (3x)	3	1/8	1-1/2	46835-C6	34.60
.035		.0350	.005	.187 (5x)	3	1/8	2-1/2	53635-C6	43.40
.035		.0350	.010	.105 (3x)	3	1/8	1-1/2	950735-C6	37.50
.9 mm		.0354	.10 mm	2.70 mm (3x)	3	4 mm	50 mm	979320-C6	39.10
1.0 mm		.0393	.10 mm	1.50 mm (1.5x)	3	4 mm	50 mm	984122-C6	38.70
1.0 mm		.0393	.10 mm	3.00 mm (3x)	3	4 mm	50 mm	979322-C6	38.70
1.0 mm		.0393	.10 mm	5.00 mm (5x)	3	4 mm	50 mm	965822-C6	47.80
1.0 mm		.0393	.30 mm	3.00 mm (3x)	3	4 mm	50 mm	843322-C6	39.10
.040		.0400	.003	.120 (3x)	3	1/8	1-1/2	923640-C6	34.60
.040		.0400	.005	.032 (0.8x)	3	1/8	1-1/2	954240-C6	38.00
.040		.0400	.005	.060 (1.5x)	3	1/8	1-1/2	52240-C6	34.60
.040		.0400	.005	.120 (3x)	3	1/8	1-1/2	46840-C6	34.60
.040		.0400	.005	.203 (5x)	3	1/8	2-1/2	53640-C6	43.40
.040		.0400	.010	.120 (3x)	3	1/8	1-1/2	950740-C6	37.50
1.1 mm		.0433	.10 mm	3.00 mm (3x)	3	4 mm	50 mm	979324-C6	39.10
.045		.0450	.005	.068 (1.5x)	3	1/8	1-1/2	52245-C6	34.60
.045		.0450	.005	.135 (3x)	3	1/8	1-1/2	46845-C6	34.60
.045		.0450	.005	.225 (5x)	3	1/8	2-1/2	53645-C6	43.40
.047 (3/64)		.0470	.003	.141 (3x)	3	1/8	1-1/2	923647-C6	34.30
.047 (3/64)		.0470	.005	.038 (0.8x)	3	1/8	1-1/2	954247-C6	36.00
.047 (3/64)		.0470	.005	.071 (1.5x)	3	1/8	1-1/2	52247-C6	34.60
.047 (3/64)		.0470	.005	.071 (1.5x)	4	1/8	1-1/2	795547-C6	36.90
.047 (3/64)		.0470	.005	.141 (3x)	3	1/8	1-1/2	46847-C6	34.60
.047 (3/64)		.0470	.005	.141 (3x)	4	1/8	1-1/2	850747-C6	36.90
.047 (3/64)		.0470	.005	.187 (4x)	3	1/8	2-1/2	796747-C6	39.30
.047 (3/64)		.0470	.005	.250 (5x)	3	1/8	2-1/2	53647-C6	43.40
.047 (3/64)		.0470	.005	.250 (5x)	4	1/8	2-1/2	796947-C6	46.50
.047 (3/64)		.0470	.010	.071 (1.5x)	3	1/8	1-1/2	912947-C6	37.30
.047 (3/64)		.0470	.010	.141 (3x)	3	1/8	1-1/2	950747-C6	37.50
.047 (3/64)		.0470	.015	.071 (1.5x)	3	1/8	1-1/2	975647-C6	35.20
.047 (3/64)		.0470	.015	.141 (3x)	3	1/8	1-1/2	964147-C6	37.50

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Corner Radius (cont.)

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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal equivalent	+ .001" - .001" + .025mm - .025mm	+ .010" - .000" + .25mm - .00mm					
	1.2 mm	.0472	<b>.10 mm</b>	1.80 mm (1.5x)	3	4 mm	50 mm	984127-C6	39.10
	1.2 mm	.0472	<b>.10 mm</b>	3.50 mm (3x)	3	4 mm	50 mm	979327-C6	39.10
.050		.0500	<b>.005</b>	.040 (0.8x)	3	1/8	1-1/2	954250-C6	37.60
.050		.0500	<b>.005</b>	.075 (1.5x)	3	1/8	1-1/2	52250-C6	34.30
.050		.0500	<b>.005</b>	.150 (3x)	3	1/8	1-1/2	46850-C6	34.30
.050		.0500	<b>.005</b>	.250 (5x)	3	1/8	2-1/2	53650-C6	43.40
.050		.0500	<b>.010</b>	.075 (1.5x)	3	1/8	1-1/2	912950-C6	37.30
.050		.0500	<b>.010</b>	.150 (3x)	3	1/8	1-1/2	950750-C6	38.20
.050		.0500	<b>.015</b>	.075 (1.5x)	3	1/8	1-1/2	975650-C6	37.50
.050		.0500	<b>.015</b>	.150 (3x)	3	1/8	1-1/2	964150-C6	36.30
	1.3 mm	.0511	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	979329-C6	39.10
.055		.0550	<b>.005</b>	.083 (1.5x)	3	1/8	1-1/2	52255-C6	34.30
.055		.0550	<b>.005</b>	.165 (3x)	3	1/8	1-1/2	46855-C6	34.30
.055		.0550	<b>.005</b>	.275 (5x)	3	1/8	2-1/2	53655-C6	43.40
.055		.0550	<b>.010</b>	.083 (1.5x)	3	1/8	1-1/2	912955-C6	38.00
.055		.0550	<b>.010</b>	.165 (3x)	3	1/8	1-1/2	950755-C6	38.20
.055		.0550	<b>.015</b>	.083 (1.5x)	3	1/8	1-1/2	975655-C6	38.20
.055		.0550	<b>.015</b>	.165 (3x)	3	1/8	1-1/2	964155-C6	38.20
	1.4 mm	.0551	<b>.10 mm</b>	2.10 mm (1.5x)	3	4 mm	50 mm	984131-C6	39.10
	1.4 mm	.0551	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	979331-C6	39.10
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm (1.5x)	3	4 mm	50 mm	984133-C6	36.30
	1.5 mm	.0590	<b>.20 mm</b>	4.50 mm (3x)	3	4 mm	50 mm	979333-C6	36.30
	1.5 mm	.0590	<b>.20 mm</b>	7.50 mm (5x)	3	4 mm	50 mm	965833-C6	44.80
.060		.0600	<b>.005</b>	.090 (1.5x)	3	1/8	1-1/2	908860-C6	34.30
.060		.0600	<b>.005</b>	.180 (3x)	3	1/8	1-1/2	936460-C6	34.30
.060		.0600	<b>.005</b>	.312 (5x)	3	1/8	2-1/2	869060-C6	43.40
.060		.0600	<b>.010</b>	.048 (0.8x)	3	1/8	1-1/2	954260-C6	38.00
.060		.0600	<b>.010</b>	.090 (1.5x)	3	1/8	1-1/2	52260-C6	34.30
.060		.0600	<b>.010</b>	.180 (3x)	3	1/8	1-1/2	46860-C6	34.30
.060		.0600	<b>.010</b>	.312 (5x)	3	1/8	2-1/2	53660-C6	43.40
.060		.0600	<b>.015</b>	.090 (1.5x)	3	1/8	1-1/2	975660-C6	34.60
.060		.0600	<b>.015</b>	.180 (3x)	3	1/8	1-1/2	964160-C6	35.20
.060		.0600	<b>.020</b>	.090 (1.5x)	3	1/8	1-1/2	931760-C6	35.70
.060		.0600	<b>.020</b>	.180 (3x)	3	1/8	1-1/2	959260-C6	36.00
.062 (1/16)		.0620	<b>.003</b>	.093 (1.5x)	3	1/8	1-1/2	853662-C6	32.80
.062 (1/16)		.0620	<b>.003</b>	.186 (3x)	3	1/8	1-1/2	923662-C6	32.20
.062 (1/16)		.0620	<b>.005</b>	.093 (1.5x)	3	1/8	1-1/2	908862-C6	32.20
.062 (1/16)		.0620	<b>.005</b>	.093 (1.5x)	4	1/8	1-1/2	795562-C6	35.20
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	3	1/8	1-1/2	936462-C6	32.20
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	4	1/8	1-1/2	850762-C6	34.60
.062 (1/16)		.0620	<b>.005</b>	.312 (5x)	3	1/8	2-1/2	869062-C6	41.40
.062 (1/16)		.0620	<b>.008</b>	.093 (1.5x)	3	1/8	1-1/2	847862-C6	32.20
.062 (1/16)		.0620	<b>.008</b>	.186 (3x)	3	1/8	1-1/2	848462-C6	32.80
.062 (1/16)		.0620	<b>.010</b>	.050 (0.8x)	3	1/8	1-1/2	954262-C6	32.50
.062 (1/16)		.0620	<b>.010</b>	.093 (1.5x)	3	1/8	1-1/2	52262-C6	32.20
.062 (1/16)		.0620	<b>.010</b>	.093 (1.5x)	4	1/8	1-1/2	797162-C6	36.90
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	3	1/8	1-1/2	46862-C6	32.20
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	4	1/8	1-1/2	856462-C6	36.90
.062 (1/16)		.0620	<b>.010</b>	.250 (4x)	3	1/8	2-1/2	796562-C6	38.30

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HIGH TEMP ALLOYS

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius (cont.)

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HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .001"	+ .010"					
- .0005"	- .02mm	equivalent	- .001"	- .000"					
			+ .025mm	+ .25mm					
			- .025mm	- .00mm					
.062 (1/16)	.0620	.0620	.010	.312 (5x)	3	1/8	2-1/2	53662-C6	41.60
.062 (1/16)	.0620	.0620	.010	.312 (5x)	4	1/8	2-1/2	797362-C6	45.70
.062 (1/16)	.0620	.0620	.015	.093 (1.5x)	3	1/8	1-1/2	975662-C6	32.20
.062 (1/16)	.0620	.0620	.015	.186 (3x)	3	1/8	1-1/2	964162-C6	32.20
.062 (1/16)	.0620	.0620	.015	.312 (5x)	3	1/8	2-1/2	860262-C6	42.00
.062 (1/16)	.0620	.0620	.020	.093 (1.5x)	3	1/8	1-1/2	931762-C6	35.40
.062 (1/16)	.0620	.0620	.020	.186 (3x)	3	1/8	1-1/2	959262-C6	38.80
.062 (1/16)	.0620	.0620	.020	.186 (3x)	4	1/8	1-1/2	786462-C6	40.40
.062 (1/16)	.0620	.0620	.020	.312 (5x)	3	1/8	2-1/2	870662-C6	41.60
1.6 mm	.0629	.0629	.20 mm	2.40 mm (1.5x)	3	4 mm	50 mm	984136-C6	36.30
1.6 mm	.0629	.0629	.20 mm	5.00 mm (3x)	3	4 mm	50 mm	979336-C6	36.30
1.7 mm	.0669	.0669	.20 mm	5.00 mm (3x)	3	4 mm	50 mm	979338-C6	36.30
.070	.0700	.0700	.005	.210 (3x)	3	1/8	1-1/2	936470-C6	32.80
.070	.0700	.0700	.010	.105 (1.5x)	3	1/8	1-1/2	52270-C6	32.20
.070	.0700	.0700	.010	.210 (3x)	3	1/8	1-1/2	46870-C6	32.20
.070	.0700	.0700	.010	.375 (5x)	3	1/8	2-1/2	53670-C6	42.00
1.8 mm	.0708	.0708	.20 mm	2.70 mm (1.5x)	3	4 mm	50 mm	984140-C6	36.60
1.8 mm	.0708	.0708	.20 mm	5.50 mm (3x)	3	4 mm	50 mm	979340-C6	36.60
1.9 mm	.0748	.0748	.20 mm	5.50 mm (3x)	3	4 mm	50 mm	979342-C6	36.60
.078 (5/64)	.0780	.0780	.003	.234 (3x)	3	1/8	1-1/2	923678-C6	33.40
.078 (5/64)	.0780	.0780	.005	.117 (1.5x)	3	1/8	1-1/2	908878-C6	32.20
.078 (5/64)	.0780	.0780	.005	.117 (1.5x)	4	1/8	1-1/2	795578-C6	34.60
.078 (5/64)	.0780	.0780	.005	.234 (3x)	3	1/8	1-1/2	936478-C6	32.20
.078 (5/64)	.0780	.0780	.005	.406 (5x)	3	1/8	2-1/2	869078-C6	41.40
.078 (5/64)	.0780	.0780	.010	.062 (0.8x)	3	1/8	1-1/2	954278-C6	32.50
.078 (5/64)	.0780	.0780	.010	.117 (1.5x)	3	1/8	1-1/2	52278-C6	32.20
.078 (5/64)	.0780	.0780	.010	.117 (1.5x)	4	1/8	1-1/2	797178-C6	37.30
.078 (5/64)	.0780	.0780	.010	.234 (3x)	3	1/8	1-1/2	46878-C6	32.20
.078 (5/64)	.0780	.0780	.010	.234 (3x)	4	1/8	1-1/2	856478-C6	36.90
.078 (5/64)	.0780	.0780	.010	.312 (4x)	3	1/8	2-1/2	796578-C6	38.90
.078 (5/64)	.0780	.0780	.010	.406 (5x)	3	1/8	2-1/2	53678-C6	41.40
.078 (5/64)	.0780	.0780	.010	.406 (5x)	4	1/8	2-1/2	797378-C6	46.80
.078 (5/64)	.0780	.0780	.015	.117 (1.5x)	3	1/8	1-1/2	975678-C6	35.70
.078 (5/64)	.0780	.0780	.015	.234 (3x)	3	1/8	1-1/2	964178-C6	35.70
.078 (5/64)	.0780	.0780	.020	.117 (1.5x)	3	1/8	1-1/2	931778-C6	38.80
.078 (5/64)	.0780	.0780	.020	.234 (3x)	3	1/8	1-1/2	959278-C6	38.80
.078 (5/64)	.0780	.0780	.020	.406 (5x)	3	1/8	2-1/2	870678-C6	49.10
.078 (5/64)	.0780	.0780	.025	.234 (3x)	3	1/8	1-1/2	848878-C6	38.80
2.0 mm	.0787	.0787	.20 mm	3.00 mm (1.5x)	3	4 mm	50 mm	984145-C6	36.30
2.0 mm	.0787	.0787	.20 mm	6.00 mm (3x)	3	4 mm	50 mm	979345-C6	36.30
2.0 mm	.0787	.0787	.20 mm	10.00 mm (5x)	3	4 mm	50 mm	965845-C6	44.40
2.0 mm	.0787	.0787	.50 mm	6.00 mm (3x)	3	4 mm	50 mm	842545-C6	36.60
.080	.0800	.0800	.010	.120 (1.5x)	3	1/8	1-1/2	52280-C6	32.80
.080	.0800	.0800	.010	.240 (3x)	3	1/8	1-1/2	46880-C6	32.20
.090	.0900	.0900	.010	.135 (1.5x)	3	1/8	1-1/2	52290-C6	32.20
.090	.0900	.0900	.010	.270 (3x)	3	1/8	1-1/2	46890-C6	32.80
.093 (3/32)	.0930	.0930	.003	.279 (3x)	3	1/8	1-1/2	923693-C6	32.30
.093 (3/32)	.0930	.0930	.005	.074 (0.8x)	3	1/8	1-1/2	840593-C6	32.80
.093 (3/32)	.0930	.0930	.005	.140 (1.5x)	3	1/8	1-1/2	908893-C6	32.20

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Corner Radius (cont.)

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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .001"	+ .010"					
- .0005"	- .02mm	equivalent	- .001"	- .000"					
			+ .025mm	+ .25mm					
			- .025mm	- .00mm					
.093 (3/32)		.0930	<b>.005</b>	.140 (1.5x)	4	1/8	1-1/2	795593-C6	36.90
.093 (3/32)		.0930	<b>.005</b>	.279 (3x)	3	1/8	1-1/2	936493-C6	32.20
.093 (3/32)		.0930	<b>.005</b>	.279 (3x)	4	1/8	1-1/2	850793-C6	37.30
.093 (3/32)		.0930	<b>.005</b>	.500 (5x)	3	1/8	2-1/2	869093-C6	41.30
.093 (3/32)		.0930	<b>.008</b>	.140 (1.5x)	3	1/8	1-1/2	847893-C6	32.20
.093 (3/32)		.0930	<b>.008</b>	.279 (3x)	3	1/8	1-1/2	848493-C6	32.20
.093 (3/32)		.0930	<b>.010</b>	.074 (0.8x)	3	1/8	1-1/2	954293-C6	32.80
.093 (3/32)		.0930	<b>.010</b>	.140 (1.5x)	3	1/8	1-1/2	52293-C6	32.20
.093 (3/32)		.0930	<b>.010</b>	.140 (1.5x)	4	1/8	1-1/2	797193-C6	36.90
.093 (3/32)		.0930	<b>.010</b>	.279 (3x)	3	1/8	1-1/2	46893-C6	32.20
.093 (3/32)		.0930	<b>.010</b>	.279 (3x)	4	1/8	1-1/2	856493-C6	36.90
.093 (3/32)		.0930	<b>.010</b>	.375 (4x)	3	1/8	2-1/2	796593-C6	38.90
.093 (3/32)		.0930	<b>.010</b>	.500 (5x)	3	1/8	2-1/2	53693-C6	41.40
.093 (3/32)		.0930	<b>.010</b>	.500 (5x)	4	1/8	2-1/2	797393-C6	46.40
.093 (3/32)		.0930	<b>.015</b>	.140 (1.5x)	3	1/8	1-1/2	975693-C6	32.80
.093 (3/32)		.0930	<b>.015</b>	.279 (3x)	3	1/8	1-1/2	964193-C6	32.20
.093 (3/32)		.0930	<b>.020</b>	.140 (1.5x)	3	1/8	1-1/2	931793-C6	32.20
.093 (3/32)		.0930	<b>.020</b>	.279 (3x)	3	1/8	1-1/2	959293-C6	32.20
.093 (3/32)		.0930	<b>.020</b>	.500 (5x)	3	1/8	2-1/2	870693-C6	41.80
.093 (3/32)		.0930	<b>.025</b>	.279 (3x)	3	1/8	1-1/2	848893-C6	39.00
.093 (3/32)		.0930	<b>.030</b>	.140 (1.5x)	3	1/8	1-1/2	929393-C6	39.00
.093 (3/32)		.0930	<b>.030</b>	.279 (3x)	3	1/8	1-1/2	943893-C6	39.00
.093 (3/32)		.0930	<b>.030</b>	.500 (5x)	3	1/8	2-1/2	871493-C6	48.00
	2.5 mm	.0984	<b>.20 mm</b>	3.70 mm (1.5x)	3	4 mm	50 mm	984151-C6	33.60
	2.5 mm	.0984	<b>.20 mm</b>	7.50 mm (3x)	3	4 mm	50 mm	979351-C6	36.30
	2.5 mm	.0984	<b>.20 mm</b>	12.00 mm (5x)	3	4 mm	50 mm	965851-C6	44.40
.100		.1000	<b>.005</b>	.150 (1.5x)	3	1/8	1-1/2	908800-C6	32.20
.100		.1000	<b>.005</b>	.300 (3x)	3	1/8	1-1/2	936500-C6	32.20
.100		.1000	<b>.010</b>	.150 (1.5x)	3	1/8	1-1/2	52300-C6	32.20
.100		.1000	<b>.010</b>	.300 (3x)	3	1/8	1-1/2	46900-C6	32.20
.100		.1000	<b>.010</b>	.500 (5x)	3	1/8	2-1/2	53700-C6	42.00
.100		.1000	<b>.015</b>	.150 (1.5x)	3	1/8	1-1/2	907700-C6	36.40
.100		.1000	<b>.015</b>	.300 (3x)	3	1/8	1-1/2	964200-C6	36.40
.100		.1000	<b>.020</b>	.150 (1.5x)	3	1/8	1-1/2	931800-C6	38.80
.100		.1000	<b>.020</b>	.300 (3x)	3	1/8	1-1/2	959300-C6	39.60
.100		.1000	<b>.030</b>	.150 (1.5x)	3	1/8	1-1/2	929400-C6	39.70
.100		.1000	<b>.030</b>	.300 (3x)	3	1/8	1-1/2	943900-C6	39.00
.109 (7/64)		.1090	<b>.005</b>	.327 (3x)	3	1/8	1-1/2	936502-C6	32.20
.109 (7/64)		.1090	<b>.010</b>	.327 (3x)	3	1/8	1-1/2	46902-C6	32.20
.109 (7/64)		.1090	<b>.015</b>	.327 (3x)	3	1/8	1-1/2	964202-C6	35.70
.118		.1180	<b>.010</b>	.177 (1.5x)	3	1/8	1-1/2	52305-C6	32.20
.118		.1180	<b>.010</b>	.354 (3x)	3	1/8	1-1/2	46905-C6	32.20
	3.0 mm	.1181	<b>.20 mm</b>	4.50 mm (1.5x)	3	4 mm	50 mm	984157-C6	36.30
	3.0 mm	.1181	<b>.20 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	979357-C6	36.30
	3.0 mm	.1181	<b>.20 mm</b>	15.00 mm (5x)	3	4 mm	50 mm	965857-C6	44.40
	3.0 mm	.1181	<b>.50 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	842557-C6	36.60
	3.0 mm	.1181	<b>.50 mm</b>	15.00 mm (5x)	3	4 mm	50 mm	760957-C6	44.80
	3.0 mm	.1181	<b>1.00 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	842157-C6	42.60

HIGH TEMP ALLOYS

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius (cont.)

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HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000"	+ .00mm	decimal	+ .001"	+ .030"					
- .002"	- .04mm	equivalent	- .001"	- .000"					
			+ .025mm	+ .75mm					
			- .025mm	- .00mm					
.125 (1/8)		.1250	<b>.003</b>	.187 (1.5x)	4	1/8	1-1/2	853708-C6	32.00
.125 (1/8)		.1250	<b>.003</b>	.375 (3x)	4	1/8	1-1/2	923708-C6	32.00
.125 (1/8)		.1250	<b>.005</b>	.100 (0.8x)	4	1/8	1-1/2	840608-C6	32.00
.125 (1/8)		.1250	<b>.005</b>	.187 (1.5x)	4	1/8	1-1/2	908908-C6	32.00
.125 (1/8)		.1250	<b>.005</b>	.375 (3x)	4	1/8	1-1/2	936508-C6	32.00
.125 (1/8)		.1250	<b>.005</b>	.625 (5x)	4	1/8	2-1/2	869108-C6	42.00
.125 (1/8)		.1250	<b>.008</b>	.187 (1.5x)	4	1/8	1-1/2	847908-C6	32.00
.125 (1/8)		.1250	<b>.008</b>	.375 (3x)	4	1/8	1-1/2	848508-C6	32.00
.125 (1/8)		.1250	<b>.010</b>	.187 (1.5x)	4	1/8	1-1/2	913008-C6	30.00
.125 (1/8)		.1250	<b>.010</b>	.375 (3x)	4	1/8	1-1/2	950808-C6	30.00
.125 (1/8)		.1250	<b>.010</b>	.625 (5x)	4	1/8	2-1/2	869908-C6	42.00
.125 (1/8)		.1250	<b>.015</b>	.100 (0.8x)	4	1/8	1-1/2	954308-C6	32.50
.125 (1/8)		.1250	<b>.015</b>	.187 (1.5x)	4	1/8	1-1/2	52308-C6	30.00
.125 (1/8)		.1250	<b>.015</b>	.375 (3x)	4	1/8	1-1/2	46908-C6	30.00
.125 (1/8)		.1250	<b>.015</b>	.500 (4x)	4	1/8	2-1/2	796408-C6	36.10
.125 (1/8)		.1250	<b>.015</b>	.625 (5x)	4	1/8	2-1/2	53708-C6	41.20
.125 (1/8)		.1250	<b>.020</b>	.100 (0.8x)	4	1/8	1-1/2	816408-C6	32.80
.125 (1/8)		.1250	<b>.020</b>	.187 (1.5x)	4	1/8	1-1/2	931808-C6	36.30
.125 (1/8)		.1250	<b>.020</b>	.375 (3x)	4	1/8	1-1/2	959308-C6	36.30
.125 (1/8)		.1250	<b>.020</b>	.625 (5x)	4	1/8	2-1/2	870708-C6	47.80
.125 (1/8)		.1250	<b>.025</b>	.375 (3x)	4	1/8	1-1/2	848908-C6	36.50
.125 (1/8)		.1250	<b>.030</b>	.187 (1.5x)	4	1/8	1-1/2	929408-C6	36.50
.125 (1/8)		.1250	<b>.030</b>	.375 (3x)	4	1/8	1-1/2	943908-C6	36.50
.125 (1/8)		.1250	<b>.030</b>	.625 (5x)	4	1/8	2-1/2	871508-C6	48.00
.125 (1/8)		.1250	<b>.040</b>	.375 (3x)	4	1/8	1-1/2	844008-C6	38.80
.140 (9/64)		.1406	<b>.010</b>	.425 (3x)	4	3/16	2	950809-C6	38.10
.140 (9/64)		.1406	<b>.015</b>	.112 (0.8x)	4	3/16	2	954309-C6	39.10
.140 (9/64)		.1406	<b>.015</b>	.220 (1.5x)	4	3/16	2	52309-C6	38.10
.140 (9/64)		.1406	<b>.015</b>	.425 (3x)	4	3/16	2	46909-C6	38.30
.140 (9/64)		.1406	<b>.015</b>	.750 (5x)	4	3/16	3	53709-C6	48.70
.140 (9/64)		.1406	<b>.020</b>	.425 (3x)	4	3/16	2	959309-C6	39.10
.140 (9/64)		.1406	<b>.030</b>	.425 (3x)	4	3/16	2	943909-C6	39.10
.156 (5/32)		.1562	<b>.005</b>	.235 (1.5x)	4	3/16	2	908956-C6	34.60
.156 (5/32)		.1562	<b>.005</b>	.470 (3x)	4	3/16	2	936510-C6	34.60
.156 (5/32)		.1562	<b>.010</b>	.235 (1.5x)	4	3/16	2	913010-C6	32.80
.156 (5/32)		.1562	<b>.010</b>	.470 (3x)	4	3/16	2	950810-C6	32.80
.156 (5/32)		.1562	<b>.015</b>	.125 (0.8x)	4	3/16	2	954310-C6	35.20
.156 (5/32)		.1562	<b>.015</b>	.235 (1.5x)	4	3/16	2	52310-C6	34.60
.156 (5/32)		.1562	<b>.015</b>	.470 (3x)	4	3/16	2	46910-C6	34.60
.156 (5/32)		.1562	<b>.015</b>	.750 (5x)	4	3/16	3	53710-C6	45.60
.156 (5/32)		.1562	<b>.020</b>	.470 (3x)	4	3/16	2	959310-C6	34.60
.156 (5/32)		.1562	<b>.025</b>	.470 (3x)	4	3/16	2	848910-C6	34.60
.156 (5/32)		.1562	<b>.030</b>	.235 (1.5x)	4	3/16	2	929410-C6	32.80
.156 (5/32)		.1562	<b>.030</b>	.470 (3x)	4	3/16	2	943910-C6	32.80
.156 (5/32)		.1562	<b>.030</b>	.750 (5x)	4	3/16	3	871510-C6	44.70
	4.0 mm	.1574	<b>.40 mm</b>	6.00 mm (1.5x)	4	6 mm	63 mm	984161-C6	38.90
	4.0 mm	.1574	<b>.40 mm</b>	12.00 mm (3x)	4	6 mm	63 mm	979361-C6	38.90

NEW

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Corner Radius (cont.)

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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>	+ .000" - .002"	+ .00mm - .04mm	R	L <sub>2</sub>	L <sub>1</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.187 (3/16)		.1875	<b>.005</b>	.285 (1.5x)	4	3/16	2	908910-C6	34.60
.187 (3/16)		.1875	<b>.005</b>	.562 (3x)	4	3/16	2	936512-C6	34.60
.187 (3/16)		.1875	<b>.005</b>	1.000 (5x)	4	3/16	3	869112-C6	45.20
.187 (3/16)		.1875	<b>.008</b>	.562 (3x)	4	3/16	2	848512-C6	34.60
.187 (3/16)		.1875	<b>.010</b>	.150 (0.8x)	4	3/16	2	763212-C6	36.90
.187 (3/16)		.1875	<b>.010</b>	.285 (1.5x)	4	3/16	2	913012-C6	32.50
.187 (3/16)		.1875	<b>.010</b>	.562 (3x)	4	3/16	2	950812-C6	32.80
.187 (3/16)		.1875	<b>.010</b>	1.000 (5x)	4	3/16	3	869912-C6	45.60
.187 (3/16)		.1875	<b>.015</b>	.150 (0.8x)	4	3/16	2	954312-C6	35.20
.187 (3/16)		.1875	<b>.015</b>	.285 (1.5x)	4	3/16	2	52312-C6	32.50
.187 (3/16)		.1875	<b>.015</b>	.562 (3x)	4	3/16	2	46912-C6	32.80
.187 (3/16)		.1875	<b>.015</b>	.750 (4x)	4	3/16	3	796412-C6	38.60
.187 (3/16)		.1875	<b>.015</b>	1.000 (5x)	4	3/16	3	53712-C6	45.60
.187 (3/16)		.1875	<b>.020</b>	.150 (0.8x)	4	3/16	2	816412-C6	42.80
.187 (3/16)		.1875	<b>.020</b>	.285 (1.5x)	4	3/16	2	931812-C6	38.50
.187 (3/16)		.1875	<b>.020</b>	.562 (3x)	4	3/16	2	959312-C6	38.50
.187 (3/16)		.1875	<b>.020</b>	1.000 (5x)	4	3/16	3	870712-C6	42.80
.187 (3/16)		.1875	<b>.025</b>	.285 (1.5x)	4	3/16	2	749412-C6	38.80
.187 (3/16)		.1875	<b>.025</b>	.562 (3x)	4	3/16	2	848912-C6	45.20
.187 (3/16)		.1875	<b>.030</b>	.285 (1.5x)	4	3/16	2	929412-C6	38.80
.187 (3/16)		.1875	<b>.030</b>	.562 (3x)	4	3/16	2	943912-C6	40.10
.187 (3/16)		.1875	<b>.030</b>	1.000 (5x)	4	3/16	3	871512-C6	45.20
.187 (3/16)		.1875	<b>.040</b>	.562 (3x)	4	3/16	2	844012-C6	42.00
.187 (3/16)		.1875	<b>.045</b>	.285 (1.5x)	4	3/16	2	857612-C6	41.20
.187 (3/16)		.1875	<b>.045</b>	.562 (3x)	4	3/16	2	864512-C6	41.20
.187 (3/16)		.1875	<b>.060</b>	.285 (1.5x)	4	3/16	2	845412-C6	38.50
.187 (3/16)		.1875	<b>.060</b>	.562 (3x)	4	3/16	2	885612-C6	38.50
.187 (3/16)		.1875	<b>.060</b>	1.000 (5x)	4	3/16	3	804412-C6	41.80
5.0 mm		.1968	<b>.40 mm</b>	7.50 mm (1.5x)	4	6 mm	63 mm	984164-C6	38.90
5.0 mm		.1968	<b>.40 mm</b>	15.00 mm (3x)	4	6 mm	63 mm	979364-C6	38.90
5.0 mm		.1968	<b>1.00 mm</b>	7.50 mm (1.5x)	4	6 mm	63 mm	752464-C6	39.30
5.0 mm		.1968	<b>1.00 mm</b>	15.00 mm (3x)	4	6 mm	63 mm	752964-C6	39.30
6.0 mm		.2362	<b>.40 mm</b>	9.00 mm (1.5x)	4	6 mm	63 mm	984166-C6	39.30
6.0 mm		.2362	<b>.40 mm</b>	18.00 mm (3x)	4	6 mm	63 mm	979366-C6	39.30
.250 (1/4)		.2500	<b>.005</b>	.375 (1.5x)	4	1/4	2-1/2	908916-C6	43.30
.250 (1/4)		.2500	<b>.005</b>	.750 (3x)	4	1/4	2-1/2	936516-C6	43.30
.250 (1/4)		.2500	<b>.008</b>	.750 (3x)	4	1/4	2-1/2	848516-C6	43.30
.250 (1/4)		.2500	<b>.010</b>	.375 (1.5x)	4	1/4	2-1/2	913016-C6	41.10
.250 (1/4)		.2500	<b>.010</b>	.750 (3x)	4	1/4	2-1/2	950816-C6	41.10
.250 (1/4)		.2500	<b>.015</b>	.200 (0.8x)	4	1/4	2-1/2	954316-C6	44.40
.250 (1/4)		.2500	<b>.015</b>	.375 (1.5x)	4	1/4	2-1/2	52316-C6	41.40
.250 (1/4)		.2500	<b>.015</b>	.750 (3x)	4	1/4	2-1/2	46916-C6	41.40
.250 (1/4)		.2500	<b>.015</b>	1.250 (5x)	4	1/4	4	53716-C6	56.40
.250 (1/4)		.2500	<b>.020</b>	.200 (0.8x)	4	1/4	2-1/2	816416-C6	50.30
.250 (1/4)		.2500	<b>.020</b>	.375 (1.5x)	4	1/4	2-1/2	931816-C6	46.70
.250 (1/4)		.2500	<b>.020</b>	.750 (3x)	4	1/4	2-1/2	959316-C6	47.20
.250 (1/4)		.2500	<b>.025</b>	.750 (3x)	4	1/4	2-1/2	848916-C6	47.20
.250 (1/4)		.2500	<b>.030</b>	.375 (1.5x)	4	1/4	2-1/2	929416-C6	47.20
.250 (1/4)		.2500	<b>.030</b>	.750 (3x)	4	1/4	2-1/2	943916-C6	46.70

HIGH TEMP ALLOYS

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius (cont.)

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HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+.000" -.002"	+.00mm -.04mm	decimal equivalent	+.001" -.001" +.025mm -.025mm	+.030" -.000" +.75mm -.00mm					
.250 (1/4)		.2500	<b>.030</b>	1.250 (5x)	4	1/4	4	871516-C6	53.20
.250 (1/4)		.2500	<b>.040</b>	.750 (3x)	4	1/4	2-1/2	844016-C6	50.00
.250 (1/4)		.2500	<b>.045</b>	.750 (3x)	4	1/4	2-1/2	864516-C6	50.90
.250 (1/4)		.2500	<b>.060</b>	.375 (1.5x)	4	1/4	2-1/2	845416-C6	47.20
.250 (1/4)		.2500	<b>.060</b>	.750 (3x)	4	1/4	2-1/2	885616-C6	47.20
.312 (5/16)		.3125	<b>.015</b>	.470 (1.5x)	4	5/16	2-1/2	52320-C6	59.30
.312 (5/16)		.3125	<b>.015</b>	1.000 (3x)	4	5/16	2-1/2	46920-C6	59.90
.375 (3/8)		.3750	<b>.015</b>	.570 (1.5x)	4	3/8	2-1/2	52324-C6	68.30
.375 (3/8)		.3750	<b>.015</b>	1.125 (3x)	4	3/8	2-1/2	46924-C6	69.00
.375 (3/8)		.3750	<b>.020</b>	.570 (1.5x)	4	3/8	2-1/2	931824-C6	74.00
.375 (3/8)		.3750	<b>.030</b>	.570 (1.5x)	4	3/8	2-1/2	929424-C6	74.00
.375 (3/8)		.3750	<b>.030</b>	1.125 (3x)	4	3/8	2-1/2	943924-C6	76.20
.375 (3/8)		.3750	<b>.040</b>	1.125 (3x)	4	3/8	2-1/2	844024-C6	76.20
.500 (1/2)		.5000	<b>.015</b>	.750 (1.5x)	4	1/2	3	816232-C6	88.30
.500 (1/2)		.5000	<b>.030</b>	.750 (1.5x)	4	1/2	3	52332-C6	89.20
.500 (1/2)		.5000	<b>.030</b>	1.500 (3x)	4	1/2	3	843932-C6	88.30
.500 (1/2)		.5000	<b>.060</b>	.750 (1.5x)	4	1/2	3	845532-C6	88.30

NEW  
NEW

### SPEEDS & FEEDS (Variable Helix for High Temp Alloys)

**Important Note:** Values in table are in inches and are based on 4 flute, standard (3x Dia) length of cut end mills. For 3 flutes, table values of IPT must be increased to 105% before adjustments for different lengths of cut. For shorter lengths of cut, table values of IPT must be increased (for 0.8x, increase to 115%; for 1.5x, increase to 108%). For longer lengths of cut, table values of IPT must be reduced (for 4x, reduce to 85%; for 5x, reduce to 70%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

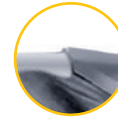
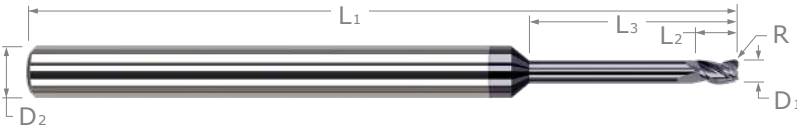
Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter												
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	
Stainless Steels: 40x, 41x, 42x, 43x, 44x, 13-8, 15-5, 15-7, 17-4, 17-7	275 - 300	160	Slotting	.00005	.00010	.00016	.00020	.00026	.00031	.00041	.00062	.00083	.00108	.00130	.00173
	300 - 350	140	Roughing	.00006	.00013	.00020	.00026	.00033	.00039	.00053	.00079	.00105	.00138	.00165	.00221
	350 - 400	100	Finishing	.00008	.00017	.00026	.00034	.00043	.00051	.00069	.00103	.00138	.00180	.00217	.00289
Tool Steels: D, H, M, T, S series	400 - 425	80	Max	.00010	.00020	.00031	.00041	.00051	.00061	.00083	.00123	.00165	.00216	.00260	.00347
	Titanium: All alloys	275 - 300	200	Radial Depth of Cut*:		Axial Depth of Cut*:									
	300 - 350	125	Slotting: 1x Dia	Slotting: 4x Dia											
	350 - 400	75	Roughing: 4x Dia	Roughing: .5x - .7x Dia											
Nickel Alloys: Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy	400 - 425	75	Finishing: .1x Dia	Finishing: .5x - 1x Dia											
	275 - 300	80													
	300 - 350	60													
	350 - 400	50													
	400 - 425	40													

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.



# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius – Long Reach, Stub Flute



Reduced Neck Diameter to Avoid Heeling

- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Long reach design for deep cavities
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
$+0.0005''$ $-0.0005''$	$+0.00mm$ $-0.02mm$	decimal equivalent	$+0.001''$ $-0.001''$ $+0.025mm$ $-0.025mm$	$+0.010''$ $-0.000''$ $+0.25mm$ $-0.00mm$	$+0.010''$ $-0.000''$ $+0.25mm$ $-0.00mm$					
.015 (1/64)		.0150	<b>.003</b>	.022	.045 (3x)	3	1/8	1-1/2	947615-C6	62.40
.015 (1/64)		.0150	<b>.003</b>	.022	.078 (5x)	3	1/8	2-1/2	64415-C6	62.40
.015 (1/64)		.0150	<b>.003</b>	.022	.125 (8x)	3	1/8	2-1/2	54815-C6	63.10
.015 (1/64)		.0150	<b>.003</b>	.022	.187 (12x)	3	1/8	2-1/2	63015-C6	69.70
.015 (1/64)		.0150	<b>.003</b>	.022	.225 (15x)	3	1/8	2-1/2	968915-C6	76.00
.4 mm		.0157	<b>.08 mm</b>	.60 mm	2.0 mm (5x)	3	4 mm	50 mm	980709-C6	69.00
.4 mm		.0157	<b>.08 mm</b>	.60 mm	3.2 mm (8x)	3	4 mm	50 mm	975009-C6	71.20
.4 mm		.0157	<b>.08 mm</b>	.60 mm	4.8 mm (12x)	3	4 mm	50 mm	987309-C6	76.00
.5 mm		.0196	<b>.10 mm</b>	.75 mm	2.5 mm (5x)	3	4 mm	50 mm	980711-C6	66.20
.5 mm		.0196	<b>.10 mm</b>	.75 mm	4.0 mm (8x)	3	4 mm	50 mm	975011-C6	68.30
.5 mm		.0196	<b>.10 mm</b>	.75 mm	6.0 mm (12x)	3	4 mm	50 mm	987311-C6	73.80
.5 mm		.0196	<b>.10 mm</b>	.75 mm	8.0 mm (16x)	3	4 mm	50 mm	971511-C6	77.10
.020		.0200	<b>.004</b>	.030	.060 (3x)	3	1/8	1-1/2	947620-C6	59.30
.020		.0200	<b>.004</b>	.030	.100 (5x)	3	1/8	2-1/2	64420-C6	59.00
.020		.0200	<b>.004</b>	.030	.160 (8x)	3	1/8	2-1/2	54820-C6	60.30
.020		.0200	<b>.004</b>	.030	.200 (10x)	3	1/8	2-1/2	932520-C6	64.00
.020		.0200	<b>.004</b>	.030	.250 (12x)	3	1/8	2-1/2	63020-C6	66.50
.6 mm		.0236	<b>.10 mm</b>	.90 mm	3.0 mm (5x)	3	4 mm	50 mm	980713-C6	65.70
.6 mm		.0236	<b>.10 mm</b>	.90 mm	4.8 mm (8x)	3	4 mm	50 mm	975013-C6	66.80
.6 mm		.0236	<b>.10 mm</b>	.90 mm	7.2 mm (12x)	3	4 mm	50 mm	987313-C6	71.40
.025		.0250	<b>.004</b>	.038	.075 (3x)	3	1/8	1-1/2	947625-C6	57.50
.025		.0250	<b>.004</b>	.038	.125 (5x)	3	1/8	2-1/2	64425-C6	57.70
.025		.0250	<b>.004</b>	.038	.203 (8x)	3	1/8	2-1/2	54825-C6	58.80
.025		.0250	<b>.004</b>	.038	.312 (12x)	3	1/8	2-1/2	63025-C6	64.90
.031 (1/32)		.0310	<b>.005</b>	.047	.093 (3x)	3	1/8	1-1/2	947631-C6	53.80
.031 (1/32)		.0310	<b>.005</b>	.047	.156 (5x)	3	1/8	2-1/2	64431-C6	54.70
.031 (1/32)		.0310	<b>.005</b>	.047	.156 (5x)	4	1/8	2-1/2	812131-C6	57.30
.031 (1/32)		.0310	<b>.005</b>	.047	.187 (6x)	3	1/8	2-1/2	796131-C6	57.30
.031 (1/32)		.0310	<b>.005</b>	.047	.250 (8x)	3	1/8	2-1/2	54831-C6	55.90
.031 (1/32)		.0310	<b>.005</b>	.047	.312 (10x)	3	1/8	2-1/2	932531-C6	57.30
.031 (1/32)		.0310	<b>.005</b>	.047	.375 (12x)	3	1/8	2-1/2	63031-C6	58.30
.031 (1/32)		.0310	<b>.005</b>	.047	.470 (15x)	3	1/8	2-1/2	968931-C6	64.50
.031 (1/32)		.0310	<b>.010</b>	.047	.156 (5x)	3	1/8	2-1/2	917331-C6	53.50
.031 (1/32)		.0310	<b>.010</b>	.047	.250 (8x)	3	1/8	2-1/2	908631-C6	55.40
.8 mm		.0314	<b>.10 mm</b>	1.20 mm	4.0 mm (5x)	3	4 mm	50 mm	980718-C6	59.80
.8 mm		.0314	<b>.10 mm</b>	1.20 mm	6.5 mm (8x)	3	4 mm	50 mm	975018-C6	62.00
.8 mm		.0314	<b>.10 mm</b>	1.20 mm	9.5 mm (12x)	3	4 mm	50 mm	987318-C6	63.70

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius – Long Reach, Stub Flute (cont.)

continued from previous page

HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub> +0.005" -0.005" +0.00mm -0.02mm decimal equivalent			R +0.01" -0.01" +0.025mm -0.025mm	L <sub>2</sub> +0.10" -0.000" +0.25mm -0.00mm	L <sub>3</sub> +0.10" -0.000" +0.25mm -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.035		.0350	<b>.005</b>	.053	.105 (3x)	3	1/8	1-1/2	947635-C6	53.80
.035		.0350	<b>.005</b>	.053	.187 (5x)	3	1/8	2-1/2	64435-C6	55.20
.035		.0350	<b>.005</b>	.053	.281 (8x)	3	1/8	2-1/2	54835-C6	55.90
.035		.0350	<b>.005</b>	.053	.350 (10x)	3	1/8	2-1/2	932535-C6	58.30
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	5.0 mm (5x)	3	4 mm	50 mm	980722-C6	59.80
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	8.0 mm (8x)	3	4 mm	50 mm	975022-C6	61.40
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	12.0 mm (12x)	3	4 mm	50 mm	987322-C6	63.10
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	16.0 mm (16x)	3	4 mm	50 mm	971522-C6	67.20
.040		.0400	<b>.005</b>	.060	.120 (3x)	3	1/8	1-1/2	947640-C6	53.80
.040		.0400	<b>.005</b>	.060	.203 (5x)	3	1/8	2-1/2	64440-C6	54.70
.040		.0400	<b>.005</b>	.060	.325 (8x)	3	1/8	2-1/2	54840-C6	55.90
.045		.0450	<b>.005</b>	.068	.135 (3x)	3	1/8	1-1/2	947645-C6	54.90
.045		.0450	<b>.005</b>	.068	.225 (5x)	3	1/8	2-1/2	64445-C6	54.70
.045		.0450	<b>.005</b>	.068	.375 (8x)	3	1/8	2-1/2	54845-C6	55.90
.047 (3/64)		.0470	<b>.005</b>	.070	.141 (3x)	3	1/8	1-1/2	947647-C6	53.80
.047 (3/64)		.0470	<b>.005</b>	.070	.250 (5x)	3	1/8	2-1/2	64447-C6	54.70
.047 (3/64)		.0470	<b>.005</b>	.070	.281 (6x)	3	1/8	2-1/2	796147-C6	54.70
.047 (3/64)		.0470	<b>.005</b>	.070	.375 (8x)	3	1/8	2-1/2	54847-C6	55.90
.047 (3/64)		.0470	<b>.005</b>	.070	.570 (12x)	3	1/8	2-1/2	63047-C6	58.30
.047 (3/64)		.0470	<b>.005</b>	.070	.710 (15x)	3	1/8	2-1/2	968947-C6	63.90
.047 (3/64)		.0470	<b>.010</b>	.070	.250 (5x)	3	1/8	2-1/2	917347-C6	54.70
.047 (3/64)		.0470	<b>.010</b>	.070	.375 (8x)	3	1/8	2-1/2	908647-C6	56.40
.050		.0500	<b>.005</b>	.075	.150 (3x)	3	1/8	1-1/2	947650-C6	54.90
.050		.0500	<b>.005</b>	.075	.250 (5x)	3	1/8	2-1/2	64450-C6	54.10
.050		.0500	<b>.005</b>	.075	.400 (8x)	3	1/8	2-1/2	54850-C6	55.40
.055		.0550	<b>.005</b>	.083	.275 (5x)	3	1/8	2-1/2	64455-C6	55.20
.055		.0550	<b>.005</b>	.083	.450 (8x)	3	1/8	2-1/2	54855-C6	55.40
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	7.5 mm (5x)	3	4 mm	50 mm	980733-C6	59.80
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	12.0 mm (8x)	3	4 mm	50 mm	975033-C6	62.00
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	18.0 mm (12x)	3	4 mm	50 mm	987333-C6	63.70
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	24.0 mm (16x)	3	4 mm	63 mm	971533-C6	67.20
.060		.0600	<b>.005</b>	.090	.312 (5x)	3	1/8	2-1/2	919860-C6	55.20
.060		.0600	<b>.005</b>	.090	.500 (8x)	3	1/8	2-1/2	915360-C6	56.40
.060		.0600	<b>.010</b>	.090	.312 (5x)	3	1/8	2-1/2	64460-C6	54.10
.060		.0600	<b>.010</b>	.090	.500 (8x)	3	1/8	2-1/2	54860-C6	55.40
.060		.0600	<b>.010</b>	.090	.625 (10x)	3	1/8	2-1/2	932560-C6	58.30
.062 (1/16)		.0620	<b>.005</b>	.093	.312 (5x)	3	1/8	2-1/2	919862-C6	53.50
.062 (1/16)		.0620	<b>.005</b>	.093	.500 (8x)	3	1/8	2-1/2	915362-C6	55.40
.062 (1/16)		.0620	<b>.005</b>	.093	.625 (10x)	3	1/8	2-1/2	884462-C6	56.00
.062 (1/16)		.0620	<b>.010</b>	.093	.186 (3x)	3	1/8	1-1/2	947662-C6	53.50
.062 (1/16)		.0620	<b>.010</b>	.093	.312 (5x)	3	1/8	2-1/2	64462-C6	54.10
.062 (1/16)		.0620	<b>.010</b>	.093	.312 (5x)	4	1/8	2-1/2	811862-C6	56.20
.062 (1/16)		.0620	<b>.010</b>	.093	.375 (6x)	3	1/8	2-1/2	795962-C6	56.20
.062 (1/16)		.0620	<b>.010</b>	.093	.500 (8x)	3	1/8	2-1/2	54862-C6	55.40
.062 (1/16)		.0620	<b>.010</b>	.093	.625 (10x)	3	1/8	2-1/2	932562-C6	57.30
.062 (1/16)		.0620	<b>.010</b>	.093	.750 (12x)	3	1/8	2-1/2	63062-C6	58.30
.062 (1/16)		.0620	<b>.010</b>	.093	.950 (15x)	3	1/8	2-1/2	968962-C6	64.50

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius – Long Reach, Stub Flute (cont.)

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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>	+ .0005" / - .0005"	+ .00mm / - .02mm	R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.062 (1/16)		.0620	<b>.015</b>	.093	.312 (5x)	3	1/8	2-1/2	902662-C6	54.50
.062 (1/16)		.0620	<b>.015</b>	.093	.500 (8x)	3	1/8	2-1/2	912062-C6	55.40
.062 (1/16)		.0620	<b>.020</b>	.093	.312 (5x)	3	1/8	2-1/2	866862-C6	54.50
.062 (1/16)		.0620	<b>.020</b>	.093	.500 (8x)	3	1/8	2-1/2	847562-C6	56.40
.078 (5/64)		.0780	<b>.005</b>	.117	.406 (5x)	3	1/8	2-1/2	919878-C6	54.10
.078 (5/64)		.0780	<b>.005</b>	.117	.625 (8x)	3	1/8	2-1/2	915378-C6	55.40
.078 (5/64)		.0780	<b>.010</b>	.117	.234 (3x)	3	1/8	1-1/2	947678-C6	54.50
.078 (5/64)		.0780	<b>.010</b>	.117	.406 (5x)	3	1/8	2-1/2	64478-C6	54.10
.078 (5/64)		.0780	<b>.010</b>	.117	.406 (5x)	4	1/8	2-1/2	811878-C6	56.20
.078 (5/64)		.0780	<b>.010</b>	.117	.475 (6x)	3	1/8	2-1/2	795978-C6	54.10
.078 (5/64)		.0780	<b>.010</b>	.117	.625 (8x)	3	1/8	2-1/2	54878-C6	55.40
.078 (5/64)		.0780	<b>.010</b>	.117	.940 (12x)	3	1/8	2-1/2	63078-C6	58.30
.078 (5/64)		.0780	<b>.010</b>	.117	1.187 (15x)	3	1/8	2-1/2	968978-C6	64.50
2.0 mm		.0787	<b>.20 mm</b>	3.00 mm	10.0 mm (5x)	3	4 mm	50 mm	980745-C6	60.40
2.0 mm		.0787	<b>.20 mm</b>	3.00 mm	16.0 mm (8x)	3	4 mm	50 mm	975045-C6	61.40
2.0 mm		.0787	<b>.20 mm</b>	3.00 mm	24.0 mm (12x)	3	4 mm	63 mm	987345-C6	63.70
2.0 mm		.0787	<b>.20 mm</b>	3.00 mm	32.0 mm (16x)	3	4 mm	63 mm	971545-C6	67.20
.093 (3/32)		.0930	<b>.005</b>	.139	.500 (5x)	3	1/8	2-1/2	919893-C6	53.50
.093 (3/32)		.0930	<b>.005</b>	.139	.750 (8x)	3	1/8	2-1/2	915393-C6	56.40
.093 (3/32)		.0930	<b>.010</b>	.139	.279 (3x)	3	1/8	1-1/2	947693-C6	53.50
.093 (3/32)		.0930	<b>.010</b>	.139	.500 (5x)	3	1/8	2-1/2	64493-C6	54.10
.093 (3/32)		.0930	<b>.010</b>	.139	.500 (5x)	4	1/8	2-1/2	811893-C6	56.20
.093 (3/32)		.0930	<b>.010</b>	.139	.585 (6x)	3	1/8	2-1/2	795993-C6	54.10
.093 (3/32)		.0930	<b>.010</b>	.139	.750 (8x)	3	1/8	2-1/2	54893-C6	55.40
.093 (3/32)		.0930	<b>.010</b>	.139	.950 (10x)	3	1/8	2-1/2	932593-C6	57.30
.093 (3/32)		.0930	<b>.010</b>	.139	1.125 (12x)	3	1/8	2-1/2	63093-C6	58.30
.093 (3/32)		.0930	<b>.010</b>	.139	1.400 (15x)	3	1/8	3	968993-C6	63.90
.093 (3/32)		.0930	<b>.015</b>	.139	.500 (5x)	3	1/8	2-1/2	902693-C6	53.50
.093 (3/32)		.0930	<b>.015</b>	.139	.750 (8x)	3	1/8	2-1/2	912093-C6	56.40
.093 (3/32)		.0930	<b>.020</b>	.139	.500 (5x)	3	1/8	2-1/2	866893-C6	54.50
.093 (3/32)		.0930	<b>.020</b>	.139	.750 (8x)	3	1/8	2-1/2	847593-C6	56.40
.093 (3/32)		.0930	<b>.030</b>	.139	.500 (5x)	3	1/8	2-1/2	910193-C6	54.50
.093 (3/32)		.0930	<b>.030</b>	.139	.750 (8x)	3	1/8	2-1/2	906493-C6	55.40
.100		.1000	<b>.010</b>	.150	.500 (5x)	3	1/8	2-1/2	64500-C6	53.50
.100		.1000	<b>.010</b>	.150	.800 (8x)	3	1/8	2-1/2	54900-C6	55.00
3.0 mm		.1181	<b>.20 mm</b>	4.50 mm	15.0 mm (5x)	3	4 mm	50 mm	980757-C6	56.80
3.0 mm		.1181	<b>.20 mm</b>	4.50 mm	24.0 mm (8x)	3	4 mm	50 mm	975057-C6	56.90

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HIGH TEMP ALLOYS

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Corner Radius – Long Reach, Stub Flute (cont.)

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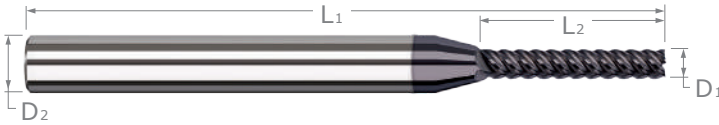
HIGH TEMP ALLOYS

CUTTER DIAMETER		CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	decimal equivalent	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.1250	<b>.005</b>	.187	.625 (5x)	4	1/8	2-1/2	919908-C6	50.40
.125 (1/8)	.1250	<b>.005</b>	.187	1.000 (8x)	4	1/8	2-1/2	915408-C6	52.20
.125 (1/8)	.1250	<b>.010</b>	.187	.625 (5x)	4	1/8	2-1/2	917408-C6	53.10
.125 (1/8)	.1250	<b>.010</b>	.187	1.000 (8x)	4	1/8	2-1/2	908708-C6	55.00
.125 (1/8)	.1250	<b>.015</b>	.187	.375 (3x)	4	1/8	1-1/2	947708-C6	51.10
.125 (1/8)	.1250	<b>.015</b>	.187	.625 (5x)	4	1/8	2-1/2	64508-C6	53.50
.125 (1/8)	.1250	<b>.015</b>	.187	.750 (6x)	4	1/8	2-1/2	795808-C6	54.50
.125 (1/8)	.1250	<b>.015</b>	.187	1.000 (8x)	4	1/8	2-1/2	54908-C6	55.00
.125 (1/8)	.1250	<b>.015</b>	.187	1.250 (10x)	4	1/8	2-1/2	932608-C6	57.30
.125 (1/8)	.1250	<b>.015</b>	.187	1.500 (12x)	4	1/8	3	63108-C6	58.30
.125 (1/8)	.1250	<b>.020</b>	.187	.625 (5x)	4	1/8	2-1/2	866908-C6	54.10
.125 (1/8)	.1250	<b>.020</b>	.187	1.000 (8x)	4	1/8	2-1/2	847608-C6	55.00
.125 (1/8)	.1250	<b>.030</b>	.187	.625 (5x)	4	1/8	2-1/2	910208-C6	53.10
.125 (1/8)	.1250	<b>.030</b>	.187	1.000 (8x)	4	1/8	2-1/2	906508-C6	55.00
.140 (9/64)	.1406	<b>.015</b>	.220	.750 (5x)	4	3/16	3	64509-C6	60.30
.140 (9/64)	.1406	<b>.015</b>	.220	1.125 (8x)	4	3/16	3	54909-C6	61.50
.156 (5/32)	.1562	<b>.010</b>	.235	.750 (5x)	4	3/16	3	917410-C6	59.10
.156 (5/32)	.1562	<b>.015</b>	.235	.750 (5x)	4	3/16	3	64510-C6	59.10
.156 (5/32)	.1562	<b>.015</b>	.235	1.250 (8x)	4	3/16	3	54910-C6	60.40
.156 (5/32)	.1562	<b>.015</b>	.235	1.875 (12x)	4	3/16	4	63110-C6	73.90
.156 (5/32)	.1562	<b>.030</b>	.235	.750 (5x)	4	3/16	3	910210-C6	59.10
.187 (3/16)	.1875	<b>.005</b>	.281	1.000 (5x)	4	3/16	3	919912-C6	58.00
.187 (3/16)	.1875	<b>.005</b>	.281	1.500 (8x)	4	3/16	3	915412-C6	59.40
.187 (3/16)	.1875	<b>.010</b>	.281	1.000 (5x)	4	3/16	3	917412-C6	60.90
.187 (3/16)	.1875	<b>.010</b>	.281	1.500 (8x)	4	3/16	3	908712-C6	61.20
.187 (3/16)	.1875	<b>.015</b>	.281	1.000 (5x)	4	3/16	3	64512-C6	59.80
.187 (3/16)	.1875	<b>.015</b>	.281	1.156 (6x)	4	3/16	3	795812-C6	60.90
.187 (3/16)	.1875	<b>.015</b>	.281	1.500 (8x)	4	3/16	3	54912-C6	61.20
.187 (3/16)	.1875	<b>.015</b>	.281	1.875 (10x)	4	3/16	4	932612-C6	72.00
.187 (3/16)	.1875	<b>.015</b>	.281	2.250 (12x)	4	3/16	4	63112-C6	73.20
.187 (3/16)	.1875	<b>.020</b>	.281	1.000 (5x)	4	3/16	3	866912-C6	60.50
.187 (3/16)	.1875	<b>.020</b>	.281	1.500 (8x)	4	3/16	3	847612-C6	62.00
.187 (3/16)	.1875	<b>.030</b>	.281	1.000 (5x)	4	3/16	3	910212-C6	59.30
.187 (3/16)	.1875	<b>.030</b>	.281	1.500 (8x)	4	3/16	3	906512-C6	60.80
.187 (3/16)	.1875	<b>.040</b>	.281	1.000 (5x)	4	3/16	3	785612-C6	59.30
.187 (3/16)	.1875	<b>.040</b>	.281	1.500 (8x)	4	3/16	3	785412-C6	62.00
.250 (1/4)	.2500	<b>.015</b>	.375	1.250 (5x)	4	1/4	4	64516-C6	67.70
.250 (1/4)	.2500	<b>.015</b>	.375	2.000 (8x)	4	1/4	4	54916-C6	67.40
.250 (1/4)	.2500	<b>.015</b>	.375	3.000 (12x)	4	1/4	6	63116-C6	82.70
.250 (1/4)	.2500	<b>.030</b>	.375	1.250 (5x)	4	1/4	4	910216-C6	67.30
.250 (1/4)	.2500	<b>.030</b>	.375	2.000 (8x)	4	1/4	4	906516-C6	68.30
.375 (3/8)	.3750	<b>.015</b>	.570	2.000 (5x)	4	3/8	4	64524-C6	76.10

PLEASE SEE SPEEDS & FEEDS ON PAGE 136

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishers - Square



Up to 7 Flutes!

- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 41°) reduces chatter and harmonics improving finish
- Large core and eccentric relief for improved tool life
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- End cutting (not center cutting) • Solid carbide • CNC ground in the USA

HIGH TEMP ALLOYS

CUTTER DIAMETER D <sub>1</sub> + .0005" - .0005" + .00mm - .02mm decimal equivalent	LENGTH OF CUT L <sub>2</sub> + .010" - .000" + .25mm - .00mm	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AlTiN NANO COATED	
					TOOL #	PRICE
.2 mm .0078	.60 mm (3x)	4	4 mm	50 mm	967604-C6	60.40
.2 mm .0078	1.00 mm (5x)	4	4 mm	50 mm	974504-C6	69.40
.2 mm .0078	1.60 mm (8x)	4	4 mm	50 mm	976104-C6	71.20
.010 .0100	.030 (3x)	4	1/8	1-1/2	57810-C6	59.50
.010 .0100	.050 (5x)	4	1/8	2-1/2	62610-C6	68.30
.3 mm .0118	.90 mm (3x)	4	4 mm	50 mm	967606-C6	55.70
.015 (1/64) .0150	.023 (1.5x)	4	1/8	1-1/2	946115-C6	46.50
.015 (1/64) .0150	.045 (3x)	4	1/8	1-1/2	57815-C6	46.50
.015 (1/64) .0150	.062 (4x)	4	1/8	2-1/2	890115-C6	57.80
.015 (1/64) .0150	.078 (5x)	4	1/8	2-1/2	62615-C6	57.80
.015 (1/64) .0150	.125 (8x)	4	1/8	2-1/2	59015-C6	59.90
.015 (1/64) .0150	.156 (10x)	4	1/8	2-1/2	941815-C6	70.00
.4 mm .0157	1.20 mm (3x)	4	4 mm	50 mm	967609-C6	53.00
.4 mm .0157	2.00 mm (5x)	4	4 mm	50 mm	974509-C6	62.10
.4 mm .0157	3.20 mm (8x)	4	4 mm	50 mm	976109-C6	64.00
.5 mm .0196	1.50 mm (3x)	4	4 mm	50 mm	967611-C6	53.00
.5 mm .0196	2.50 mm (5x)	4	4 mm	50 mm	974511-C6	60.60
.5 mm .0196	4.00 mm (8x)	4	4 mm	50 mm	976111-C6	62.80
.020 .0200	.030 (1.5x)	4	1/8	1-1/2	946120-C6	45.60
.020 .0200	.060 (3x)	4	1/8	1-1/2	57820-C6	45.60
.020 .0200	.080 (4x)	4	1/8	2-1/2	890120-C6	57.50
.020 .0200	.100 (5x)	4	1/8	2-1/2	62620-C6	57.50
.020 .0200	.160 (8x)	4	1/8	2-1/2	59020-C6	59.70
.020 .0200	.200 (10x)	4	1/8	2-1/2	941820-C6	70.00
.6 mm .0236	1.80 mm (3x)	4	4 mm	50 mm	967613-C6	53.00
.6 mm .0236	3.00 mm (5x)	4	4 mm	50 mm	974513-C6	60.60
.6 mm .0236	4.80 mm (8x)	4	4 mm	50 mm	976113-C6	62.80
.025 .0250	.075 (3x)	4	1/8	1-1/2	57825-C6	42.80
.025 .0250	.125 (5x)	4	1/8	2-1/2	62625-C6	55.40
.025 .0250	.203 (8x)	4	1/8	2-1/2	59025-C6	57.70
.025 .0250	.250 (10x)	4	1/8	2-1/2	941825-C6	67.50
.7 mm .0275	2.10 mm (3x)	4	4 mm	50 mm	967615-C6	52.70
.030 .0300	.090 (3x)	6	1/8	1-1/2	57830-C6	42.80
.030 .0300	.156 (5x)	6	1/8	2-1/2	62630-C6	56.40

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Finishers – Square (cont.)

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HIGH TEMP ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .010"					
-.0005"	-.02mm	equivalent	-.000"					
			+ .25mm					
			-.00mm					
.031 (1/32)		.0310	<b>.047</b> (1.5x)	6	1/8	1-1/2	946131-C6	38.30
.031 (1/32)		.0310	<b>.093</b> (3x)	6	1/8	1-1/2	57831-C6	38.30
.031 (1/32)		.0310	<b>.125</b> (4x)	6	1/8	2-1/2	890131-C6	53.00
.031 (1/32)		.0310	<b>.156</b> (5x)	6	1/8	2-1/2	62631-C6	53.00
.031 (1/32)		.0310	<b>.187</b> (6x)	6	1/8	2-1/2	868531-C6	54.10
.031 (1/32)		.0310	<b>.218</b> (7x)	6	1/8	2-1/2	881331-C6	54.10
.031 (1/32)		.0310	<b>.250</b> (8x)	6	1/8	2-1/2	59031-C6	55.10
.031 (1/32)		.0310	<b>.312</b> (10x)	6	1/8	2-1/2	941831-C6	64.60
.031 (1/31)		.0310	<b>.375</b> (12x)	6	1/8	2-1/2	69131-C6	69.40
	.8 mm	.0314	<b>2.40 mm</b> (3x)	6	4 mm	50 mm	967618-C6	47.10
	.8 mm	.0314	<b>4.00 mm</b> (5x)	6	4 mm	50 mm	974518-C6	55.20
	.8 mm	.0314	<b>6.50 mm</b> (8x)	6	4 mm	50 mm	976118-C6	56.90
.035		.0350	<b>.105</b> (3x)	6	1/8	1-1/2	57835-C6	42.00
.035		.0350	<b>.187</b> (5x)	6	1/8	2-1/2	62635-C6	43.60
	.9 mm	.0354	<b>2.70 mm</b> (3x)	6	4 mm	50 mm	967620-C6	45.80
	1.0 mm	.0393	<b>1.50 mm</b> (1.5x)	6	4 mm	50 mm	846722-C6	45.80
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	6	4 mm	50 mm	967622-C6	45.80
	1.0 mm	.0393	<b>5.00 mm</b> (5x)	6	4 mm	50 mm	974522-C6	56.80
	1.0 mm	.0393	<b>8.00 mm</b> (8x)	6	4 mm	50 mm	976122-C6	60.10
	1.0 mm	.0393	<b>10.00 mm</b> (10x)	6	4 mm	50 mm	938322-C6	67.70
.040		.0400	<b>.060</b> (1.5x)	6	1/8	1-1/2	946140-C6	38.30
.040		.0400	<b>.120</b> (3x)	6	1/8	1-1/2	57840-C6	38.30
.040		.0400	<b>.160</b> (4x)	6	1/8	2-1/2	890140-C6	54.00
.040		.0400	<b>.203</b> (5x)	6	1/8	2-1/2	62640-C6	53.00
.040		.0400	<b>.240</b> (6x)	6	1/8	2-1/2	868540-C6	54.60
.040		.0400	<b>.325</b> (8x)	6	1/8	2-1/2	59040-C6	55.10
	1.1 mm	.0433	<b>3.00 mm</b> (3x)	6	4 mm	50 mm	967624-C6	44.60
.045		.0450	<b>.135</b> (3x)	6	1/8	1-1/2	57845-C6	42.00
.045		.0450	<b>.225</b> (5x)	6	1/8	2-1/2	62645-C6	44.00
.047 (3/64)		.0470	<b>.071</b> (1.5x)	6	1/8	1-1/2	946147-C6	39.30
.047 (3/64)		.0470	<b>.141</b> (3x)	6	1/8	1-1/2	57847-C6	38.30
.047 (3/64)		.0470	<b>.187</b> (4x)	6	1/8	2-1/2	890147-C6	53.00
.047 (3/64)		.0470	<b>.250</b> (5x)	6	1/8	2-1/2	62647-C6	53.00
.047 (3/64)		.0470	<b>.281</b> (6x)	6	1/8	2-1/2	868547-C6	54.10
.047 (3/64)		.0470	<b>.328</b> (7x)	6	1/8	2-1/2	881347-C6	54.10
.047 (3/64)		.0470	<b>.375</b> (8x)	6	1/8	2-1/2	59047-C6	55.10
.047 (3/64)		.0470	<b>.480</b> (10x)	6	1/8	2-1/2	941847-C6	64.60
.047 (3/64)		.0470	<b>.570</b> (12x)	6	1/8	2-1/2	69147-C6	70.00
	1.2 mm	.0472	<b>3.50 mm</b> (3x)	6	4 mm	50 mm	967627-C6	46.30
	1.2 mm	.0472	<b>6.00 mm</b> (5x)	6	4 mm	50 mm	974527-C6	57.30
	1.2 mm	.0472	<b>9.50 mm</b> (8x)	6	4 mm	50 mm	976127-C6	60.10
.050		.0500	<b>.075</b> (1.5x)	7	1/8	1-1/2	946150-C6	39.30
.050		.0500	<b>.150</b> (3x)	7	1/8	1-1/2	57850-C6	38.30
.050		.0500	<b>.250</b> (5x)	7	1/8	2-1/2	62650-C6	53.00
.050		.0500	<b>.400</b> (8x)	7	1/8	2-1/2	59050-C6	55.10

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishers – Square (cont.)

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CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .010" - .000" + .25mm - .00mm					
	1.3 mm	.0511	<b>4.00 mm</b> (3x)	7	4 mm	50 mm	967629-C6	46.30
.055		.0550	<b>.165</b> (3x)	7	1/8	1-1/2	57855-C6	41.40
.055		.0550	<b>.275</b> (5x)	7	1/8	2-1/2	62655-C6	42.50
	1.4 mm	.0551	<b>4.00 mm</b> (3x)	7	4 mm	50 mm	967631-C6	45.80
	1.4 mm	.0551	<b>7.00 mm</b> (5x)	7	4 mm	50 mm	974531-C6	56.80
	1.4 mm	.0551	<b>11.00 mm</b> (8x)	7	4 mm	50 mm	976131-C6	60.10
	1.5 mm	.0590	<b>2.20 mm</b> (1.5x)	7	4 mm	50 mm	846733-C6	44.70
	1.5 mm	.0590	<b>4.50 mm</b> (3x)	7	4 mm	50 mm	967633-C6	44.70
	1.5 mm	.0590	<b>7.50 mm</b> (5x)	7	4 mm	50 mm	974533-C6	55.20
	1.5 mm	.0590	<b>12.00 mm</b> (8x)	7	4 mm	50 mm	976133-C6	58.40
	1.5 mm	.0590	<b>15.00 mm</b> (10x)	7	4 mm	50 mm	938333-C6	69.10
.060		.0600	<b>.090</b> (1.5x)	7	1/8	1-1/2	946160-C6	37.80
.060		.0600	<b>.180</b> (3x)	7	1/8	1-1/2	57860-C6	37.80
.060		.0600	<b>.312</b> (5x)	7	1/8	2-1/2	62660-C6	48.90
.060		.0600	<b>.500</b> (8x)	7	1/8	2-1/2	59060-C6	51.10
.062 (1/16)		.0620	<b>.093</b> (1.5x)	7	1/8	1-1/2	946162-C6	37.80
.062 (1/16)		.0620	<b>.186</b> (3x)	7	1/8	1-1/2	57862-C6	37.80
.062 (1/16)		.0620	<b>.250</b> (4x)	7	1/8	2-1/2	890162-C6	50.00
.062 (1/16)		.0620	<b>.312</b> (5x)	7	1/8	2-1/2	62662-C6	50.00
.062 (1/16)		.0620	<b>.375</b> (6x)	7	1/8	2-1/2	868562-C6	51.20
.062 (1/16)		.0620	<b>.437</b> (7x)	7	1/8	2-1/2	881362-C6	51.20
.062 (1/16)		.0620	<b>.500</b> (8x)	7	1/8	2-1/2	59062-C6	52.00
.062 (1/16)		.0620	<b>.625</b> (10x)	7	1/8	2-1/2	941862-C6	65.80
.062 (1/16)		.0620	<b>.750</b> (12x)	7	1/8	2-1/2	69162-C6	74.60
.062 (1/16)		.0620	<b>.950</b> (15x)	7	1/8	2-1/2	68762-C6	93.90
	1.6 mm	.0629	<b>5.00 mm</b> (3x)	7	4 mm	50 mm	967636-C6	44.70
	1.6 mm	.0629	<b>8.00 mm</b> (5x)	7	4 mm	50 mm	974536-C6	55.20
	1.6 mm	.0629	<b>13.00 mm</b> (8x)	7	4 mm	50 mm	976136-C6	58.40
	1.7 mm	.0669	<b>5.00 mm</b> (3x)	7	4 mm	50 mm	967638-C6	44.30
.070		.0700	<b>.210</b> (3x)	7	1/8	1-1/2	57870-C6	35.70
.070		.0700	<b>.375</b> (5x)	7	1/8	2-1/2	62670-C6	50.00
.070		.0700	<b>.570</b> (8x)	7	1/8	2-1/2	59070-C6	52.00
	1.8 mm	.0708	<b>5.50 mm</b> (3x)	7	4 mm	50 mm	967640-C6	44.70
	1.8 mm	.0708	<b>9.00 mm</b> (5x)	7	4 mm	50 mm	974540-C6	55.20
	1.8 mm	.0708	<b>14.00 mm</b> (8x)	7	4 mm	50 mm	976140-C6	58.40
	1.9 mm	.0748	<b>5.50 mm</b> (3x)	7	4 mm	50 mm	967642-C6	44.70
.078 (5/64)		.0780	<b>.117</b> (1.5x)	7	1/8	1-1/2	946178-C6	35.70
.078 (5/64)		.0780	<b>.234</b> (3x)	7	1/8	1-1/2	57878-C6	35.70
.078 (5/64)		.0780	<b>.312</b> (4x)	7	1/8	2-1/2	890178-C6	50.00
.078 (5/64)		.0780	<b>.406</b> (5x)	7	1/8	2-1/2	62678-C6	50.00
.078 (5/64)		.0780	<b>.475</b> (6x)	7	1/8	2-1/2	868578-C6	51.20
.078 (5/64)		.0780	<b>.550</b> (7x)	7	1/8	2-1/2	881378-C6	51.20
.078 (5/64)		.0780	<b>.625</b> (8x)	7	1/8	2-1/2	59078-C6	52.00
.078 (5/64)		.0780	<b>.800</b> (10x)	7	1/8	2-1/2	941878-C6	65.80
.078 (5/64)		.0780	<b>.940</b> (12x)	7	1/8	2-1/2	69178-C6	74.60
.078 (5/64)		.0780	<b>1.187</b> (15x)	7	1/8	2-1/2	68778-C6	93.90

HIGH TEMP ALLOYS

continued on next page

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Finishers – Square (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .010"					
- .0005"	- .02mm	equivalent	- .000"					
			+ .25mm					
			- .00mm					
	2.0 mm	.0787	<b>3.00 mm</b> (1.5x)	7	4 mm	50 mm	846745-C6	44.30
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	7	4 mm	50 mm	967645-C6	44.30
	2.0 mm	.0787	<b>10.00 mm</b> (5x)	7	4 mm	50 mm	974545-C6	54.90
	2.0 mm	.0787	<b>16.00 mm</b> (8x)	7	4 mm	50 mm	976145-C6	58.00
.080		.0800	<b>.120</b> (1.5x)	7	1/8	1-1/2	946180-C6	38.50
.080		.0800	<b>.240</b> (3x)	7	1/8	1-1/2	57880-C6	35.70
.080		.0800	<b>.406</b> (5x)	7	1/8	2-1/2	62680-C6	50.90
.080		.0800	<b>.650</b> (8x)	7	1/8	2-1/2	59080-C6	52.50
.090		.0900	<b>.270</b> (3x)	7	1/8	1-1/2	57890-C6	36.40
.090		.0900	<b>.450</b> (5x)	7	1/8	2-1/2	62690-C6	50.00
.090		.0900	<b>.750</b> (8x)	7	1/8	2-1/2	59090-C6	52.50
.093 (3/32)		.0930	<b>.074</b> (0.8x)	7	1/8	1-1/2	836593-C6	39.20
.093 (3/32)		.0930	<b>.140</b> (1.5x)	7	1/8	1-1/2	946193-C6	35.70
.093 (3/32)		.0930	<b>.279</b> (3x)	7	1/8	1-1/2	57893-C6	35.70
.093 (3/32)		.0930	<b>.375</b> (4x)	7	1/8	2-1/2	890193-C6	50.00
.093 (3/32)		.0930	<b>.500</b> (5x)	7	1/8	2-1/2	62693-C6	50.00
.093 (3/32)		.0930	<b>.585</b> (6x)	7	1/8	2-1/2	868593-C6	51.20
.093 (3/32)		.0930	<b>.670</b> (7x)	7	1/8	2-1/2	881393-C6	51.20
.093 (3/32)		.0930	<b>.750</b> (8x)	7	1/8	2-1/2	59093-C6	52.00
.093 (3/32)		.0930	<b>.950</b> (10x)	7	1/8	2-1/2	941893-C6	66.40
.093 (3/32)		.0930	<b>1.125</b> (12x)	7	1/8	2-1/2	69193-C6	73.90
.093 (3/32)		.0930	<b>1.400</b> (15x)	7	1/8	3	68793-C6	93.40
	2.5 mm	.0984	<b>7.50 mm</b> (3x)	7	4 mm	50 mm	967651-C6	44.30
.100		.1000	<b>.150</b> (1.5x)	7	1/8	1-1/2	960100-C6	36.60
.100		.1000	<b>.300</b> (3x)	7	1/8	1-1/2	57900-C6	35.70
.100		.1000	<b>.500</b> (5x)	7	1/8	2-1/2	62700-C6	50.00
.100		.1000	<b>.800</b> (8x)	7	1/8	2-1/2	59100-C6	52.00
.109 (7/64)		.1090	<b>.327</b> (3x)	7	1/8	1-1/2	57902-C6	35.70
.109 (7/64)		.1090	<b>.570</b> (5x)	7	1/8	2-1/2	62702-C6	50.00
.109 (7/64)		.1090	<b>.900</b> (8x)	7	1/8	2-1/2	59102-C6	54.60
	3.0 mm	.1181	<b>4.50 mm</b> (1.5x)	7	4 mm	50 mm	846757-C6	44.70
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	7	4 mm	50 mm	967657-C6	44.30
	3.0 mm	.1181	<b>12.00 mm</b> (4x)	7	4 mm	50 mm	773057-C6	44.70
	3.0 mm	.1181	<b>15.00 mm</b> (5x)	7	4 mm	50 mm	974557-C6	45.70
	3.0 mm	.1181	<b>24.00 mm</b> (8x)	7	4 mm	50 mm	976157-C6	50.10

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HIGH TEMP ALLOYS



# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishers – Square (cont.)

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CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" - .002"	+ .00mm - .04mm	decimal equivalent	+ .030" - .000" + .75mm - .00mm					
.125 (1/8)		.1250	<b>.100</b> (0.8x)	7	1/8	1-1/2	836608-C6	37.90
.125 (1/8)		.1250	<b>.187</b> (1.5x)	7	1/8	1-1/2	960108-C6	34.30
.125 (1/8)		.1250	<b>.375</b> (3x)	7	1/8	1-1/2	57908-C6	33.60
.125 (1/8)		.1250	<b>.500</b> (4x)	7	1/8	2-1/2	890208-C6	49.10
.125 (1/8)		.1250	<b>.625</b> (5x)	7	1/8	2-1/2	62708-C6	49.10
.125 (1/8)		.1250	<b>.750</b> (6x)	7	1/8	2-1/2	868608-C6	50.40
.125 (1/8)		.1250	<b>.875</b> (7x)	7	1/8	2-1/2	881408-C6	50.40
.125 (1/8)		.1250	<b>1.000</b> (8x)	7	1/8	2-1/2	59108-C6	51.20
.125 (1/8)		.1250	<b>1.250</b> (10x)	7	1/8	2-1/2	941908-C6	65.10
.125 (1/8)		.1250	<b>1.500</b> (12x)	7	1/8	3	69208-C6	74.00
.125 (1/8)		.1250	<b>1.875</b> (15x)	7	1/8	3	68808-C6	95.70
.140 (9/64)		.1406	<b>.425</b> (3x)	7	3/16	2	57909-C6	47.10
.140 (9/64)		.1406	<b>.750</b> (5x)	7	3/16	3	62709-C6	49.10
.140 (9/64)		.1406	<b>1.125</b> (8x)	7	3/16	3	59109-C6	53.40
.156 (5/32)		.1562	<b>.235</b> (1.5x)	7	3/16	2	960110-C6	38.80
.156 (5/32)		.1562	<b>.470</b> (3x)	7	3/16	2	57910-C6	38.30
.156 (5/32)		.1562	<b>.625</b> (4x)	7	3/16	3	890210-C6	39.10
.156 (5/32)		.1562	<b>.750</b> (5x)	7	3/16	3	62710-C6	51.70
.156 (5/32)		.1562	<b>1.250</b> (8x)	7	3/16	3	59110-C6	56.60
.187 (3/16)		.1875	<b>.150</b> (0.8x)	7	3/16	2	836612-C6	42.50
.187 (3/16)		.1875	<b>.285</b> (1.5x)	7	3/16	2	960112-C6	38.80
.187 (3/16)		.1875	<b>.570</b> (3x)	7	3/16	2	57912-C6	38.30
.187 (3/16)		.1875	<b>.750</b> (4x)	7	3/16	3	890212-C6	52.70
.187 (3/16)		.1875	<b>1.000</b> (5x)	7	3/16	3	62712-C6	51.70
.187 (3/16)		.1875	<b>1.156</b> (6x)	7	3/16	3	868612-C6	55.30
.187 (3/16)		.1875	<b>1.312</b> (7x)	7	3/16	3	881412-C6	55.80
.187 (3/16)		.1875	<b>1.500</b> (8x)	7	3/16	3	59112-C6	56.20
	5.0 mm	.1968	<b>25.00 mm</b> (5x)	7	6 mm	63 mm	974564-C6	53.40
.218 (7/32)		.2187	<b>.660</b> (3x)	7	1/4	2-1/2	57814-C6	51.90
.218 (7/32)		.2187	<b>1.125</b> (5x)	7	1/4	4	62714-C6	65.80
	6.0 mm	.2362	<b>18.00 mm</b> (3x)	7	6 mm	63 mm	967666-C6	50.30
	6.0 mm	.2362	<b>30.00 mm</b> (5x)	7	6 mm	63 mm	974566-C6	53.40
.250 (1/4)		.2500	<b>.200</b> (0.8x)	7	1/4	2-1/2	836616-C6	54.30
.250 (1/4)		.2500	<b>.375</b> (1.5x)	7	1/4	2-1/2	960116-C6	50.60
.250 (1/4)		.2500	<b>.750</b> (3x)	7	1/4	2-1/2	57916-C6	49.80
.250 (1/4)		.2500	<b>1.000</b> (4x)	7	1/4	4	890216-C6	64.70
.250 (1/4)		.2500	<b>1.250</b> (5x)	7	1/4	4	62716-C6	63.50
.250 (1/4)		.2500	<b>1.500</b> (6x)	7	1/4	4	868616-C6	68.30
.250 (1/4)		.2500	<b>1.750</b> (7x)	7	1/4	4	881416-C6	68.30
.250 (1/4)		.2500	<b>2.000</b> (8x)	7	1/4	4	59116-C6	68.40
.312 (5/16)		.3125	<b>.470</b> (1.5x)	7	5/16	2-1/2	960120-C6	69.70
.312 (5/16)		.3125	<b>1.000</b> (3x)	7	5/16	2-1/2	57920-C6	67.40
.375 (3/8)		.3750	<b>.570</b> (1.5x)	7	3/8	2-1/2	960124-C6	77.60
.375 (3/8)		.3750	<b>1.125</b> (3x)	7	3/8	2-1/2	57924-C6	77.00
.375 (3/8)		.3750	<b>2.000</b> (5x)	7	3/8	4	62724-C6	99.60
.500 (1/2)		.5000	<b>.750</b> (1.5x)	7	1/2	3	960132-C6	101.70
.500 (1/2)		.5000	<b>1.500</b> (3x)	7	1/2	3	57932-C6	101.70

HIGH TEMP ALLOYS

PLEASE SEE SPEEDS & FEEDS ON PAGE 154-155

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Finishers – Square (cont.)

HIGH TEMP ALLOYS

SPEEDS & FEEDS (Finishers for High Temp Alloys)														
Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter									Depth of Cut		
			.015	.031	.047	.062	.078	.093	.125	.187	.250	Radial	Axial	
Stainless Steels: 40x, 41x, 42x, 43x, 44x, 13-8, 15-5, 15-7, 17-4, 17-7	275 - 300 300 - 350	400 350	Finishing (0.8x LOC)	.00013	.00026	.00040	.00053	.00066	.00079	.00106	.00158	.00212	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.00012	.00024	.00036	.00048	.00060	.00072	.00096	.00144	.00193	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00011	.00022	.00033	.00043	.00055	.00065	.00088	.00131	.00175	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00010	.00021	.00031	.00042	.00052	.00062	.00084	.00125	.00167	< .10x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.00008	.00016	.00025	.00033	.00041	.00049	.00066	.00098	.00131	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00007	.00015	.00022	.00030	.00037	.00044	.00060	.00089	.00119	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.00006	.00013	.00020	.00026	.00032	.00039	.00052	.00078	.00104	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.00006	.00012	.00018	.00024	.00030	.00036	.00048	.00072	.00096	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00011	.00017	.00023	.00028	.00034	.00046	.00068	.00091	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.00011	.00016	.00022	.00027	.00033	.00044	.00065	.00088	< .04x Dia	.5x - 12x Dia
Finishing (15x LOC)	-	-	-	.00020	.00025	.00029	.00039	.00059	.00079	< .02x Dia	.5x - 15x Dia			
Tool Steels: D, H, M, T, S series	300 - 350	500	Finishing (0.8x LOC)	.00013	.00026	.00040	.00053	.00066	.00079	.00106	.00158	.00212	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.00012	.00024	.00036	.00048	.00060	.00072	.00096	.00144	.00193	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00011	.00022	.00033	.00043	.00055	.00065	.00088	.00131	.00175	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00010	.00021	.00031	.00042	.00052	.00062	.00084	.00125	.00167	< .10x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.00008	.00016	.00025	.00033	.00041	.00049	.00066	.00098	.00131	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00007	.00015	.00022	.00030	.00037	.00044	.00060	.00089	.00119	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.00006	.00013	.00020	.00026	.00032	.00039	.00052	.00078	.00104	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.00006	.00012	.00018	.00024	.00030	.00036	.00048	.00072	.00096	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00011	.00017	.00023	.00028	.00034	.00046	.00068	.00091	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.00011	.00016	.00022	.00027	.00033	.00044	.00065	.00088	< .04x Dia	.5x - 12x Dia
Finishing (15x LOC)	-	-	-	.00020	.00025	.00029	.00039	.00059	.00079	< .02x Dia	.5x - 15x Dia			
	350 - 400	250	Finishing (0.8x LOC)	.00010	.00021	.00032	.00042	.00053	.00063	.00085	.00127	.00169	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.00009	.00019	.00029	.00038	.00048	.00057	.00077	.00115	.00154	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00008	.00017	.00026	.00035	.00044	.00052	.00070	.00105	.00140	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00008	.00017	.00025	.00033	.00042	.00050	.00067	.00100	.00134	< .10x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.00006	.00013	.00020	.00026	.00033	.00039	.00053	.00079	.00105	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00006	.00012	.00018	.00024	.00030	.00035	.00048	.00071	.00095	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.00005	.00010	.00016	.00021	.00026	.00031	.00042	.00062	.00083	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.00005	.00010	.00014	.00019	.00024	.00029	.00039	.00058	.00077	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00009	.00014	.00018	.00023	.00027	.00036	.00054	.00073	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.00009	.00013	.00017	.00022	.00026	.00035	.00052	.00070	< .04x Dia	.5x - 12x Dia
Finishing (15x LOC)	-	-	-	.00016	.00020	.00023	.00032	.00047	.00063	< .02x Dia	.5x - 15x Dia			
	400 - 540	200	Finishing (0.8x LOC)	.00008	.00017	.00026	.00034	.00043	.00051	.00069	.00103	.00138	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.00008	.00016	.00024	.00031	.00039	.00047	.00063	.00094	.00125	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00007	.00014	.00021	.00028	.00035	.00042	.00057	.00085	.00114	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00007	.00013	.00020	.00027	.00034	.00040	.00054	.00081	.00109	< .10x Dia	.5x - 5x Dia
			Finishing (5x LOC)	.00005	.00011	.00016	.00021	.00027	.00032	.00043	.00064	.00085	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00005	.00010	.00015	.00019	.00024	.00029	.00039	.00058	.00077	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.00004	.00008	.00013	.00017	.00021	.00025	.00034	.00050	.00067	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.00004	.00008	.00012	.00016	.00020	.00023	.00031	.00047	.00063	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00007	.00011	.00015	.00018	.00022	.00030	.00044	.00059	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.00007	.00011	.00014	.00018	.00021	.00028	.00043	.00057	< .04x Dia	.5x - 12x Dia
Finishing (15x LOC)	-	-	-	.00013	.00016	.00019	.00026	.00038	.00051	< .02x Dia	.5x - 15x Dia			

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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Finishers – Square (cont.)

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SPEEDS & FEEDS (Finishers for High Temp Alloys)															
Material	Hardness (HBn)	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter								Depth of Cut			
				.015	.031	.047	.062	.078	.093	.125	.187	.250	Radial	Axial	
Titanium: All alloys	275 - 300 300 - 350	300 200	Finishing (0.8x LOC)	.00006	.00012	.00018	.00023	.00029	.00035	.00047	.00070	.00094	< .10x Dia	.5x - 1.5x Dia	
			Finishing (1.5x LOC)	.00005	.00011	.00016	.00021	.00027	.00032	.00043	.00064	.00085	< .10x Dia	.5x - 1.5x Dia	
			Finishing (3x LOC)	.00005	.00010	.00015	.00019	.00024	.00029	.00039	.00058	.00078	< .10x Dia	.5x - 3x Dia	
			Finishing (4x LOC)	.00004	.00009	.00014	.00018	.00023	.00028	.00037	.00055	.00074	< .10x Dia	.5x - 4x Dia	
			Finishing (5x LOC)	.00003	.00007	.00011	.00014	.00018	.00022	.00029	.00043	.00058	< .07x Dia	.5x - 5x Dia	
			Finishing (6x LOC)	.00003	.00007	.00010	.00013	.00016	.00020	.00026	.00039	.00053	< .07x Dia	.5x - 6x Dia	
			Finishing (7x LOC)	.00003	.00006	.00009	.00011	.00014	.00017	.00023	.00034	.00046	< .05x Dia	.5x - 7x Dia	
			Finishing (8x LOC)	.00003	.00005	.00008	.00011	.00013	.00016	.00021	.00032	.00043	< .05x Dia	.5x - 8x Dia	
			Finishing (10x LOC)	-	.00005	.00008	.00010	.00013	.00015	.00020	.00030	.00040	< .04x Dia	.5x - 10x Dia	
			Finishing (12x LOC)	-	.00005	.00007	.00010	.00012	.00014	.00019	.00029	.00039	< .04x Dia	.5x - 12x Dia	
	Finishing (15x LOC)	-	-	-	.00009	.00011	.00013	.00017	.00026	.00035	< .02x Dia	.5x - 15x Dia			
	350 - 400 400 - 425	150 100	Finishing (0.8x LOC)	.00005	.00009	.00014	.00019	.00023	.00028	.00038	.00056	.00075	< .10x Dia	.5x - 1.5x Dia	
			Finishing (1.5x LOC)	.00004	.00008	.00013	.00017	.00021	.00025	.00034	.00051	.00068	< .10x Dia	.5x - 1.5x Dia	
			Finishing (3x LOC)	.00004	.00008	.00012	.00015	.00019	.00023	.00031	.00046	.00062	< .10x Dia	.5x - 3x Dia	
			Finishing (4x LOC)	.00004	.00007	.00011	.00015	.00019	.00022	.00030	.00044	.00059	< .10x Dia	.5x - 4x Dia	
			Finishing (5x LOC)	.00003	.00006	.00009	.00012	.00015	.00017	.00023	.00035	.00047	< .07x Dia	.5x - 5x Dia	
			Finishing (6x LOC)	.00003	.00005	.00008	.00010	.00013	.00016	.00021	.00032	.00042	< .07x Dia	.5x - 6x Dia	
			Finishing (7x LOC)	.00002	.00005	.00007	.00009	.00011	.00014	.00018	.00028	.00037	< .05x Dia	.5x - 7x Dia	
			Finishing (8x LOC)	.00002	.00004	.00006	.00008	.00011	.00013	.00017	.00026	.00034	< .05x Dia	.5x - 8x Dia	
			Finishing (10x LOC)	-	.00004	.00006	.00008	.00010	.00012	.00016	.00024	.00032	< .04x Dia	.5x - 10x Dia	
			Finishing (12x LOC)	-	.00004	.00006	.00008	.00010	.00012	.00016	.00023	.00031	< .04x Dia	.5x - 12x Dia	
	Finishing (15x LOC)	-	-	-	.00007	.00009	.00010	.00014	.00021	.00028	< .02x Dia	.5x - 15x Dia			
	Nickel Alloys: Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	275 - 300 300 - 350	150 100	Finishing (0.8x LOC)	.00002	.00005	.00007	.00010	.00012	.00015	.00020	.00029	.00039	< .10x Dia	.5x - 1.5x Dia
				Finishing (1.5x LOC)	.00002	.00004	.00007	.00009	.00011	.00013	.00018	.00027	.00036	< .10x Dia	.5x - 1.5x Dia
				Finishing (3x LOC)	.00002	.00004	.00006	.00008	.00010	.00012	.00016	.00024	.00033	< .10x Dia	.5x - 3x Dia
				Finishing (4x LOC)	.00002	.00004	.00005	.00007	.00009	.00011	.00014	.00021	.00029	< .10x Dia	.5x - 4x Dia
				Finishing (5x LOC)	.00001	.00002	.00004	.00005	.00006	.00007	.00010	.00015	.00020	< .05x Dia	.5x - 5x Dia
				Finishing (6x LOC)	.00001	.00002	.00003	.00005	.00006	.00007	.00009	.00014	.00018	< .05x Dia	.5x - 6x Dia
Finishing (7x LOC)				.00001	.00002	.00003	.00004	.00005	.00006	.00007	.00011	.00015	< .03x Dia	.5x - 7x Dia	
Finishing (8x LOC)				.00001	.00002	.00003	.00004	.00005	.00006	.00008	.00011	.00015	< .03x Dia	.5x - 8x Dia	
Finishing (10x LOC)				-	.00002	.00003	.00003	.00004	.00005	.00007	.00010	.00014	< .02x Dia	.5x - 10x Dia	
Finishing (12x LOC)				-	.00002	.00002	.00003	.00004	.00005	.00007	.00010	.00013	< .02x Dia	.5x - 12x Dia	
Finishing (15x LOC)		-	-	-	.00003	.00004	.00004	.00006	.00009	.00011	< .01x Dia	.5x - 15x Dia			
350 - 400 400 - 425		80 60	Finishing (0.8x LOC)	.00002	.00004	.00006	.00008	.00010	.00012	.00016	.00024	.00031	< .10x Dia	.5x - 1.5x Dia	
			Finishing (1.5x LOC)	.00002	.00004	.00005	.00007	.00009	.00011	.00014	.00021	.00029	< .10x Dia	.5x - 1.5x Dia	
			Finishing (3x LOC)	.00002	.00003	.00005	.00006	.00008	.00010	.00013	.00019	.00026	< .10x Dia	.5x - 3x Dia	
			Finishing (4x LOC)	.00001	.00003	.00004	.00006	.00007	.00009	.00011	.00017	.00023	< .10x Dia	.5x - 4x Dia	
			Finishing (5x LOC)	.00001	.00002	.00003	.00004	.00005	.00006	.00008	.00012	.00016	< .05x Dia	.5x - 5x Dia	
			Finishing (6x LOC)	.00001	.00002	.00003	.00004	.00005	.00005	.00007	.00011	.00015	< .05x Dia	.5x - 6x Dia	
			Finishing (7x LOC)	.00001	.00001	.00002	.00003	.00004	.00004	.00006	.00009	.00012	< .03x Dia	.5x - 7x Dia	
			Finishing (8x LOC)	.00001	.00002	.00002	.00003	.00004	.00005	.00006	.00009	.00012	< .03x Dia	.5x - 8x Dia	
			Finishing (10x LOC)	-	.00001	.00002	.00003	.00003	.00004	.00006	.00008	.00011	< .02x Dia	.5x - 10x Dia	
			Finishing (12x LOC)	-	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00010	< .02x Dia	.5x - 12x Dia	
Finishing (15x LOC)		-	-	-	.00002	.00003	.00003	.00005	.00007	.00009	< .01x Dia	.5x - 15x Dia			

HIGH TEMP ALLOYS

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Finishers – Square – Long Reach



HIGH TEMP ALLOYS

- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Long reach design for deep cavities and increased rigidity • Reduced neck diameter to avoid heeling
- Length of cut = 3x diameter • Variable helix design (approx. 41°) reduces chatter and harmonics improving finish
- Large core and eccentric relief for improved tool life
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders • End cutting (not center cutting)
- Solid carbide • CNC ground in the USA

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITiN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.0005"	+0.00mm	decimal	+0.010"	+0.010"					
-0.0005"	-0.02mm	equivalent	+0.000"	-0.000"					
			+0.25mm	+0.25mm					
			-0.00mm	-0.00mm					
.015 (1/64)	.0150	.0150	.045	<b>.078</b> (5x)	4	1/8	2-1/2	940715-C6	62.10
.015 (1/64)	.0150	.0150	.045	<b>.125</b> (8x)	4	1/8	2-1/2	962115-C6	64.20
.015 (1/64)	.0150	.0150	.045	<b>.187</b> (12x)	4	1/8	2-1/2	951815-C6	68.30
.020	.0200	.0200	.060	<b>.160</b> (8x)	4	1/8	2-1/2	962120-C6	56.70
.025	.0250	.0250	.075	<b>.203</b> (8x)	4	1/8	2-1/2	962125-C6	56.10
.031 (1/32)	.0310	.0310	.093	<b>.156</b> (5x)	6	1/8	2-1/2	940731-C6	54.70
.031 (1/32)	.0310	.0310	.093	<b>.187</b> (6x)	6	1/8	2-1/2	792531-C6	54.70
.031 (1/32)	.0310	.0310	.093	<b>.250</b> (8x)	6	1/8	2-1/2	962131-C6	56.10
.031 (1/32)	.0310	.0310	.093	<b>.312</b> (10x)	6	1/8	2-1/2	862831-C6	58.60
.031 (1/32)	.0310	.0310	.093	<b>.375</b> (12x)	6	1/8	2-1/2	951831-C6	59.70
1.0 mm	.0393	3.00 mm	<b>8.0 mm</b> (8x)	6	4 mm	50 mm	924722-C6	57.20	
.040	.0400	.120	<b>.325</b> (8x)	6	1/8	2-1/2	962140-C6	56.70	
.047 (3/64)	.0470	.141	<b>.250</b> (5x)	6	1/8	2-1/2	940747-C6	54.70	
.047 (3/64)	.0470	.141	<b>.375</b> (8x)	6	1/8	2-1/2	962147-C6	56.10	
.047 (3/64)	.0470	.141	<b>.570</b> (12x)	6	1/8	2-1/2	951847-C6	59.70	
.050	.0500	.150	<b>.250</b> (5x)	7	1/8	2-1/2	940750-C6	54.70	
.050	.0500	.150	<b>.400</b> (8x)	7	1/8	2-1/2	962150-C6	56.10	
1.5 mm	.0590	4.50 mm	<b>12.0 mm</b> (8x)	7	4 mm	50 mm	924733-C6	57.20	
.060	.0600	.180	<b>.500</b> (8x)	7	1/8	2-1/2	962160-C6	56.10	
.062 (1/16)	.0620	.186	<b>.312</b> (5x)	7	1/8	2-1/2	940762-C6	52.20	
.062 (1/16)	.0620	.186	<b>.375</b> (6x)	7	1/8	2-1/2	792562-C6	52.20	
.062 (1/16)	.0620	.186	<b>.500</b> (8x)	7	1/8	2-1/2	962162-C6	53.80	
.062 (1/16)	.0620	.186	<b>.625</b> (10x)	7	1/8	2-1/2	862862-C6	55.70	
.062 (1/16)	.0620	.186	<b>.750</b> (12x)	7	1/8	2-1/2	951862-C6	57.50	
.070	.0700	.210	<b>.570</b> (8x)	7	1/8	2-1/2	962170-C6	54.30	
.078 (5/64)	.0780	.234	<b>.406</b> (5x)	7	1/8	2-1/2	940778-C6	52.20	
.078 (5/64)	.0780	.234	<b>.625</b> (8x)	7	1/8	2-1/2	962178-C6	53.80	
.078 (5/64)	.0780	.234	<b>.940</b> (12x)	7	1/8	2-1/2	951878-C6	57.50	
2.0 mm	.0787	6.00 mm	<b>16.0 mm</b> (8x)	7	4 mm	50 mm	924745-C6	54.90	

continued on next page

## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishers – Square – Long Reach (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm	+ .010" - .000" + .25mm - .00mm					
.080		.0800	.240	<b>.650</b> (8x)	7	1/8	2-1/2	962180-C6	54.30
.090		.0900	.270	<b>.750</b> (8x)	7	1/8	2-1/2	962190-C6	54.30
.093 (3/32)		.0930	.279	<b>.500</b> (5x)	7	1/8	2-1/2	940793-C6	52.20
.093 (3/32)		.0930	.279	<b>.585</b> (6x)	7	1/8	2-1/2	792593-C6	52.70
.093 (3/32)		.0930	.279	<b>.750</b> (8x)	7	1/8	2-1/2	962193-C6	53.80
.093 (3/32)		.0930	.279	<b>.950</b> (10x)	7	1/8	2-1/2	862893-C6	56.20
.093 (3/32)		.0930	.279	<b>1.125</b> (12x)	7	1/8	2-1/2	951893-C6	57.50
.100		.1000	.300	<b>.800</b> (8x)	7	1/8	2-1/2	962200-C6	53.80
.109 (7/64)		.1094	.327	<b>.570</b> (5x)	7	1/8	2-1/2	940802-C6	52.20
.109 (7/64)		.1094	.327	<b>.900</b> (8x)	7	1/8	2-1/2	962202-C6	53.80
3.0 mm		.1181	9.00 mm	<b>24.0 mm</b> (8x)	7	4 mm	50 mm	924757-C6	54.30

HIGH TEMP ALLOYS

D <sub>1</sub>		L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	
+ .000" - .002"		+ .030" - .000"	+ .030" - .000"						
.125 (1/8)		.1250	.375	<b>.625</b> (5x)	7	1/8	2-1/2	940808-C6	50.50
.125 (1/8)		.1250	.375	<b>.750</b> (6x)	7	1/8	2-1/2	792608-C6	50.90
.125 (1/8)		.1250	.375	<b>1.000</b> (8x)	7	1/8	2-1/2	962208-C6	51.90
.125 (1/8)		.1250	.375	<b>1.250</b> (10x)	7	1/8	3	862908-C6	54.10
.125 (1/8)		.1250	.375	<b>1.500</b> (12x)	7	1/8	3	951908-C6	55.30
.140 (9/64)		.1406	.425	<b>.703</b> (5x)	7	3/16	3	940809-C6	54.30
.140 (9/64)		.1406	.425	<b>1.125</b> (8x)	7	3/16	3	962209-C6	55.80
.156 (5/32)		.1562	.470	<b>.750</b> (5x)	7	3/16	3	940810-C6	50.50
.156 (5/32)		.1562	.470	<b>1.250</b> (8x)	7	3/16	3	962210-C6	51.90
.187 (3/16)		.1875	.570	<b>1.000</b> (5x)	7	3/16	3	940812-C6	53.50
.187 (3/16)		.1875	.570	<b>1.500</b> (8x)	7	3/16	3	962212-C6	55.40
.250 (1/4)		.2500	.750	<b>1.250</b> (5x)	7	1/4	4	940816-C6	64.60
.250 (1/4)		.2500	.750	<b>2.000</b> (8x)	7	1/4	4	962216-C6	67.40

PLEASE SEE SPEEDS & FEEDS ON PAGE 158



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# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

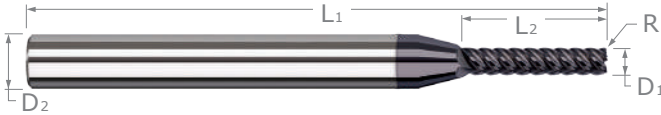
## Finishers – Square – Long Reach (cont.)

HIGH TEMP ALLOYS

SPEEDS & FEEDS (Finishers – Long Reach for High Temp Alloys)														
Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter										Depth of Cut	
			.015	.031	.047	.062	.078	.093	.125	.187	.250	Radial	Axial	
<b>Stainless Steels:</b> 40x, 41x, 42x, 43x, 44x, 13-8, 15-5, 15-7, 17-4, 17-7	275 - 300	400	Finishing (5x Reach)	.0009	.0020	.0030	.0039	.0049	.0059	.0079	.0118	.0158	< .10x Dia	.5x - 3x Dia
		350	Finishing (6x Reach)	.0009	.0018	.0028	.0037	.0046	.0055	.0074	.0111	.0148	< .07x Dia	.5x - 3x Dia
	300 - 350	Finishing (8x Reach)	.0008	.0016	.0025	.0032	.0041	.0049	.0065	.0098	.0131	< .07x Dia	.5x - 3x Dia	
		Finishing (10x Reach)	.0007	.0015	.0023	.0031	.0039	.0046	.0062	.0093	.0124	< .05x Dia	.5x - 3x Dia	
		Finishing (12x Reach)	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0088	.0118	< .05x Dia	.5x - 3x Dia	
<b>Tool Steels:</b> D, H, M, T, S series	300 - 350	500	Finishing (5x Reach)	.0009	.0020	.0030	.0039	.0049	.0059	.0079	.0118	.0158	< .10x Dia	.5x - 3x Dia
			Finishing (6x Reach)	.0009	.0018	.0028	.0037	.0046	.0055	.0074	.0111	.0148	< .07x Dia	.5x - 3x Dia
			Finishing (8x Reach)	.0008	.0016	.0025	.0032	.0041	.0049	.0065	.0098	.0131	< .07x Dia	.5x - 3x Dia
			Finishing (10x Reach)	.0007	.0015	.0023	.0031	.0039	.0046	.0062	.0093	.0124	< .05x Dia	.5x - 3x Dia
			Finishing (12x Reach)	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0088	.0118	< .05x Dia	.5x - 3x Dia
	350 - 400	250	Finishing (5x Reach)	.0008	.0016	.0024	.0031	.0039	.0047	.0063	.0094	.0126	< .10x Dia	.5x - 3x Dia
			Finishing (6x Reach)	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0089	.0118	< .07x Dia	.5x - 3x Dia
			Finishing (8x Reach)	.0006	.0013	.0020	.0026	.0033	.0039	.0052	.0078	.0105	< .07x Dia	.5x - 3x Dia
			Finishing (10x Reach)	.0006	.0012	.0019	.0025	.0031	.0037	.0050	.0074	.0100	< .05x Dia	.5x - 3x Dia
			Finishing (12x Reach)	.0006	.0012	.0018	.0023	.0029	.0035	.0047	.0071	.0095	< .05x Dia	.5x - 3x Dia
	400 - 540	200	Finishing (5x Reach)	.0006	.0013	.0019	.0025	.0032	.0038	.0051	.0077	.0102	< .10x Dia	.5x - 3x Dia
			Finishing (6x Reach)	.0006	.0012	.0018	.0024	.0030	.0036	.0048	.0072	.0096	< .07x Dia	.5x - 3x Dia
			Finishing (8x Reach)	.0005	.0011	.0016	.0021	.0027	.0032	.0042	.0064	.0085	< .07x Dia	.5x - 3x Dia
			Finishing (10x Reach)	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0060	.0081	< .05x Dia	.5x - 3x Dia
			Finishing (12x Reach)	.0005	.0010	.0014	.0019	.0024	.0029	.0038	.0057	.0077	< .05x Dia	.5x - 3x Dia
<b>Titanium:</b> All alloys	275 - 300 300 - 350	300 200	Finishing (5x Reach)	.0004	.0009	.0013	.0017	.0022	.0026	.0035	.0052	.0070	< .10x Dia	.5x - 3x Dia
			Finishing (6x Reach)	.0004	.0008	.0012	.0016	.0020	.0024	.0033	.0049	.0066	< .07x Dia	.5x - 3x Dia
			Finishing (8x Reach)	.0003	.0007	.0011	.0014	.0018	.0022	.0029	.0043	.0058	< .07x Dia	.5x - 3x Dia
			Finishing (10x Reach)	.0003	.0007	.0010	.0014	.0017	.0020	.0028	.0041	.0055	< .05x Dia	.5x - 3x Dia
			Finishing (12x Reach)	.0003	.0006	.0010	.0013	.0016	.0019	.0026	.0039	.0052	< .05x Dia	.5x - 3x Dia
	350 - 400 400 - 425	150 100	Finishing (5x Reach)	.0003	.0007	.0010	.0014	.0017	.0021	.0028	.0042	.0056	< .10x Dia	.5x - 3x Dia
			Finishing (6x Reach)	.0003	.0007	.0010	.0013	.0016	.0020	.0026	.0039	.0052	< .07x Dia	.5x - 3x Dia
			Finishing (8x Reach)	.0003	.0006	.0009	.0011	.0014	.0017	.0023	.0035	.0046	< .07x Dia	.5x - 3x Dia
			Finishing (10x Reach)	.0003	.0005	.0008	.0011	.0014	.0016	.0022	.0033	.0044	< .05x Dia	.5x - 3x Dia
			Finishing (12x Reach)	.0003	.0005	.0008	.0010	.0013	.0016	.0021	.0031	.0042	< .05x Dia	.5x - 3x Dia
<b>Nickel Alloys:</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	275 - 300 300 - 350	150 100	Finishing (5x Reach)	.0002	.0004	.0005	.0007	.0009	.0011	.0015	.0022	.0029	< .10x Dia	.5x - 3x Dia
			Finishing (6x Reach)	.0001	.0002	.0004	.0005	.0006	.0007	.0010	.0014	.0019	< .05x Dia	.5x - 3x Dia
			Finishing (8x Reach)	.0001	.0002	.0003	.0004	.0005	.0007	.0009	.0013	.0018	< .05x Dia	.5x - 3x Dia
			Finishing (10x Reach)	.0001	.0002	.0003	.0004	.0005	.0006	.0008	.0012	.0016	< .03x Dia	.5x - 3x Dia
			Finishing (12x Reach)	.0001	.0002	.0003	.0003	.0004	.0005	.0007	.0010	.0014	< .03x Dia	.5x - 3x Dia
	350 - 400 400 - 425	80 60	Finishing (5x Reach)	.0001	.0003	.0004	.0006	.0007	.0009	.0012	.0018	.0023	< .10x Dia	.5x - 3x Dia
			Finishing (6x Reach)	.0001	.0002	.0003	.0004	.0005	.0006	.0008	.0012	.0015	< .05x Dia	.5x - 3x Dia
			Finishing (8x Reach)	.0001	.0002	.0003	.0003	.0004	.0005	.0007	.0011	.0014	< .05x Dia	.5x - 3x Dia
			Finishing (10x Reach)	.0001	.0002	.0002	.0003	.0004	.0005	.0006	.0010	.0013	< .03x Dia	.5x - 3x Dia
			Finishing (12x Reach)	.0001	.0001	.0002	.0003	.0003	.0004	.0005	.0008	.0011	< .03x Dia	.5x - 3x Dia

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Finishers – Corner Radius



- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 41°) reduces chatter and harmonics improving finish
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- End cutting (not center cutting)
- Solid carbide
- CNC ground in the USA

HIGH TEMP ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal equivalent	+ .001" - .001"	+ .010" - .000"					
- .0005"	- .02mm		+ .025mm - .025mm	+ .25mm - .25mm					
.015 (1/64)		.0150	<b>.003</b>	.045 (3x)	4	1/8	1-1/2	775615-C6	43.50
.015 (1/64)		.0150	<b>.003</b>	.078 (5x)	4	1/8	2-1/2	774715-C6	58.60
.020		.0200	<b>.003</b>	.060 (3x)	4	1/8	1-1/2	775620-C6	43.50
.020		.0200	<b>.003</b>	.100 (5x)	4	1/8	2-1/2	774720-C6	58.60
.020		.0200	<b>.005</b>	.060 (3x)	4	1/8	1-1/2	873020-C6	43.50
.020		.0200	<b>.005</b>	.100 (5x)	4	1/8	1-1/2	874620-C6	58.00
.031 (1/32)		.0310	<b>.005</b>	.093 (3x)	6	1/8	1-1/2	873031-C6	41.00
.031 (1/32)		.0310	<b>.005</b>	.156 (5x)	6	1/8	2-1/2	874631-C6	55.90
.031 (1/32)		.0310	<b>.010</b>	.093 (3x)	6	1/8	1-1/2	882631-C6	41.40
.031 (1/32)		.0310	<b>.010</b>	.156 (5x)	6	1/8	2-1/2	885431-C6	56.40
	1.0 mm	.0393	<b>.10 mm</b>	3.00 mm (3x)	6	4 mm	50 mm	749122-C6	43.30
	1.0 mm	.0393	<b>.10 mm</b>	5.00 mm (5x)	6	4 mm	50 mm	748522-C6	58.40
.040		.0400	<b>.005</b>	.120 (3x)	6	1/8	1-1/2	873040-C6	41.40
.040		.0400	<b>.010</b>	.120 (3x)	6	1/8	1-1/2	882640-C6	56.40
.047 (3/64)		.0470	<b>.005</b>	.141 (3x)	6	1/8	1-1/2	873047-C6	41.00
.047 (3/64)		.0470	<b>.005</b>	.250 (5x)	6	1/8	2-1/2	874647-C6	56.40
.047 (3/64)		.0470	<b>.010</b>	.141 (3x)	6	1/8	1-1/2	882647-C6	41.00
.047 (3/64)		.0470	<b>.010</b>	.250 (5x)	6	1/8	2-1/2	885447-C6	56.40
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	7	1/8	1-1/2	873062-C6	40.80
.062 (1/16)		.0620	<b>.005</b>	.312 (5x)	7	1/8	2-1/2	874662-C6	53.50
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	7	1/8	1-1/2	882662-C6	40.80
.062 (1/16)		.0620	<b>.010</b>	.312 (5x)	7	1/8	2-1/2	885462-C6	53.50
.078 (5/64)		.0780	<b>.005</b>	.234 (3x)	7	1/8	1-1/2	873078-C6	38.90
.078 (5/64)		.0780	<b>.005</b>	.406 (5x)	7	1/8	2-1/2	874678-C6	53.50
.078 (5/64)		.0780	<b>.010</b>	.234 (3x)	7	1/8	1-1/2	882678-C6	39.30
.078 (5/64)		.0780	<b>.010</b>	.406 (5x)	7	1/8	2-1/2	885478-C6	53.50
	2.0 mm	.0787	<b>.20 mm</b>	6.00 mm (3x)	7	4 mm	50 mm	748745-C6	43.30
	2.0 mm	.0787	<b>.20 mm</b>	10.00 mm (5x)	7	4 mm	50 mm	747945-C6	58.40
.093 (3/32)		.0930	<b>.005</b>	.279 (3x)	7	1/8	1-1/2	873093-C6	38.90
.093 (3/32)		.0930	<b>.005</b>	.500 (5x)	7	1/8	2-1/2	874693-C6	53.50
.093 (3/32)		.0930	<b>.010</b>	.279 (3x)	7	1/8	1-1/2	882693-C6	38.90
.093 (3/32)		.0930	<b>.010</b>	.500 (5x)	7	1/8	2-1/2	885493-C6	53.50
.093 (3/32)		.0930	<b>.020</b>	.279 (3x)	7	1/8	1-1/2	774093-C6	39.30
	3.0 mm	.1181	<b>.20 mm</b>	9.00 mm (3x)	7	4 mm	50 mm	748757-C6	43.30
	3.0 mm	.1181	<b>.20 mm</b>	15.00 mm (5x)	7	4 mm	50 mm	747957-C6	58.40

continued on next page

# VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

## Finishers – Corner Radius (cont.)

continued from previous page

HIGH TEMP ALLOYS

CUTTER DIAMETER		CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	decimal equivalent	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.1250	.005	.187 (1.5x)	7	1/8	1-1/2	872308-C6	34.50
.125 (1/8)	.1250	.005	.375 (3x)	7	1/8	1-1/2	873108-C6	34.50
.125 (1/8)	.1250	.005	.625 (5x)	7	1/8	2-1/2	874708-C6	37.30
.125 (1/8)	.1250	.010	.187 (1.5x)	7	1/8	1-1/2	880108-C6	34.50
.125 (1/8)	.1250	.010	.375 (3x)	7	1/8	1-1/2	882708-C6	34.50
.125 (1/8)	.1250	.010	.625 (5x)	7	1/8	2-1/2	885508-C6	37.30
.125 (1/8)	.1250	.015	.375 (3x)	7	1/8	1-1/2	813808-C6	34.50
.125 (1/8)	.1250	.020	.375 (3x)	7	1/8	1-1/2	774108-C6	34.50
.125 (1/8)	.1250	.030	.187 (1.5x)	7	1/8	1-1/2	890508-C6	35.50
.125 (1/8)	.1250	.030	.375 (3x)	7	1/8	1-1/2	892708-C6	34.50
.156 (5/32)	.1560	.005	.470 (3x)	7	3/16	2	873110-C6	38.60
.156 (5/32)	.1560	.010	.470 (3x)	7	3/16	2	882710-C6	38.60
.187 (3/16)	.1870	.005	.285 (1.5x)	7	3/16	2	872312-C6	38.80
.187 (3/16)	.1870	.005	.570 (3x)	7	3/16	2	873112-C6	38.60
.187 (3/16)	.1870	.010	.285 (1.5x)	7	3/16	2	880112-C6	39.90
.187 (3/16)	.1870	.010	.570 (3x)	7	3/16	2	882712-C6	38.60
.187 (3/16)	.1870	.015	.570 (3x)	7	3/16	2	813812-C6	38.60
.187 (3/16)	.1870	.020	.570 (3x)	7	3/16	2	774112-C6	38.60
.187 (3/16)	.1870	.030	.285 (1.5x)	7	3/16	2	890512-C6	39.20
.187 (3/16)	.1870	.030	.570 (3x)	7	3/16	2	892712-C6	38.60
.250 (1/4)	.2500	.005	.375 (1.5x)	7	1/4	2-1/2	872316-C6	50.00
.250 (1/4)	.2500	.005	.750 (3x)	7	1/4	2-1/2	873116-C6	49.70
.250 (1/4)	.2500	.010	.375 (1.5x)	7	1/4	2-1/2	880116-C6	50.50
.250 (1/4)	.2500	.010	.750 (3x)	7	1/4	2-1/2	882716-C6	49.70
.250 (1/4)	.2500	.010	1.250 (5x)	7	1/4	4	885516-C6	54.20
.250 (1/4)	.2500	.015	.750 (3x)	7	1/4	2-1/2	813816-C6	49.70
.250 (1/4)	.2500	.020	.750 (3x)	7	1/4	2-1/2	774116-C6	49.70
.250 (1/4)	.2500	.030	.375 (1.5x)	7	1/4	2-1/2	890516-C6	50.50
.250 (1/4)	.2500	.030	.750 (3x)	7	1/4	2-1/2	892716-C6	49.70

PLEASE SEE SPEEDS & FEEDS ON PAGE 154



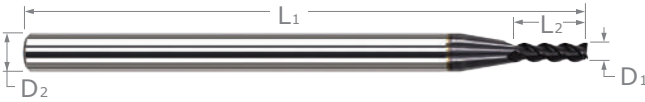
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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

**Square**



- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

MEDIUM ALLOY STEELS

CUTTER DIAMETER  D <sub>1</sub> + .0005" / - .0005" / + .00mm / - .02mm / decimal equivalent	LENGTH OF CUT  L <sub>2</sub> + .010" / - .000" / + .25mm / - .00mm	FLUTES	SHANK DIAMETER  D <sub>2</sub> (h6)	OVERALL LENGTH  L <sub>1</sub>	AlTiN COATED		
					TOOL #	PRICE	
.010	.0100	<b>.015</b> (1.5x)	3	1/8	1-1/2	964910-C3	56.90
.010	.0100	<b>.030</b> (3x)	3	1/8	1-1/2	958510-C3	56.90
.015 (1/64)	.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	964915-C3	45.40
.015 (1/64)	.0150	<b>.045</b> (3x)	3	1/8	1-1/2	958515-C3	45.40
.015 (1/64)	.0150	<b>.078</b> (5x)	3	1/8	2-1/2	952615-C3	56.90
.5 mm	.0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	945911-C3	44.60
.020	.0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	964920-C3	39.90
.020	.0200	<b>.060</b> (3x)	3	1/8	1-1/2	958520-C3	39.90
.020	.0200	<b>.100</b> (5x)	3	1/8	2-1/2	952620-C3	49.60
.025	.0250	<b>.038</b> (1.5x)	3	1/8	1-1/2	964925-C3	38.30
.025	.0250	<b>.075</b> (3x)	3	1/8	1-1/2	958525-C3	38.30
.025	.0250	<b>.125</b> (5x)	3	1/8	2-1/2	952625-C3	48.50
.030	.0300	<b>.090</b> (3x)	3	1/8	1-1/2	958530-C3	38.10
.031 (1/32)	.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	964931-C3	32.30
.031 (1/32)	.0310	<b>.093</b> (3x)	3	1/8	1-1/2	958531-C3	32.30
.031 (1/32)	.0310	<b>.125</b> (4x)	3	1/8	2-1/2	814831-C3	42.10
.031 (1/32)	.0310	<b>.156</b> (5x)	3	1/8	2-1/2	952631-C3	42.10
.035	.0350	<b>.053</b> (1.5x)	3	1/8	1-1/2	964935-C3	32.90
.035	.0350	<b>.105</b> (3x)	3	1/8	1-1/2	958535-C3	32.30
1.0 mm	.0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	945922-C3	36.90
.040	.0400	<b>.060</b> (1.5x)	3	1/8	1-1/2	964940-C3	32.50
.040	.0400	<b>.120</b> (3x)	3	1/8	1-1/2	958540-C3	32.50
.040	.0400	<b>.203</b> (5x)	3	1/8	2-1/2	952640-C3	42.30
.045	.0450	<b>.068</b> (1.5x)	3	1/8	1-1/2	964945-C3	32.50
.045	.0450	<b>.135</b> (3x)	3	1/8	1-1/2	958545-C3	32.50
.045	.0450	<b>.225</b> (5x)	3	1/8	2-1/2	952645-C3	42.70
.047 (3/64)	.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	964947-C3	32.30
.047 (3/64)	.0470	<b>.141</b> (3x)	3	1/8	1-1/2	958547-C3	32.30
.047 (3/64)	.0470	<b>.250</b> (5x)	3	1/8	2-1/2	952647-C3	42.50
.050	.0500	<b>.075</b> (1.5x)	3	1/8	1-1/2	964950-C3	32.50
.050	.0500	<b>.150</b> (3x)	3	1/8	1-1/2	958550-C3	32.50
.055	.0550	<b>.083</b> (1.5x)	3	1/8	1-1/2	964955-C3	32.90
.055	.0550	<b>.165</b> (3x)	3	1/8	1-1/2	958555-C3	32.30
.055	.0550	<b>.275</b> (5x)	3	1/8	2-1/2	952655-C3	42.50
1.5 mm	.0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	945933-C3	34.60
.060	.0600	<b>.180</b> (3x)	3	1/8	1-1/2	958560-C3	33.50
.062 (1/16)	.0620	<b>.050</b> (0.8x)	3	1/8	1-1/2	835762-C3	33.40
.062 (1/16)	.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	964962-C3	30.20

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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

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MEDIUM ALLOY STEELS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .010" - .000" + .25mm - .00mm					
.062 (1/16)		.0620	.186 (3x)	3	1/8	1-1/2	958562-C3	30.20
.062 (1/16)		.0620	.250 (4x)	3	1/8	2-1/2	814862-C3	35.00
.062 (1/16)		.0620	.312 (5x)	3	1/8	2-1/2	952662-C3	40.20
.070		.0700	.105 (1.5x)	3	1/8	1-1/2	964970-C3	30.80
.070		.0700	.210 (3x)	3	1/8	1-1/2	958570-C3	30.80
.078 (5/64)		.0780	.118 (1.5x)	3	1/8	1-1/2	964978-C3	30.20
.078 (5/64)		.0780	.234 (3x)	3	1/8	1-1/2	958578-C3	30.20
.078 (5/64)		.0780	.406 (5x)	3	1/8	2-1/2	952678-C3	40.20
2.0 mm		.0787	6.00 mm (3x)	3	4 mm	50 mm	945945-C3	34.60
.080		.0800	.240 (3x)	3	1/8	1-1/2	958580-C3	30.20
.090		.0900	.270 (3x)	3	1/8	1-1/2	958590-C3	30.20
.093 (3/32)		.0930	.074 (0.8x)	3	1/8	1-1/2	835793-C3	33.40
.093 (3/32)		.0930	.140 (1.5x)	3	1/8	1-1/2	964993-C3	30.20
.093 (3/32)		.0930	.279 (3x)	3	1/8	1-1/2	958593-C3	30.20
.093 (3/32)		.0930	.375 (4x)	3	1/8	2-1/2	814893-C3	35.00
.093 (3/32)		.0930	.500 (5x)	3	1/8	2-1/2	952693-C3	40.20
.100		.1000	.150 (1.5x)	3	1/8	1-1/2	965000-C3	30.20
.100		.1000	.300 (3x)	3	1/8	1-1/2	958600-C3	30.20
.109 (7/64)		.1090	.164 (1.5x)	3	1/8	1-1/2	965002-C3	30.20
.109 (7/64)		.1090	.327 (3x)	3	1/8	1-1/2	958602-C3	30.20
3.0 mm		.1181	9.00 mm (3x)	3	4 mm	50 mm	945957-C3	34.60

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" - .002"	+ .00mm - .04mm		+ .030" - .000" + .75mm - .00mm					
.125 (1/8)		.1250	.100 (0.8x)	4	1/8	1-1/2	835808-C3	31.80
.125 (1/8)		.1250	.187 (1.5x)	4	1/8	1-1/2	965008-C3	28.40
.125 (1/8)		.1250	.375 (3x)	4	1/8	1-1/2	958608-C3	28.40
.125 (1/8)		.1250	.500 (4x)	4	1/8	2-1/2	814908-C3	36.50
.125 (1/8)		.1250	.625 (5x)	4	1/8	2-1/2	952708-C3	39.60
.140 (9/64)		.1406	.220 (1.5x)	4	3/16	2	965009-C3	41.20
.140 (9/64)		.1406	.425 (3x)	4	3/16	2	958609-C3	41.20
.156 (5/32)		.1562	.235 (1.5x)	4	3/16	2	965010-C3	30.60
.156 (5/32)		.1562	.470 (3x)	4	3/16	2	958610-C3	30.90
.156 (5/32)		.1562	.750 (5x)	4	3/16	3	952710-C3	42.30
.187 (3/16)		.1875	.150 (0.8x)	4	3/16	2	835812-C3	34.00
.187 (3/16)		.1875	.285 (1.5x)	4	3/16	2	965012-C3	30.60
.187 (3/16)		.1875	.562 (3x)	4	3/16	2	958612-C3	30.90
.187 (3/16)		.1875	1.000 (5x)	4	3/16	3	952712-C3	42.30
6.0 mm		.2362	18.00 mm (3x)	4	6 mm	63 mm	945972-C3	34.90
.250 (1/4)		.2500	.375 (1.5x)	4	1/4	2-1/2	965016-C3	38.80
.250 (1/4)		.2500	.750 (3x)	4	1/4	2-1/2	958616-C3	39.20
.250 (1/4)		.2500	1.250 (5x)	4	1/4	4	952716-C3	46.50
.375 (3/8)		.3750	.570 (1.5x)	4	3/8	2-1/2	965024-C3	48.50
.375 (3/8)		.3750	1.125 (3x)	4	3/8	2-1/2	958624-C3	48.50
.500 (1/2)		.5000	1.500 (3x)	4	1/2	3	958632-C3	70.00

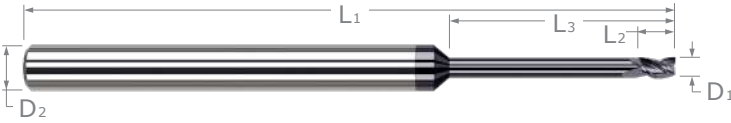
NEW

NEW

PLEASE SEE SPEEDS & FEEDS ON PAGE 166

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Square – Long Reach, Stub Flute



- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

MEDIUM ALLOY STEELS

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
D <sub>1</sub>	D <sub>2</sub>	decimal equivalent	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" / - .0005"	+ .00mm / - .02mm		+ .010" / - .000"	+ .010" / - .000"					
			+ .25mm / - .00mm	+ .25mm / - .00mm					
.015 (1/64)	.0150	.0150	.023	<b>.078</b> (5x)	3	1/8	2-1/2	936115-C3	60.50
.015 (1/64)	.0150	.0150	.023	<b>.125</b> (8x)	3	1/8	2-1/2	933815-C3	60.80
.020	.0200	.0200	.030	<b>.105</b> (5x)	3	1/8	2-1/2	936120-C3	57.20
.020	.0200	.0200	.030	<b>.160</b> (8x)	3	1/8	2-1/2	933820-C3	59.50
.025	.0250	.0250	.038	<b>.125</b> (5x)	3	1/8	2-1/2	936125-C3	56.70
.025	.0250	.0250	.038	<b>.203</b> (8x)	3	1/8	2-1/2	933825-C3	57.20
.030	.0300	.0300	.045	<b>.156</b> (5x)	3	1/8	2-1/2	936130-C3	52.40
.030	.0300	.0300	.045	<b>.250</b> (8x)	3	1/8	2-1/2	933830-C3	54.50
.031 (1/32)	.0310	.0310	.047	<b>.093</b> (3x)	3	1/8	1-1/2	945331-C3	51.70
.031 (1/32)	.0310	.0310	.047	<b>.156</b> (5x)	3	1/8	2-1/2	936131-C3	53.40
.031 (1/32)	.0310	.0310	.047	<b>.250</b> (8x)	3	1/8	2-1/2	933831-C3	53.50
.031 (1/32)	.0310	.0310	.047	<b>.312</b> (10x)	3	1/8	2-1/2	931131-C3	57.20
	1.0 mm	.0393	1.50 mm	<b>5.0 mm</b> (5x)	3	4 mm	50 mm	886422-C3	56.40
	1.0 mm	.0393	1.50 mm	<b>8.0 mm</b> (8x)	3	4 mm	50 mm	887122-C3	57.50
.040	.0400	.0400	.060	<b>.203</b> (5x)	3	1/8	2-1/2	936140-C3	55.40
.040	.0400	.0400	.060	<b>.325</b> (8x)	3	1/8	2-1/2	933840-C3	56.90
.047 (3/64)	.0470	.0470	.071	<b>.250</b> (5x)	3	1/8	2-1/2	936147-C3	52.40
.047 (3/64)	.0470	.0470	.071	<b>.375</b> (8x)	3	1/8	2-1/2	933847-C3	53.50
.062 (1/16)	.0620	.0620	.093	<b>.186</b> (3x)	3	1/8	1-1/2	945362-C3	52.00
.062 (1/16)	.0620	.0620	.093	<b>.312</b> (5x)	3	1/8	2-1/2	936162-C3	52.10
.062 (1/16)	.0620	.0620	.093	<b>.500</b> (8x)	3	1/8	2-1/2	933862-C3	53.50
.062 (1/16)	.0620	.0620	.093	<b>.625</b> (10x)	3	1/8	2-1/2	931162-C3	56.70
.078 (5/64)	.0780	.0780	.118	<b>.406</b> (5x)	3	1/8	2-1/2	936178-C3	52.10
.078 (5/64)	.0780	.0780	.118	<b>.625</b> (8x)	3	1/8	2-1/2	933878-C3	54.50
	2.0 mm	.0787	3.00 mm	<b>10.0 mm</b> (5x)	3	4 mm	50 mm	886445-C3	56.40
	2.0 mm	.0787	3.00 mm	<b>16.0 mm</b> (8x)	3	4 mm	50 mm	887145-C3	57.50
.093 (3/32)	.0930	.0930	.140	<b>.279</b> (3x)	3	1/8	1-1/2	945393-C3	51.00
.093 (3/32)	.0930	.0930	.140	<b>.500</b> (5x)	3	1/8	2-1/2	936193-C3	52.10
.093 (3/32)	.0930	.0930	.140	<b>.750</b> (8x)	3	1/8	2-1/2	933893-C3	53.50
.093 (3/32)	.0930	.0930	.140	<b>.950</b> (10x)	3	1/8	2-1/2	931193-C3	57.20

continued on next page

## VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Square – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
D <sub>1</sub> +.0005" -.0005"	+ .00mm -.02mm	decimal equivalent	L <sub>2</sub> +.010" -.000" +.25mm -.00mm	L <sub>3</sub> +.010" -.000" +.25mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.100		.1000	.150	<b>.500</b> (5x)	3	1/8	2-1/2	936200-C3	56.40
.100		.1000	.150	<b>.800</b> (8x)	3	1/8	2-1/2	933900-C3	58.00
.109 (7/64)		.1090	.164	<b>.570</b> (5x)	3	1/8	2-1/2	936202-C3	56.40
.109 (7/64)		.1090	.164	<b>.900</b> (8x)	3	1/8	2-1/2	933902-C3	58.00
	3.0 mm	.1181	4.50 mm	<b>15.0 mm</b> (5x)	3	4 mm	50 mm	886457-C3	57.80
	3.0 mm	.1181	4.50 mm	<b>24.0 mm</b> (8x)	3	4 mm	50 mm	887157-C3	59.10
D <sub>1</sub> +.000" -.002"		decimal equivalent	L <sub>2</sub> +.030" -.000"	L <sub>3</sub> +.030" -.000"		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)		.1250	.187	<b>.375</b> (3x)	4	1/8	1-1/2	945408-C3	52.00
.125 (1/8)		.1250	.187	<b>.625</b> (5x)	4	1/8	2-1/2	936208-C3	51.40
.125 (1/8)		.1250	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	933908-C3	53.00
.125 (1/8)		.1250	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	931208-C3	53.80
.156 (5/32)		.1562	.235	<b>.750</b> (5x)	4	3/16	3	936210-C3	57.20
.187 (3/16)		.1875	.285	<b>1.000</b> (5x)	4	3/16	3	936212-C3	57.20
.250 (1/4)		.2500	.375	<b>1.250</b> (5x)	4	1/4	4	936216-C3	63.80

PLEASE SEE SPEEDS & FEEDS ON PAGE 168

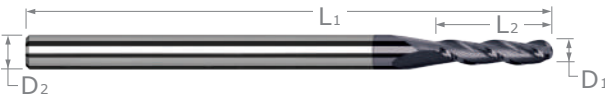


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[harveytool.com/resources/simulation-files](http://harveytool.com/resources/simulation-files)

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Ball



- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

MEDIUM ALLOY STEELS

CUTTER DIAMETER D <sub>1</sub> + .0005" / - .0005" / + .00mm / - .02mm / decimal equivalent	LENGTH OF CUT L <sub>2</sub> + .010" / - .000" / + .25mm / - .00mm	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AlTiN COATED	
					TOOL #	PRICE
.2 mm .0078	<b>.60 mm</b> (3x)	3	4 mm	50 mm	974804-C3	65.90
.010 .0100	<b>.030</b> (3x)	3	1/8	1-1/2	971810-C3	64.30
.015 (1/64) .0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	963015-C3	54.30
.015 (1/64) .0150	<b>.045</b> (3x)	3	1/8	1-1/2	971815-C3	53.30
.4 mm .0157	<b>1.20 mm</b> (3x)	3	4 mm	50 mm	974809-C3	57.10
.5 mm .0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	974811-C3	49.20
.020 .0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	963020-C3	48.80
.020 .0200	<b>.060</b> (3x)	3	1/8	1-1/2	971820-C3	48.30
.6 mm .0236	<b>1.80 mm</b> (3x)	3	4 mm	50 mm	974813-C3	47.70
.025 .0250	<b>.075</b> (3x)	3	1/8	1-1/2	971825-C3	47.20
.031 (1/32) .0310	<b>.025</b> (0.8x)	3	1/8	1-1/2	883931-C3	43.00
.031 (1/32) .0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	963031-C3	40.10
.031 (1/32) .0310	<b>.093</b> (3x)	3	1/8	1-1/2	971831-C3	40.10
.031 (1/32) .0310	<b>.156</b> (5x)	3	1/8	2-1/2	888631-C3	50.30
.8 mm .0314	<b>2.40 mm</b> (3x)	3	4 mm	50 mm	974818-C3	41.40
1.0 mm .0393	<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	929222-C3	41.40
1.0 mm .0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	974822-C3	41.40
.040 .0400	<b>.120</b> (3x)	3	1/8	1-1/2	971840-C3	40.90
.047 (3/64) .0470	<b>.038</b> (0.8x)	3	1/8	1-1/2	883947-C3	44.80
.047 (3/64) .0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	963047-C3	40.10
.047 (3/64) .0470	<b>.141</b> (3x)	3	1/8	1-1/2	971847-C3	40.90
1.2 mm .0472	<b>3.50 mm</b> (3x)	3	4 mm	50 mm	974827-C3	41.40
.050 .0500	<b>.150</b> (3x)	3	1/8	1-1/2	971850-C3	40.50
1.4 mm .0551	<b>4.00 mm</b> (3x)	3	4 mm	50 mm	974831-C3	41.40
1.5 mm .0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	974833-C3	39.10
.060 .0600	<b>.180</b> (3x)	3	1/8	1-1/2	971860-C3	40.90
.062 (1/16) .0620	<b>.050</b> (0.8x)	3	1/8	1-1/2	883962-C3	40.60
.062 (1/16) .0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	963062-C3	37.90
.062 (1/16) .0620	<b>.186</b> (3x)	3	1/8	1-1/2	971862-C3	37.90
.062 (1/16) .0620	<b>.312</b> (5x)	3	1/8	2-1/2	888662-C3	47.80
1.6 mm .0629	<b>5.00 mm</b> (3x)	3	4 mm	50 mm	974836-C3	39.10
.070 .0700	<b>.210</b> (3x)	3	1/8	1-1/2	971870-C3	38.60
1.8 mm .0708	<b>5.50 mm</b> (3x)	3	4 mm	50 mm	974840-C3	39.10
.078 (5/64) .0780	<b>.062</b> (0.8x)	3	1/8	1-1/2	883978-C3	43.60
.078 (5/64) .0780	<b>.118</b> (1.5x)	3	1/8	1-1/2	963078-C3	38.60
.078 (5/64) .0780	<b>.234</b> (3x)	3	1/8	1-1/2	971878-C3	38.60

continued on next page

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Ball (cont.)

continued from previous page

MEDIUM ALLOY STEELS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI# COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.0005" - .0005"	+0.00mm - .02mm		+0.10" - .000"					
2.0 mm		.0787	<b>6.00 mm</b> (3x)	3	4 mm	50 mm	974845-C3	39.10
.080		.0800	<b>.240</b> (3x)	3	1/8	1-1/2	971880-C3	38.60
.090		.0900	<b>.270</b> (3x)	3	1/8	1-1/2	971890-C3	38.60
.093 (3/32)		.0930	<b>.074</b> (0.8x)	3	1/8	1-1/2	883993-C3	41.40
.093 (3/32)		.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	963093-C3	37.90
.093 (3/32)		.0930	<b>.279</b> (3x)	3	1/8	1-1/2	971893-C3	37.90
.093 (3/32)		.0930	<b>.500</b> (5x)	3	1/8	2-1/2	888693-C3	47.80
.100		.1000	<b>.300</b> (3x)	3	1/8	1-1/2	971900-C3	38.30
.109 (7/64)		.1090	<b>.327</b> (3x)	3	1/8	1-1/2	971902-C3	38.60
3.0 mm		.1181	<b>4.50 mm</b> (1.5x)	3	4 mm	50 mm	929257-C3	39.30
3.0 mm		.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	974857-C3	39.30

D <sub>1</sub>	decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.000" - .002"		+0.030" - .000"					
.125 (1/8)	.1250	<b>.100</b> (0.8x)	4	1/8	1-1/2	884008-C3	41.40
.125 (1/8)	.1250	<b>.187</b> (1.5x)	4	1/8	1-1/2	963108-C3	35.40
.125 (1/8)	.1250	<b>.375</b> (3x)	4	1/8	1-1/2	971908-C3	35.70
.125 (1/8)	.1250	<b>.625</b> (5x)	4	1/8	2-1/2	888708-C3	47.80
.140 (9/64)	.1406	<b>.425</b> (3x)	4	3/16	2	971909-C3	51.30
.156 (5/32)	.1562	<b>.235</b> (1.5x)	4	3/16	2	963110-C3	41.20
.156 (5/32)	.1562	<b>.470</b> (3x)	4	3/16	2	971910-C3	41.20
.187 (3/16)	.1875	<b>.150</b> (0.8x)	4	3/16	2	884012-C3	44.20
.187 (3/16)	.1875	<b>.285</b> (1.5x)	4	3/16	2	963112-C3	38.90
.187 (3/16)	.1875	<b>.562</b> (3x)	4	3/16	2	971912-C3	38.10
.250 (1/4)	.2500	<b>.375</b> (1.5x)	4	1/4	2-1/2	963116-C3	46.20
.250 (1/4)	.2500	<b>.750</b> (3x)	4	1/4	2-1/2	971916-C3	46.60

### SPEEDS & FEEDS (Variable Helix for Medium Alloy Steels)

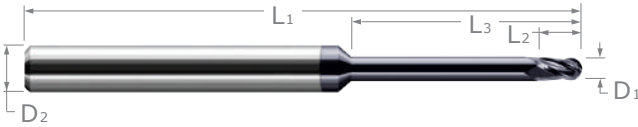
**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 0.8x, increase to 125%; for 1.5x, increase to 112%). For longer lengths of cut, table values of IPT and DOC must be reduced (for 4x, reduce to 85%; for 5x, reduce to 70%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter												
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	
<b>Carbon Steels:</b> 1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx, 52Lxxx, 6xxx, 8xxx, 9xxx	225 - 250	250	Slotting	.0008	.00017	.00026	.00035	.00043	.00052	.00066	.00099	.00133	.00174	.00209	.00278
			Roughing	.0010	.00021	.00032	.00042	.00052	.00062	.00080	.00120	.00160	.00210	.00252	.00336
			Finishing	.0012	.00025	.00038	.00050	.00063	.00075	.00096	.00144	.00193	.00252	.00303	.00404
			Max	.0016	.00032	.00049	.00064	.00081	.00097	.00124	.00185	.00248	.00324	.00390	.00520
<b>Stainless Steels:</b> 201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 414, 42x, 43x, 44x, 501, 502	250 - 275	220	<b>Radial Depth of Cut*:</b>		<b>Axial Depth of Cut*:</b>										
			Slotting: 1x Dia		Slotting: .5x Dia										
			Roughing: .5x Dia		Roughing: .5x - 1x Dia										
<b>Tool Steels:</b> A, L, O, P, W series	275 - 300	180	Finishing: .1x Dia		Finishing: .5x - 1x Dia										

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Ball – Long Reach, Stub Flute



- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA
- Center cutting

**IMPROVES PERFORMANCE**

Contour Profiling    Tipped Multi-Axis Machining

MEDIUM ALLOY STEELS

CUTTER DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL REACH L <sub>3</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AlTiN COATED	
						4 FL	PRICE
$\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$ .0150    decimal equivalent	$\begin{matrix} +.010'' \\ -.000'' \\ +.25\text{mm} \\ -.00\text{mm} \end{matrix}$	$\begin{matrix} +.010'' \\ -.000'' \\ +.25\text{mm} \\ -.00\text{mm} \end{matrix}$					
.015 (1/64)	.022	<b>.078</b> (5x)	4	1/8	2-1/2	64215-C3	68.30
.015 (1/64)	.022	<b>.125</b> (8x)	4	1/8	2-1/2	56615-C3	69.70
.015 (1/64)	.022	<b>.187</b> (12x)	4	1/8	2-1/2	65415-C3	73.90
.4 mm	.0157	<b>2.0 mm</b> (5x)	4	4 mm	50 mm	984709-C3	74.60
.4 mm	.0157	<b>3.2 mm</b> (8x)	4	4 mm	50 mm	971009-C3	76.00
.4 mm	.0157	<b>4.8 mm</b> (12x)	4	4 mm	50 mm	988309-C3	82.00
.5 mm	.0196	<b>2.5 mm</b> (5x)	4	4 mm	50 mm	984711-C3	71.80
.5 mm	.0196	<b>4.0 mm</b> (8x)	4	4 mm	50 mm	971011-C3	72.80
.5 mm	.0196	<b>6.0 mm</b> (12x)	4	4 mm	50 mm	988311-C3	79.30
.5 mm	.0196	<b>8.0 mm</b> (16x)	4	4 mm	50 mm	979511-C3	82.70
.020	.0200	<b>.100</b> (5x)	4	1/8	2-1/2	64220-C3	64.60
.020	.0200	<b>.160</b> (8x)	4	1/8	2-1/2	56620-C3	65.90
.020	.0200	<b>.250</b> (12x)	4	1/8	2-1/2	65420-C3	70.80
.6 mm	.0236	<b>3.0 mm</b> (5x)	4	4 mm	50 mm	984713-C3	70.20
.6 mm	.0236	<b>4.8 mm</b> (8x)	4	4 mm	50 mm	971013-C3	71.60
.6 mm	.0236	<b>7.2 mm</b> (12x)	4	4 mm	50 mm	988313-C3	76.30
.025	.0250	<b>.125</b> (5x)	4	1/8	2-1/2	64225-C3	63.70
.025	.0250	<b>.203</b> (8x)	4	1/8	2-1/2	56625-C3	64.20
.025	.0250	<b>.312</b> (12x)	4	1/8	2-1/2	65425-C3	70.10
.031 (1/32)	.0310	<b>.156</b> (5x)	4	1/8	2-1/2	64231-C3	59.00
.031 (1/32)	.0310	<b>.250</b> (8x)	4	1/8	2-1/2	56631-C3	60.30
.031 (1/32)	.0310	<b>.375</b> (12x)	4	1/8	2-1/2	65431-C3	63.10
.8 mm	.0314	<b>4.0 mm</b> (5x)	4	4 mm	50 mm	984718-C3	65.70
.8 mm	.0314	<b>6.5 mm</b> (8x)	4	4 mm	50 mm	971018-C3	66.80
.8 mm	.0314	<b>9.5 mm</b> (12x)	4	4 mm	50 mm	988318-C3	69.10
1.0 mm	.0393	<b>5.0 mm</b> (5x)	4	4 mm	50 mm	984722-C3	65.10
1.0 mm	.0393	<b>8.0 mm</b> (8x)	4	4 mm	50 mm	971022-C3	66.20
1.0 mm	.0393	<b>12.0 mm</b> (12x)	4	4 mm	50 mm	988322-C3	69.10
1.0 mm	.0393	<b>16.0 mm</b> (16x)	4	4 mm	50 mm	979522-C3	72.20
.047 (3/64)	.0470	<b>.250</b> (5x)	4	1/8	2-1/2	64247-C3	59.00
.047 (3/64)	.0470	<b>.375</b> (8x)	4	1/8	2-1/2	56647-C3	60.30
.047 (3/64)	.0470	<b>.570</b> (12x)	4	1/8	2-1/2	65447-C3	62.50
1.5 mm	.0590	<b>7.5 mm</b> (5x)	4	4 mm	50 mm	984733-C3	65.10
1.5 mm	.0590	<b>12.0 mm</b> (8x)	4	4 mm	50 mm	971033-C3	66.80
1.5 mm	.0590	<b>18.0 mm</b> (12x)	4	4 mm	50 mm	988333-C3	69.10
1.5 mm	.0590	<b>24.0 mm</b> (16x)	4	4 mm	63 mm	979533-C3	72.20

continued on next page

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Ball – Long Reach, Stub Flute (cont.)

continued from previous page

MEDIUM ALLOY STEELS

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .010" - .000" + .25mm - .00mm	+ .010" - .000" + .25mm - .00mm					
.062 (1/16)		.0620	.093	<b>.186</b> (3x)	4	1/8	1-1/2	755462-C3	57.60
.062 (1/16)		.0620	.093	<b>.312</b> (5x)	4	1/8	2-1/2	64262-C3	59.00
.062 (1/16)		.0620	.093	<b>.500</b> (8x)	4	1/8	2-1/2	56662-C3	60.30
.062 (1/16)		.0620	.093	<b>.750</b> (12x)	4	1/8	2-1/2	65462-C3	62.50
.078 (5/64)		.0780	.117	<b>.234</b> (3x)	4	1/8	1-1/2	755478-C3	57.60
.078 (5/64)		.0780	.117	<b>.406</b> (5x)	4	1/8	2-1/2	64278-C3	59.00
.078 (5/64)		.0780	.117	<b>.625</b> (8x)	4	1/8	2-1/2	56678-C3	60.30
.078 (5/64)		.0780	.117	<b>.940</b> (12x)	4	1/8	2-1/2	65478-C3	62.50
2.0 mm	.0787		3.00 mm	<b>10.0 mm</b> (5x)	4	4 mm	50 mm	984745-C3	65.70
2.0 mm	.0787		3.00 mm	<b>16.0 mm</b> (8x)	4	4 mm	50 mm	971045-C3	66.80
2.0 mm	.0787		3.00 mm	<b>24.0 mm</b> (12x)	4	4 mm	63 mm	988345-C3	69.10
2.0 mm	.0787		3.00 mm	<b>32.0 mm</b> (16x)	4	4 mm	63 mm	979545-C3	72.20
.093 (3/32)		.0930	.139	<b>.279</b> (3x)	4	1/8	1-1/2	755493-C3	57.60
.093 (3/32)		.0930	.139	<b>.500</b> (5x)	4	1/8	2-1/2	64293-C3	59.00
.093 (3/32)		.0930	.139	<b>.750</b> (8x)	4	1/8	2-1/2	56693-C3	60.30
.093 (3/32)		.0930	.139	<b>1.125</b> (12x)	4	1/8	2-1/2	65493-C3	63.10
3.0 mm	.1181		4.50 mm	<b>15.0 mm</b> (5x)	4	4 mm	50 mm	984757-C3	62.00

D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	L <sub>3</sub>	FLUTES	SHANK DIAMETER	OVERALL LENGTH	4 FL	PRICE
+ .000" - .002"		+ .030" - .000"	+ .030" - .000"		D <sub>2</sub> (h6)	L <sub>1</sub>		
.125 (1/8)	.1250	.187	<b>.375</b> (3x)	4	1/8	2-1/2	755508-C3	58.90
.125 (1/8)	.1250	.187	<b>.625</b> (5x)	4	1/8	2-1/2	64308-C3	58.30
.125 (1/8)	.1250	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	56708-C3	59.70
.125 (1/8)	.1250	.187	<b>1.500</b> (12x)	4	1/8	3	65508-C3	62.50
.156 (5/32)	.1562	.234	<b>.750</b> (5x)	4	3/16	3	64310-C3	64.20
.156 (5/32)	.1562	.234	<b>1.250</b> (8x)	4	3/16	3	56710-C3	65.60
.187 (3/16)	.1875	.281	<b>1.000</b> (5x)	4	3/16	3	64312-C3	65.60
.187 (3/16)	.1875	.281	<b>1.500</b> (8x)	4	3/16	3	56712-C3	66.20
.250 (1/4)	.2500	.375	<b>.750</b> (3x)	4	1/4	4	755516-C3	72.20
.250 (1/4)	.2500	.375	<b>1.250</b> (5x)	4	1/4	4	64316-C3	71.60
.250 (1/4)	.2500	.375	<b>2.000</b> (8x)	4	1/4	4	56716-C3	73.00

### SPEEDS & FEEDS (Variable Helix – Long Reach, Stub Flute for Medium Alloy Steels)

**Important Note:** Values in table are in inches and are based on reached (8x Dia) end mills. For shorter reaches, table values of IPT must be increased (for 3x, increase to 135%; for 5x, increase to 125%). For longer reaches, table values of IPT and DOC must be reduced (for 10x, reduce to 90%; for 12x, reduce to 80%; for 16x, reduce to 75%) For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter									
			.015	.031	.047	.062	.078	.093	.125	.187	.250	
<b>Carbon Steels:</b> 1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx <b>Stainless Steels:</b> 201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 414, 42x, 43x, 44x, 501, 502 <b>Tool Steels:</b> A, L, O, P, W series	225 - 250	250	Slotting	.00007	.00014	.00021	.00028	.00035	.00041	.00053	.00079	.00106
			Roughing	.00008	.00017	.00025	.00033	.00042	.00050	.00064	.00096	.00128
	Finishing	.00010	.00020	.00030	.00040	.00050	.00060	.00077	.00115	.00154		
	Max	.00012	.00026	.00039	.00052	.00065	.00077	.00099	.00148	.00198		
			<b>Radial Depth of Cut*:</b>				<b>Axial Depth of Cut*:</b>					
			Slotting: 1x Dia				Slotting: .35x Dia					
			Roughing: .35x Dia				Roughing: .5x - 1x Dia					
			Finishing: .1x Dia				Finishing: .5x - 1x Dia					

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.

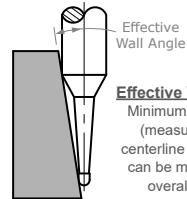


# HIGH HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Ball – Tapered Reach (Mold Cutters)



Excellent in Readily Machinable Mold Steels, Stainless Steels, & Tool Steels

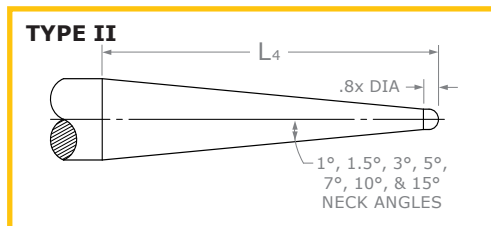
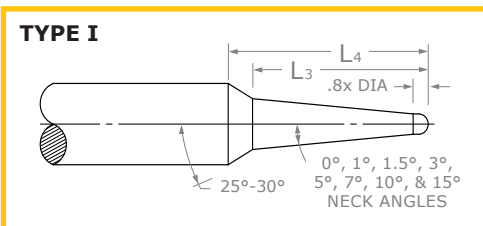


- Very short length of cut and solid tapered neck for maximum rigidity
- Ideal for contour machining of mold and die cavities
- 35° helix for increased cutting performance
- h6 shank tolerance for high precision tool holders
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- 2 flutes to center • Solid carbide • CNC ground in the USA

MEDIUM ALLOY STEELS

NECK ANGLE	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
									2 FL	PRICE
A1 <sup>+0°00'</sup> / <sub>-0°30'</sub>	D1 <sup>+0.000"</sup> / <sub>-0.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-0.000"</sub>		L3	L4		D2 (h6)	L1		
0° (straight neck)	.062 (1/16)	.050	I	.500	<b>.610</b>	6.2°	3/16	2	882843-C6	60.90
	.062 (1/16)	.050	I	1.000	<b>1.110</b>	3.3°	3/16	2-1/2	882850-C6	66.50
	.093 (3/32)	.074	I	.750	<b>.833</b>	3.4°	3/16	2	882864-C6	60.90
	.093 (3/32)	.074	I	1.125	<b>1.208</b>	2.3°	3/16	2-1/2	882871-C6	66.50
	.125 (1/8)	.100	I	1.000	<b>1.058</b>	1.8°	3/16	2-1/2	882877-C6	66.50
	.125 (1/8)	.100	I	1.750	<b>1.808</b>	1.0°	3/16	3	882885-C6	68.50
1°	.062 (1/16)	.050	I	.500	<b>.595</b>	6.4°	3/16	2	927543-C6	59.90
	.062 (1/16)	.050	I	1.000	<b>1.080</b>	3.5°	3/16	2-1/2	927550-C6	65.40
	.093 (3/32)	.074	I	.750	<b>.811</b>	3.6°	3/16	2	927564-C6	60.50
	.093 (3/32)	.074	I	1.125	<b>1.175</b>	2.4°	3/16	2-1/2	927571-C6	65.40
	.125 (1/8)	.100	I	1.000	<b>1.027</b>	1.9°	3/16	2	927577-C6	62.30
	.125 (1/8)	.100	II	1.890	<b>1.890</b>	1.0°	3/16	3	927585-C6	67.60
	.187 (3/16)	.150	II	1.940	<b>1.940</b>	1.0°	1/4	4	927587-C6	79.40
	.250 (1/4)	.200	II	1.990	<b>1.990</b>	1.0°	5/16	4	927592-C6	84.80
1.5°	.015 (1/64)	.012	I	.125	<b>.269</b>	18.2°	3/16	2	19001-C6	68.00
	.015 (1/64)	.012	I	.250	<b>.389</b>	12.8°	3/16	2	19008-C6	68.00
	.031 (1/32)	.025	I	.250	<b>.375</b>	12.3°	3/16	2	19015-C6	66.50
	.031 (1/32)	.025	I	.500	<b>.614</b>	7.5°	3/16	2	19022-C6	66.50
	.039 (1 mm)	.031	I	.375	<b>.488</b>	9.0°	3/16	2	19025-C6	63.60
	.047 (3/64)	.038	I	.375	<b>.481</b>	8.7°	3/16	2	19029-C6	63.60
	.047 (3/64)	.038	I	.750	<b>.839</b>	5.0°	3/16	2	19036-C6	63.60
	.062 (1/16)	.050	I	.500	<b>.588</b>	6.4°	3/16	2	19043-C6	59.90
	.062 (1/16)	.050	I	1.000	<b>1.066</b>	3.5°	3/16	2-1/2	19050-C6	66.00
	.062 (1/16)	.050	I	1.500	<b>1.543</b>	2.4°	3/16	3	19053-C6	67.90
	.078 (5/64)	.062	I	.625	<b>.694</b>	4.8°	3/16	2	19057-C6	60.50
	.093 (3/32)	.074	I	.750	<b>.801</b>	3.6°	3/16	2	19064-C6	59.90
	.093 (3/32)	.074	I	1.500	<b>1.517</b>	1.9°	3/16	2-1/2	19066-C6	65.40
	.093 (3/32)	.074	II	1.878	<b>1.878</b>	1.5°	3/16	3	19068-C6	68.50
	.125 (1/8)	.100	II	1.293	<b>1.293</b>	1.5°	3/16	2-1/2	19071-C6	62.30
	.125 (1/8)	.100	II	2.487	<b>2.487</b>	1.5°	1/4	4	19078-C6	73.20
	.187 (3/16)	.150	II	1.343	<b>1.343</b>	1.5°	1/4	2-1/2	19085-C6	67.70
	.250 (1/4)	.200	II	1.393	<b>1.393</b>	1.5°	5/16	2-1/2	19092-C6	86.40

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# HIGH HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Ball – Tapered Reach (Mold Cutters) (cont.)

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NECK ANGLE	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
									2 FL	PRICE
A <sub>1</sub> <sup>+0°00'</sup> <sub>-0°30'</sub>	D <sub>1</sub> <sup>+0.000"</sup> <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> <sub>-.000"</sub>		L <sub>3</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>		
3°	.015 (1/64)	.012	I	.156	<b>.292</b>	16.8°	3/16	2-1/2	36901-C6	73.10
	.015 (1/64)	.012	I	.375	<b>.491</b>	10.1°	3/16	2-1/2	66643-C6	68.50
	.015 (1/64)	.012	I	.875	<b>.946</b>	5.3°	3/16	2-1/2	66648-C6	67.90
	.020	.016	I	.250	<b>.374</b>	13.0°	3/16	2-1/2	36904-C6	72.40
	.020	.016	I	.500	<b>.601</b>	8.1°	3/16	2-1/2	36907-C6	72.40
	.025	.020	I	.250	<b>.370</b>	12.8°	3/16	2-1/2	36910-C6	72.80
	.025	.020	I	.500	<b>.597</b>	7.9°	3/16	2-1/2	36913-C6	72.10
	.031 (1/32)	.025	I	.312	<b>.421</b>	10.9°	3/16	2-1/2	36916-C6	72.80
	.031 (1/32)	.025	I	.750	<b>.820</b>	5.6°	3/16	2-1/2	67046-C6	59.70
	.031 (1/32)	.025	II	1.518	<b>1.518</b>	3.0°	3/16	2-1/2	36931-C6	59.70
	.039 (1 mm)	.031	I	.375	<b>.472</b>	9.3°	3/16	2-1/2	36917-C6	72.80
	.039 (1 mm)	.031	I	.750	<b>.813</b>	5.4°	3/16	2-1/2	36919-C6	72.10
	.039 (1 mm)	.031	II	1.448	<b>1.448</b>	3.0°	3/16	2-1/2	36921-C6	72.80
	.047 (3/64)	.038	I	.375	<b>.466</b>	9.0°	3/16	2-1/2	36922-C6	69.70
	.047 (3/64)	.038	I	.875	<b>.921</b>	4.5°	3/16	2-1/2	67348-C6	56.30
	.047 (3/64)	.038	II	1.378	<b>1.378</b>	3.0°	3/16	2-1/2	36947-C6	56.30
	.050	.040	I	.500	<b>.577</b>	7.1°	3/16	2-1/2	36925-C6	69.70
	.060	.048	I	.625	<b>.683</b>	5.6°	3/16	2-1/2	36928-C6	69.70
	.062 (1/16)	.050	I	.375	<b>.454</b>	8.4°	3/16	2-1/2	36934-C6	65.70
	.062 (1/16)	.050	I	.625	<b>.681</b>	5.5°	3/16	2-1/2	66946-C6	56.30
	.062 (1/16)	.050	I	.875	<b>.909</b>	4.1°	3/16	2-1/2	36937-C6	65.10
	.062 (1/16)	.050	II	1.247	<b>1.247</b>	3.0°	3/16	2-1/2	36962-C6	56.30
	.062 (1/16)	.050	II	1.843	<b>1.843</b>	3.0°	1/4	3	37362-C6	74.40
	.078 (5/64)	.062	I	.500	<b>.555</b>	6.1°	3/16	2-1/2	36940-C6	65.10
	.078 (5/64)	.062	II	1.107	<b>1.107</b>	3.0°	3/16	2-1/2	36978-C6	54.80
	.093 (3/32)	.074	I	.625	<b>.657</b>	4.5°	3/16	2	36943-C6	59.90
	.093 (3/32)	.074	II	.976	<b>.976</b>	3.0°	3/16	2	36993-C6	49.90
	.093 (3/32)	.074	II	1.572	<b>1.572</b>	3.0°	1/4	3	37393-C6	73.10
	.100	.080	II	1.511	<b>1.511</b>	3.0°	1/4	3	37400-C6	75.60
	.109 (7/64)	.087	II	1.432	<b>1.432</b>	3.0°	1/4	3	37402-C6	75.60
	.118 (3 mm)	.094	II	1.354	<b>1.354</b>	2.9°	1/4	2-1/2	37405-C6	74.90
	.125 (1/8)	.100	I	.875	<b>.913</b>	4.2°	1/4	2-1/2	36946-C6	71.60
.125 (1/8)	.100	II	1.293	<b>1.293</b>	2.9°	1/4	2-1/2	37408-C6	68.10	
.125 (1/8)	.100	II	2.485	<b>2.485</b>	3.0°	3/8	4	37708-C6	106.70	
.156 (5/32)	.125	II	1.020	<b>1.020</b>	2.8°	1/4	2-1/2	37410-C6	74.40	
.187 (3/16)	.150	II	.746	<b>.746</b>	2.8°	1/4	2-1/2	37412-C6	73.70	
.187 (3/16)	.150	II	1.343	<b>1.343</b>	2.9°	5/16	2-1/2	36949-C6	86.40	
.187 (3/16)	.150	II	1.939	<b>1.939</b>	2.9°	3/8	4	37712-C6	106.70	
.250 (1/4)	.200	II	1.393	<b>1.393</b>	2.9°	3/8	2-1/2	37716-C6	89.00	
5°	.015 (1/64)	.012	I	.375	<b>.469</b>	10.6°	3/16	2	66664-C6	61.50
	.015 (1/64)	.012	II	.998	<b>.998</b>	5.0°	3/16	2	38515-C6	61.20
	.020	.016	I	.562	<b>.624</b>	7.8°	3/16	2	38907-C6	66.80
	.020	.016	II	.973	<b>.973</b>	5.0°	3/16	2	38520-C6	66.50
	.025	.020	I	.562	<b>.621</b>	7.6°	3/16	2	38914-C6	67.50
	.025	.020	II	.949	<b>.949</b>	5.0°	3/16	2	38525-C6	67.20
	.031 (1/32)	.025	I	.375	<b>.457</b>	10.1°	3/16	2	67065-C6	54.70
	.031 (1/32)	.025	II	.919	<b>.919</b>	5.0°	3/16	2	38531-C6	54.70
	.039 (1 mm)	.031	I	.625	<b>.664</b>	6.6°	3/16	2	38921-C6	66.50

continued on next page

MEDIUM ALLOY STEELS

# HIGH HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Ball – Tapered Reach (Mold Cutters) (cont.)

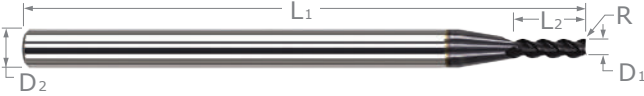
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NECK ANGLE	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
									2 FL	PRICE
A1 <sup>+0°00'</sup> / <sub>-0°30'</sub>	D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>		L3	L4		D2 (h6)	L1		
5°	.047 (3/64)	.038	II	.841	<b>.841</b>	5.0°	3/16	2	38547-C6	55.20
	.047 (3/64)	.038	II	1.198	<b>1.198</b>	5.0°	1/4	2-1/2	38947-C6	73.70
	.050	.040	II	.826	<b>.826</b>	4.9°	3/16	2	38928-C6	55.60
	.060	.048	II	.777	<b>.777</b>	4.9°	3/16	2	38935-C6	55.10
	.060	.048	II	1.134	<b>1.134</b>	5.0°	1/4	2-1/2	38960-C6	73.70
	.062 (1/16)	.050	I	.375	<b>.434</b>	8.8°	3/16	2	66963-C6	52.00
	.062 (1/16)	.050	II	.767	<b>.767</b>	4.9°	3/16	2	38562-C6	51.50
	.062 (1/16)	.050	II	1.124	<b>1.124</b>	5.0°	1/4	2-1/2	38962-C6	73.70
	.078 (5/64)	.062	II	1.045	<b>1.045</b>	4.9°	1/4	2-1/2	38978-C6	70.30
	.093 (3/32)	.074	II	.972	<b>.972</b>	4.9°	1/4	2-1/2	38993-C6	71.00
	.093 (3/32)	.074	II	1.686	<b>1.686</b>	5.0°	3/8	3	39293-C6	94.20
	.100	.080	II	.937	<b>.937</b>	4.9°	1/4	2-1/2	39000-C6	71.50
	.109 (7/64)	.087	II	.893	<b>.893</b>	4.8°	1/4	2-1/2	39002-C6	71.50
	.118 (3 mm)	.094	II	.849	<b>.849</b>	4.7°	1/4	2-1/2	39005-C6	70.80
	.125 (1/8)	.100	I	.500	<b>.548</b>	7.3°	1/4	2-1/2	38942-C6	67.40
	.125 (1/8)	.100	II	.814	<b>.814</b>	4.8°	1/4	2-1/2	39008-C6	67.00
	.125 (1/8)	.100	II	1.529	<b>1.529</b>	4.9°	3/8	3	39308-C6	90.00
	.156 (5/32)	.125	II	.661	<b>.661</b>	4.6°	1/4	2-1/2	39010-C6	70.30
	.187 (3/16)	.150	II	1.222	<b>1.222</b>	4.8°	3/8	2-1/2	39312-C6	86.40
	.187 (3/16)	.150	II	1.222	<b>1.222</b>	4.8°	3/8	4	922312-C6	96.30
.250 (1/4)	.200	II	.914	<b>.914</b>	4.5°	3/8	2-1/2	39316-C6	87.20	
.250 (1/4)	.200	II	.914	<b>.914</b>	4.5°	3/8	4	922316-C6	96.30	
7°	.015 (1/64)	.012	I	.187	<b>.299</b>	16.5°	3/16	2	66678-C6	61.50
	.015 (1/64)	.012	II	.714	<b>.714</b>	7.0°	3/16	2	40015-C6	62.10
	.020	.016	II	.698	<b>.698</b>	7.0°	3/16	2	40020-C6	61.50
	.031 (1/32)	.025	I	.250	<b>.338</b>	13.6°	3/16	2	67078-C6	55.10
	.031 (1/32)	.025	II	.662	<b>.662</b>	6.9°	3/16	2	40031-C6	55.10
	.031 (1/32)	.025	II	.917	<b>.917</b>	7.0°	1/4	2-1/2	40431-C6	70.30
	.039 (1 mm)	.031	II	.636	<b>.636</b>	6.9°	3/16	2	40007-C6	55.10
	.047 (3/64)	.038	I	.375	<b>.425</b>	9.9°	3/16	2	40014-C6	55.10
	.047 (3/64)	.038	II	.610	<b>.610</b>	6.9°	3/16	2	40047-C6	55.10
	.047 (3/64)	.038	II	.864	<b>.864</b>	6.9°	1/4	2-1/2	40447-C6	70.30
	.060	.048	II	.822	<b>.822</b>	6.9°	1/4	2-1/2	40460-C6	71.00
	.062 (1/16)	.050	I	.500	<b>.567</b>	9.9°	1/4	2-1/2	66980-C6	70.30
	.062 (1/16)	.050	II	.815	<b>.815</b>	6.9°	1/4	2-1/2	40462-C6	70.30
	.062 (1/16)	.050	II	1.324	<b>1.324</b>	6.9°	3/8	2-1/2	40862-C6	90.20
	.078 (5/64)	.062	II	1.272	<b>1.272</b>	6.9°	3/8	2-1/2	40878-C6	90.20
	.093 (3/32)	.074	II	.714	<b>.714</b>	6.7°	1/4	2-1/2	40493-C6	67.00
	.093 (3/32)	.074	II	1.223	<b>1.223</b>	6.9°	3/8	2-1/2	40893-C6	90.20
	.125 (1/8)	.100	II	.609	<b>.609</b>	6.5°	1/4	2-1/2	40508-C6	63.90
	.125 (1/8)	.100	II	1.118	<b>1.118</b>	6.8°	3/8	2-1/2	40908-C6	87.20
	.187 (3/16)	.150	II	.914	<b>.914</b>	6.5°	3/8	2-1/2	40912-C6	87.20
.187 (3/16)	.150	II	.914	<b>.914</b>	6.5°	3/8	4	917212-C6	97.30	
10°	.031 (1/32)	.025	I	.250	<b>.317</b>	14.5°	3/16	2	774631-C6	55.60
	.062 (1/16)	.050	I	.500	<b>.525</b>	10.7°	1/4	2	774662-C6	71.00
	.125 (1/8)	.100	II	.632	<b>.632</b>	9.0°	5/16	2-1/2	774608-C6	87.20
15°	.031 (1/32)	.025	I	.250	<b>.281</b>	16.3°	3/16	2	773931-C6	55.60
	.062 (1/16)	.050	II	.401	<b>.401</b>	14.1°	1/4	2	773962-C6	71.00
	.125 (1/8)	.100	II	.567	<b>.567</b>	13.7°	3/8	2-1/2	773908-C6	87.20

MEDIUM ALLOY STEELS

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Corner Radius



- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

MEDIUM ALLOY STEELS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .001"	+ .010"					
- .0005"	- .02mm	equivalent	- .001"	- .000"					
			+ .025mm	+ .25mm					
			- .025mm	- .00mm					
.2 mm	.0078		<b>.05 mm</b>	.30 mm (1.5x)	3	4 mm	50 mm	985604-C3	60.50
.2 mm	.0078		<b>.05 mm</b>	.60 mm (3x)	3	4 mm	50 mm	976804-C3	60.50
.010	.0100		<b>.003</b>	.015 (1.5x)	3	1/8	1-1/2	52610-C3	57.10
.010	.0100		<b>.003</b>	.030 (3x)	3	1/8	1-1/2	45610-C3	57.10
.3 mm	.0118		<b>.08 mm</b>	.90 mm (3x)	3	4 mm	50 mm	976806-C3	59.30
.015 (1/64)	.0150		<b>.003</b>	.022 (1.5x)	3	1/8	1-1/2	52615-C3	47.20
.015 (1/64)	.0150		<b>.003</b>	.045 (3x)	3	1/8	1-1/2	45615-C3	46.30
.015 (1/64)	.0150		<b>.003</b>	.078 (5x)	3	1/8	2-1/2	53815-C3	57.20
.4 mm	.0157		<b>.08 mm</b>	.60 mm (1.5x)	3	4 mm	50 mm	985609-C3	50.50
.4 mm	.0157		<b>.08 mm</b>	1.20 mm (3x)	3	4 mm	50 mm	976809-C3	50.00
.5 mm	.0196		<b>.10 mm</b>	.75 mm (1.5x)	3	4 mm	50 mm	985611-C3	45.20
.5 mm	.0196		<b>.10 mm</b>	1.50 mm (3x)	3	4 mm	50 mm	976811-C3	45.20
.020	.0200		<b>.004</b>	.030 (1.5x)	3	1/8	1-1/2	52620-C3	41.40
.020	.0200		<b>.004</b>	.060 (3x)	3	1/8	1-1/2	45620-C3	41.40
.020	.0200		<b>.004</b>	.100 (5x)	3	1/8	2-1/2	53820-C3	50.70
.6 mm	.0236		<b>.10 mm</b>	.90 mm (1.5x)	3	4 mm	50 mm	985613-C3	43.80
.6 mm	.0236		<b>.10 mm</b>	1.80 mm (3x)	3	4 mm	50 mm	976813-C3	43.80
.025	.0250		<b>.004</b>	.038 (1.5x)	3	1/8	1-1/2	52625-C3	39.30
.025	.0250		<b>.004</b>	.075 (3x)	3	1/8	1-1/2	45625-C3	40.00
.025	.0250		<b>.004</b>	.125 (5x)	3	1/8	2-1/2	53825-C3	48.30
.7 mm	.0275		<b>.10 mm</b>	2.10 mm (3x)	3	4 mm	50 mm	976815-C3	43.80
.031 (1/32)	.0310		<b>.005</b>	.047 (1.5x)	3	1/8	1-1/2	52631-C3	33.10
.031 (1/32)	.0310		<b>.005</b>	.093 (3x)	3	1/8	1-1/2	45631-C3	33.10
.031 (1/32)	.0310		<b>.005</b>	.156 (5x)	3	1/8	2-1/2	53831-C3	41.70
.031 (1/32)	.0310		<b>.010</b>	.093 (3x)	3	1/8	1-1/2	907231-C3	33.00
.8 mm	.0314		<b>.10 mm</b>	1.20 mm (1.5x)	3	4 mm	50 mm	985618-C3	37.80
.8 mm	.0314		<b>.10 mm</b>	2.40 mm (3x)	3	4 mm	50 mm	976818-C3	37.40
.035	.0350		<b>.005</b>	.053 (1.5x)	3	1/8	1-1/2	52635-C3	33.90
.035	.0350		<b>.005</b>	.105 (3x)	3	1/8	1-1/2	45635-C3	33.90
.035	.0350		<b>.005</b>	.187 (5x)	3	1/8	2-1/2	53835-C3	42.50
.9 mm	.0354		<b>.10 mm</b>	2.70 mm (3x)	3	4 mm	50 mm	976820-C3	37.40

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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Corner Radius (cont.)

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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.0005"	+0.00mm	decimal	+0.001"	+0.010"					
-0.0005"	-0.02mm	equivalent	-0.001"	-0.000"					
			+0.025mm	+0.25mm					
			-0.025mm	-0.00mm					
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm (1.5x)	3	4 mm	50 mm	985622-C3	37.80
	1.0 mm	.0393	<b>.10 mm</b>	3.00 mm (3x)	3	4 mm	50 mm	976822-C3	37.80
.040		.0400	<b>.005</b>	.060 (1.5x)	3	1/8	1-1/2	52640-C3	33.90
.040		.0400	<b>.005</b>	.120 (3x)	3	1/8	1-1/2	45640-C3	33.90
.040		.0400	<b>.005</b>	.203 (5x)	3	1/8	2-1/2	53840-C3	41.70
	1.1 mm	.0433	<b>.10 mm</b>	3.00 mm (3x)	3	4 mm	50 mm	976824-C3	37.80
.045		.0450	<b>.005</b>	.068 (1.5x)	3	1/8	1-1/2	52645-C3	33.90
.045		.0450	<b>.005</b>	.135 (3x)	3	1/8	1-1/2	45645-C3	33.20
.045		.0450	<b>.005</b>	.225 (5x)	3	1/8	2-1/2	53845-C3	42.50
.047 (3/64)		.0470	<b>.005</b>	.071 (1.5x)	3	1/8	1-1/2	52647-C3	33.80
.047 (3/64)		.0470	<b>.005</b>	.141 (3x)	3	1/8	1-1/2	45647-C3	33.10
.047 (3/64)		.0470	<b>.005</b>	.250 (5x)	3	1/8	2-1/2	53847-C3	41.70
.047 (3/64)		.0470	<b>.010</b>	.141 (3x)	3	1/8	1-1/2	907247-C3	33.10
.047 (3/64)		.0470	<b>.015</b>	.141 (3x)	3	1/8	1-1/2	903447-C3	33.10
	1.2 mm	.0472	<b>.10 mm</b>	1.80 mm (1.5x)	3	4 mm	50 mm	985627-C3	37.80
	1.2 mm	.0472	<b>.10 mm</b>	3.50 mm (3x)	3	4 mm	50 mm	976827-C3	37.40
.050		.0500	<b>.005</b>	.075 (1.5x)	3	1/8	1-1/2	52650-C3	33.90
.050		.0500	<b>.005</b>	.150 (3x)	3	1/8	1-1/2	45650-C3	33.20
.050		.0500	<b>.005</b>	.250 (5x)	3	1/8	2-1/2	53850-C3	41.70
	1.3 mm	.0511	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	976829-C3	37.80
.055		.0550	<b>.005</b>	.083 (1.5x)	3	1/8	1-1/2	52655-C3	33.90
.055		.0550	<b>.005</b>	.165 (3x)	3	1/8	1-1/2	45655-C3	33.20
.055		.0550	<b>.005</b>	.275 (5x)	3	1/8	2-1/2	53855-C3	41.70
	1.4 mm	.0551	<b>.10 mm</b>	2.10 mm (1.5x)	3	4 mm	50 mm	985631-C3	37.80
	1.4 mm	.0551	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	976831-C3	37.80
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm (1.5x)	3	4 mm	50 mm	985633-C3	35.60
	1.5 mm	.0590	<b>.20 mm</b>	4.50 mm (3x)	3	4 mm	50 mm	976833-C3	35.20
.060		.0600	<b>.010</b>	.090 (1.5x)	3	1/8	1-1/2	52660-C3	33.90
.060		.0600	<b>.010</b>	.180 (3x)	3	1/8	1-1/2	45660-C3	33.90
.060		.0600	<b>.010</b>	.312 (5x)	3	1/8	2-1/2	53860-C3	42.50
.062 (1/16)		.0620	<b>.005</b>	.093 (1.5x)	3	1/8	1-1/2	881862-C3	30.70
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	3	1/8	1-1/2	913862-C3	30.70
.062 (1/16)		.0620	<b>.005</b>	.312 (5x)	3	1/8	2-1/2	759662-C3	40.90
.062 (1/16)		.0620	<b>.010</b>	.093 (1.5x)	3	1/8	1-1/2	52662-C3	30.70
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	3	1/8	1-1/2	45662-C3	30.70
.062 (1/16)		.0620	<b>.010</b>	.312 (5x)	3	1/8	2-1/2	53862-C3	40.10
.062 (1/16)		.0620	<b>.015</b>	.186 (3x)	3	1/8	1-1/2	903462-C3	30.70
.062 (1/16)		.0620	<b>.020</b>	.186 (3x)	3	1/8	1-1/2	931362-C3	30.70
	1.6 mm	.0629	<b>.20 mm</b>	2.40 mm (1.5x)	3	4 mm	50 mm	985636-C3	35.60
	1.6 mm	.0629	<b>.20 mm</b>	5.00 mm (3x)	3	4 mm	50 mm	976836-C3	35.60
	1.7 mm	.0669	<b>.20 mm</b>	5.00 mm (3x)	3	4 mm	50 mm	976838-C3	35.60
.070		.0700	<b>.010</b>	.105 (1.5x)	3	1/8	1-1/2	52670-C3	31.40
.070		.0700	<b>.010</b>	.210 (3x)	3	1/8	1-1/2	45670-C3	30.80
	1.8 mm	.0708	<b>.20 mm</b>	2.70 mm (1.5x)	3	4 mm	50 mm	985640-C3	35.60
	1.8 mm	.0708	<b>.20 mm</b>	5.50 mm (3x)	3	4 mm	50 mm	976840-C3	35.60

MEDIUM ALLOY STEELS

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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Corner Radius (cont.)

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MEDIUM ALLOY STEELS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED	
D <sub>1</sub>		decimal equivalent	R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .001" - .001" + .025mm - .025mm	+ .010" - .000" + .25mm - .00mm					
1.9 mm		.0748	<b>.20 mm</b>	5.50 mm (3x)	3	4 mm	50 mm	976842-C3	35.60
.078 (5/64)		.0780	<b>.005</b>	.118 (1.5x)	3	1/8	1-1/2	881878-C3	30.80
.078 (5/64)		.0780	<b>.005</b>	.234 (3x)	3	1/8	1-1/2	913878-C3	30.80
.078 (5/64)		.0780	<b>.010</b>	.118 (1.5x)	3	1/8	1-1/2	52678-C3	30.80
.078 (5/64)		.0780	<b>.010</b>	.234 (3x)	3	1/8	1-1/2	45678-C3	30.80
.078 (5/64)		.0780	<b>.010</b>	.406 (5x)	3	1/8	2-1/2	53878-C3	40.10
.078 (5/64)		.0780	<b>.015</b>	.234 (3x)	3	1/8	1-1/2	903478-C3	31.40
.078 (5/64)		.0780	<b>.020</b>	.234 (3x)	3	1/8	1-1/2	931378-C3	31.40
2.0 mm		.0787	<b>.20 mm</b>	3.00 mm (1.5x)	3	4 mm	50 mm	985645-C3	35.60
2.0 mm		.0787	<b>.20 mm</b>	6.00 mm (3x)	3	4 mm	50 mm	976845-C3	35.60
.080		.0800	<b>.010</b>	.120 (1.5x)	3	1/8	1-1/2	52680-C3	31.40
.080		.0800	<b>.010</b>	.240 (3x)	3	1/8	1-1/2	45680-C3	31.40
.090		.0900	<b>.010</b>	.270 (3x)	3	1/8	1-1/2	45690-C3	31.40
.093 (3/32)		.0930	<b>.005</b>	.140 (1.5x)	3	1/8	1-1/2	881893-C3	30.70
.093 (3/32)		.0930	<b>.005</b>	.279 (3x)	3	1/8	1-1/2	913893-C3	30.70
.093 (3/32)		.0930	<b>.005</b>	.500 (5x)	3	1/8	2-1/2	759693-C3	40.90
.093 (3/32)		.0930	<b>.010</b>	.140 (1.5x)	3	1/8	1-1/2	52693-C3	30.70
.093 (3/32)		.0930	<b>.010</b>	.279 (3x)	3	1/8	1-1/2	45693-C3	30.70
.093 (3/32)		.0930	<b>.010</b>	.500 (5x)	3	1/8	2-1/2	53893-C3	40.10
.093 (3/32)		.0930	<b>.015</b>	.140 (1.5x)	3	1/8	1-1/2	792393-C3	30.70
.093 (3/32)		.0930	<b>.015</b>	.279 (3x)	3	1/8	1-1/2	903493-C3	30.70
.093 (3/32)		.0930	<b>.020</b>	.279 (3x)	3	1/8	1-1/2	931393-C3	30.70
.093 (3/32)		.0930	<b>.030</b>	.279 (3x)	3	1/8	1-1/2	927893-C3	36.00
2.5 mm		.0984	<b>.20 mm</b>	3.70 mm (1.5x)	3	4 mm	50 mm	985651-C3	35.20
2.5 mm		.0984	<b>.20 mm</b>	7.50 mm (3x)	3	4 mm	50 mm	976851-C3	35.20
.100		.1000	<b>.010</b>	.150 (1.5x)	3	1/8	1-1/2	52700-C3	31.40
.100		.1000	<b>.010</b>	.300 (3x)	3	1/8	1-1/2	45700-C3	31.40
.100		.1000	<b>.010</b>	.500 (5x)	3	1/8	2-1/2	53900-C3	40.50
.109 (7/64)		.1090	<b>.010</b>	.164 (1.5x)	3	1/8	1-1/2	52702-C3	30.80
.109 (7/64)		.1090	<b>.010</b>	.327 (3x)	3	1/8	1-1/2	45702-C3	31.40
3.0 mm		.1181	<b>.20 mm</b>	4.50 mm (1.5x)	3	4 mm	50 mm	985657-C3	35.60
3.0 mm		.1181	<b>.20 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	976857-C3	35.60

D <sub>1</sub>	decimal equivalent	R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" - .002"		+ .001" - .001"	+ .030" - .000"					
.125 (1/8)	.1250	<b>.005</b>	.187 (1.5x)	4	1/8	1-1/2	881908-C3	31.40
.125 (1/8)	.1250	<b>.005</b>	.375 (3x)	4	1/8	1-1/2	913908-C3	30.80
.125 (1/8)	.1250	<b>.010</b>	.375 (3x)	4	1/8	1-1/2	907308-C3	29.10
.125 (1/8)	.1250	<b>.015</b>	.187 (1.5x)	4	1/8	1-1/2	52708-C3	28.80
.125 (1/8)	.1250	<b>.015</b>	.375 (3x)	4	1/8	1-1/2	45708-C3	28.80
.125 (1/8)	.1250	<b>.015</b>	.625 (5x)	4	1/8	2-1/2	53908-C3	40.10
.125 (1/8)	.1250	<b>.020</b>	.187 (1.5x)	4	1/8	1-1/2	778708-C3	29.10
.125 (1/8)	.1250	<b>.020</b>	.375 (3x)	4	1/8	1-1/2	931408-C3	28.80
.125 (1/8)	.1250	<b>.020</b>	.625 (5x)	4	1/8	2-1/2	767308-C3	39.50
.125 (1/8)	.1250	<b>.030</b>	.375 (3x)	4	1/8	1-1/2	927908-C3	34.10
.140 (9/64)	.1406	<b>.015</b>	.220 (1.5x)	4	3/16	2	52709-C3	37.20
.140 (9/64)	.1406	<b>.015</b>	.425 (3x)	4	3/16	2	45709-C3	37.90

continued on next page

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Corner Radius (cont.)

continued from previous page

CUTTER DIAMETER		CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED	
D <sub>1</sub> <sup>+0.000"</sup> <sub>-0.002"</sub>	decimal equivalent	R <sup>+0.001"</sup> <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> <sub>-0.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.156 (5/32)	.1562	<b>.015</b>	.235 (1.5x)	4	3/16	2	52710-C3	33.40
.156 (5/32)	.1562	<b>.015</b>	.470 (3x)	4	3/16	2	45710-C3	34.10
.156 (5/32)	.1562	<b>.015</b>	.750 (5x)	4	3/16	3	53910-C3	44.20
.156 (5/32)	.1562	<b>.030</b>	.470 (3x)	4	3/16	2	927910-C3	39.50
.187 (3/16)	.1875	<b>.005</b>	.562 (3x)	4	3/16	2	913912-C3	34.00
.187 (3/16)	.1875	<b>.010</b>	.562 (3x)	4	3/16	2	907312-C3	34.00
.187 (3/16)	.1875	<b>.015</b>	.285 (1.5x)	4	3/16	2	52712-C3	31.60
.187 (3/16)	.1875	<b>.015</b>	.562 (3x)	4	3/16	2	45712-C3	31.60
.187 (3/16)	.1875	<b>.015</b>	1.000 (5x)	4	3/16	3	53912-C3	44.20
.187 (3/16)	.1875	<b>.020</b>	.562 (3x)	4	3/16	2	931412-C3	38.10
.187 (3/16)	.1875	<b>.030</b>	.562 (3x)	4	3/16	2	927912-C3	38.10
.187 (3/16)	.1875	<b>.060</b>	.562 (3x)	4	3/16	2	816812-C3	38.10
.250 (1/4)	.2500	<b>.015</b>	.375 (1.5x)	4	1/4	2-1/2	52716-C3	39.80
.250 (1/4)	.2500	<b>.015</b>	.750 (3x)	4	1/4	2-1/2	45716-C3	39.80
.250 (1/4)	.2500	<b>.015</b>	1.250 (5x)	4	1/4	4	53916-C3	54.90
.250 (1/4)	.2500	<b>.020</b>	.750 (3x)	4	1/4	2-1/2	931416-C3	39.80
.250 (1/4)	.2500	<b>.060</b>	.750 (3x)	4	1/4	2-1/2	816816-C3	39.80
.312 (5/16)	.3125	<b>.015</b>	.470 (1.5x)	4	5/16	2-1/2	52720-C3	59.60
.312 (5/16)	.3125	<b>.015</b>	1.000 (3x)	4	5/16	2-1/2	45720-C3	58.50
.375 (3/8)	.3750	<b>.015</b>	.570 (1.5x)	4	3/8	2-1/2	52724-C3	68.00
.375 (3/8)	.3750	<b>.015</b>	1.125 (3x)	4	3/8	2-1/2	45724-C3	68.00
.500 (1/2)	.5000	<b>.030</b>	.750 (1.5x)	4	1/2	3	52732-C3	87.90

MEDIUM ALLOY STEELS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 166**

**MACHINING  
ADVISOR PRO**

FREE for desktop,  
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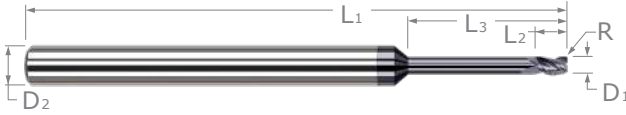


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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Corner Radius – Long Reach, Stub Flute



- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- Corner radius for improved strength
- TiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

MEDIUM ALLOY STEELS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	TiN COATED	
D <sub>1</sub>			R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" / - .0005"	+ .00mm / - .02mm	decimal equivalent	+ .001" / - .001" / + .025mm / - .025mm	+ .010" / - .000" / + .25mm / - .00mm	+ .010" / - .000" / + .25mm / - .00mm					
.015 (1/64)		.0150	.003	.022	.078 (5x)	3	1/8	2-1/2	62415-C3	61.10
.015 (1/64)		.0150	.003	.022	.125 (8x)	3	1/8	2-1/2	55015-C3	62.40
.015 (1/64)		.0150	.003	.022	.187 (12x)	3	1/8	2-1/2	63815-C3	68.30
	.4 mm	.0157	.08 mm	.60 mm	2.0 mm (5x)	3	4 mm	50 mm	986709-C3	68.30
	.4 mm	.0157	.08 mm	.60 mm	3.2 mm (8x)	3	4 mm	50 mm	978009-C3	69.70
	.4 mm	.0157	.08 mm	.60 mm	4.8 mm (12x)	3	4 mm	50 mm	982309-C3	75.60
	.5 mm	.0196	.10 mm	.75 mm	2.5 mm (5x)	3	4 mm	50 mm	986711-C3	65.70
	.5 mm	.0196	.10 mm	.75 mm	4.0 mm (8x)	3	4 mm	50 mm	978011-C3	66.80
	.5 mm	.0196	.10 mm	.75 mm	6.0 mm (12x)	3	4 mm	50 mm	982311-C3	73.20
	.5 mm	.0196	.10 mm	.75 mm	8.0 mm (16x)	3	4 mm	50 mm	975511-C3	76.50
.020		.0200	.004	.030	.100 (5x)	3	1/8	2-1/2	62420-C3	58.30
.020		.0200	.004	.030	.160 (8x)	3	1/8	2-1/2	55020-C3	59.50
.020		.0200	.004	.030	.250 (12x)	3	1/8	2-1/2	63820-C3	65.90
	.6 mm	.0236	.10 mm	.90 mm	3.0 mm (5x)	3	4 mm	50 mm	986713-C3	64.20
	.6 mm	.0236	.10 mm	.90 mm	4.8 mm (8x)	3	4 mm	50 mm	978013-C3	65.70
	.6 mm	.0236	.10 mm	.90 mm	7.2 mm (12x)	3	4 mm	50 mm	982313-C3	70.00
.025		.0250	.004	.038	.125 (5x)	3	1/8	2-1/2	62425-C3	56.10
.025		.0250	.004	.038	.203 (8x)	3	1/8	2-1/2	55025-C3	57.70
.025		.0250	.004	.038	.312 (12x)	3	1/8	2-1/2	63825-C3	64.10
.031 (1/32)		.0310	.005	.047	.156 (5x)	3	1/8	2-1/2	62431-C3	53.20
.031 (1/32)		.0310	.005	.047	.250 (8x)	3	1/8	2-1/2	55031-C3	54.30
.031 (1/32)		.0310	.005	.047	.375 (12x)	3	1/8	2-1/2	63831-C3	56.70
	.8 mm	.0314	.10 mm	1.20 mm	4.0 mm (5x)	3	4 mm	50 mm	986718-C3	59.20
	.8 mm	.0314	.10 mm	1.20 mm	6.5 mm (8x)	3	4 mm	50 mm	978018-C3	60.40
	.8 mm	.0314	.10 mm	1.20 mm	9.5 mm (12x)	3	4 mm	50 mm	982318-C3	62.60
.035		.0350	.005	.053	.187 (5x)	3	1/8	2-1/2	62435-C3	54.00
	1.0 mm	.0393	.10 mm	1.50 mm	5.0 mm (5x)	3	4 mm	50 mm	986722-C3	59.20
	1.0 mm	.0393	.10 mm	1.50 mm	8.0 mm (8x)	3	4 mm	50 mm	978022-C3	59.80
	1.0 mm	.0393	.10 mm	1.50 mm	12.0 mm (12x)	3	4 mm	50 mm	982322-C3	62.60
	1.0 mm	.0393	.10 mm	1.50 mm	16.0 mm (16x)	3	4 mm	50 mm	975522-C3	66.20
.040		.0400	.005	.060	.203 (5x)	3	1/8	2-1/2	62440-C3	53.50
.045		.0450	.005	.068	.225 (5x)	3	1/8	2-1/2	62445-C3	54.00
.047 (3/64)		.0470	.005	.070	.250 (5x)	3	1/8	2-1/2	62447-C3	53.50
.047 (3/64)		.0470	.005	.070	.375 (8x)	3	1/8	2-1/2	55047-C3	54.30
.047 (3/64)		.0470	.005	.070	.570 (12x)	3	1/8	2-1/2	63847-C3	57.20

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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Corner Radius – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
D <sub>1</sub>			R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .001" - .001" + .025mm - .025mm	+ .010" - .000" + .25mm - .00mm	+ .010" - .000" + .25mm - .00mm					
.050		.0500	<b>.005</b>	.075	.250 (5x)	3	1/8	2-1/2	62450-C3	52.90
.055		.0550	<b>.005</b>	.083	.275 (5x)	3	1/8	2-1/2	62455-C3	53.40
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	7.5 mm (5x)	3	4 mm	50 mm	986733-C3	59.20
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	12.0 mm (8x)	3	4 mm	50 mm	978033-C3	60.40
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	18.0 mm (12x)	3	4 mm	50 mm	982333-C3	62.60
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	24.0 mm (16x)	3	4 mm	63 mm	975533-C3	66.20
.060		.0600	<b>.010</b>	.090	.312 (5x)	3	1/8	2-1/2	62460-C3	54.00
.062 (1/16)		.0620	<b>.005</b>	.093	.312 (5x)	3	1/8	2-1/2	815662-C3	56.00
.062 (1/16)		.0620	<b>.005</b>	.093	.500 (8x)	3	1/8	2-1/2	816562-C3	57.20
.062 (1/16)		.0620	<b>.010</b>	.093	.312 (5x)	3	1/8	2-1/2	62462-C3	53.20
.062 (1/16)		.0620	<b>.010</b>	.093	.500 (8x)	3	1/8	2-1/2	55062-C3	54.30
.062 (1/16)		.0620	<b>.010</b>	.093	.750 (12x)	3	1/8	2-1/2	63862-C3	56.70
.078 (5/64)		.0780	<b>.010</b>	.117	.406 (5x)	3	1/8	2-1/2	62478-C3	53.20
.078 (5/64)		.0780	<b>.010</b>	.117	.625 (8x)	3	1/8	2-1/2	55078-C3	54.30
.078 (5/64)		.0780	<b>.010</b>	.117	.940 (12x)	3	1/8	2-1/2	63878-C3	57.20
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	10.0 mm (5x)	3	4 mm	50 mm	986745-C3	59.20
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	16.0 mm (8x)	3	4 mm	50 mm	978045-C3	60.40
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	24.0 mm (12x)	3	4 mm	63 mm	982345-C3	62.60
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	32.0 mm (16x)	3	4 mm	63 mm	975545-C3	66.20
.093 (3/32)		.0930	<b>.005</b>	.139	.500 (5x)	3	1/8	2-1/2	815693-C3	56.00
.093 (3/32)		.0930	<b>.005</b>	.139	.750 (8x)	3	1/8	2-1/2	816593-C3	57.20
.093 (3/32)		.0930	<b>.010</b>	.139	.500 (5x)	3	1/8	2-1/2	62493-C3	53.20
.093 (3/32)		.0930	<b>.010</b>	.139	.750 (8x)	3	1/8	2-1/2	55093-C3	54.30
.093 (3/32)		.0930	<b>.010</b>	.139	1.125 (12x)	3	1/8	2-1/2	63893-C3	57.20
.100		.1000	<b>.010</b>	.150	.500 (5x)	3	1/8	2-1/2	62500-C3	55.40
	3.0 mm	.1181	<b>.20 mm</b>	4.50 mm	15.0 mm (5x)	3	4 mm	50 mm	986757-C3	55.60

D <sub>1</sub>	+ .000" - .002"	decimal equivalent	R	+ .001" - .001"	L <sub>2</sub>	+ .030" - .000"	L <sub>3</sub>	+ .030" - .000"	D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)		.1250	<b>.010</b>	.187	.625 (5x)	4	1/8	2-1/2	815708-C3	53.40		
.125 (1/8)		.1250	<b>.010</b>	.187	1.000 (8x)	4	1/8	2-1/2	816608-C3	54.50		
.125 (1/8)		.1250	<b>.015</b>	.187	.625 (5x)	4	1/8	2-1/2	62508-C3	53.40		
.125 (1/8)		.1250	<b>.015</b>	.187	1.000 (8x)	4	1/8	2-1/2	55108-C3	53.50		
.125 (1/8)		.1250	<b>.015</b>	.187	1.500 (12x)	4	1/8	3	63908-C3	56.70		
.156 (5/32)		.1562	<b>.015</b>	.235	.750 (5x)	4	3/16	3	62510-C3	57.80		
.156 (5/32)		.1562	<b>.015</b>	.235	1.250 (8x)	4	3/16	3	55110-C3	59.10		
.156 (5/32)		.1562	<b>.015</b>	.235	1.875 (12x)	4	3/16	4	63910-C3	73.70		
.156 (5/32)		.1562	<b>.030</b>	.235	1.250 (8x)	4	3/16	3	817310-C3	64.50		
.187 (3/16)		.1875	<b>.015</b>	.281	1.000 (5x)	4	3/16	3	62512-C3	57.80		
.187 (3/16)		.1875	<b>.015</b>	.281	1.500 (8x)	4	3/16	3	55112-C3	59.10		
.187 (3/16)		.1875	<b>.015</b>	.281	2.250 (12x)	4	3/16	4	63912-C3	73.70		
.187 (3/16)		.1875	<b>.030</b>	.281	1.500 (8x)	4	3/16	3	817312-C3	65.80		
.250 (1/4)		.2500	<b>.015</b>	.375	1.250 (5x)	4	1/4	4	62516-C3	65.60		
.250 (1/4)		.2500	<b>.015</b>	.375	2.000 (8x)	4	1/4	4	55116-C3	65.60		
.250 (1/4)		.2500	<b>.015</b>	.375	3.000 (12x)	4	1/4	6	63916-C3	81.50		

**PLEASE SEE SPEEDS & FEEDS ON PAGE 168**

MEDIUM ALLOY STEELS

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Finishers – Square



◀ Down to .2 mm!

- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Multi-flute, high helix (approx. 44°), coated design improves finishing in carbon steels, 300 and 400 stainless steels, and machinable tool steels
- Can be used in light duty roughing and profiling applications
- AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- End cutting (not center cutting)
- Solid carbide
- CNC ground in the USA

MEDIUM ALLOY STEELS

CUTTER DIAMETER D <sub>1</sub> +.0005" / -.0005" / +.00mm / -.02mm / decimal equivalent	LENGTH OF CUT L <sub>2</sub> +.010" / -.000" / +.25mm / -.00mm	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AITIN NANO COATED	
					TOOL #	PRICE
.2 mm .0078	<b>.60 mm</b> (3x)	4	4 mm	50 mm	977704-C6	56.70
.2 mm .0078	<b>1.00 mm</b> (5x)	4	4 mm	50 mm	980104-C6	65.60
.2 mm .0078	<b>1.60 mm</b> (8x)	4	4 mm	50 mm	981704-C6	67.20
.10 .0100	<b>.050</b> (5x)	4	1/8	2-1/2	53310-C6	57.10
.3 mm .0118	<b>.90 mm</b> (3x)	4	4 mm	50 mm	977706-C6	52.40
.015 (1/64) .0150	<b>.045</b> (3x)	4	1/8	1-1/2	24315-C6	46.00
.015 (1/64) .0150	<b>.078</b> (5x)	4	1/8	2-1/2	53315-C6	57.10
.015 (1/64) .0150	<b>.125</b> (8x)	4	1/8	2-1/2	62815-C6	58.30
.4 mm .0157	<b>1.20 mm</b> (3x)	4	4 mm	50 mm	977709-C6	49.90
.4 mm .0157	<b>2.00 mm</b> (5x)	4	4 mm	50 mm	980109-C6	58.30
.4 mm .0157	<b>3.20 mm</b> (8x)	4	4 mm	50 mm	981709-C6	60.30
.5 mm .0196	<b>1.50 mm</b> (3x)	4	4 mm	50 mm	977711-C6	49.20
.5 mm .0196	<b>2.50 mm</b> (5x)	4	4 mm	50 mm	980111-C6	56.70
.5 mm .0196	<b>4.00 mm</b> (8x)	4	4 mm	50 mm	981711-C6	59.30
.020 .0200	<b>.030</b> (1.5x)	4	1/8	1-1/2	935920-C6	45.20
.020 .0200	<b>.060</b> (3x)	4	1/8	1-1/2	24320-C6	44.80
.020 .0200	<b>.080</b> (4x)	4	1/8	1-1/2	835320-C6	47.20
.020 .0200	<b>.100</b> (5x)	4	1/8	2-1/2	53320-C6	56.10
.020 .0200	<b>.160</b> (8x)	4	1/8	2-1/2	62820-C6	57.80
.6 mm .0236	<b>1.80 mm</b> (3x)	4	4 mm	50 mm	977713-C6	49.20
.6 mm .0236	<b>3.00 mm</b> (5x)	4	4 mm	50 mm	980113-C6	57.20
.6 mm .0236	<b>4.80 mm</b> (8x)	4	4 mm	50 mm	981713-C6	59.30
.025 .0250	<b>.038</b> (1.5x)	4	1/8	1-1/2	935925-C6	42.10
.025 .0250	<b>.075</b> (3x)	4	1/8	1-1/2	24325-C6	42.10
.025 .0250	<b>.125</b> (5x)	4	1/8	2-1/2	53325-C6	54.30
.025 .0250	<b>.203</b> (8x)	4	1/8	2-1/2	62825-C6	55.50
.7 mm .0275	<b>2.10 mm</b> (3x)	4	4 mm	50 mm	977715-C6	49.20
.030 .0300	<b>.156</b> (5x)	5	1/8	2-1/2	53330-C6	52.70
.031 (1/32) .0310	<b>.047</b> (1.5x)	5	1/8	1-1/2	935931-C6	37.10
.031 (1/32) .0310	<b>.093</b> (3x)	5	1/8	1-1/2	24331-C6	37.10
.031 (1/32) .0310	<b>.125</b> (4x)	5	1/8	2-1/2	835331-C6	52.20
.031 (1/32) .0310	<b>.156</b> (5x)	5	1/8	2-1/2	53331-C6	52.20
.031 (1/32) .0310	<b>.250</b> (8x)	5	1/8	2-1/2	62831-C6	53.70
.031 (1/32) .0310	<b>.312</b> (10x)	5	1/8	2-1/2	882431-C6	61.50
.031 (1/32) .0310	<b>.375</b> (12x)	5	1/8	2-1/2	68531-C6	65.60
.8 mm .0314	<b>2.40 mm</b> (3x)	5	4 mm	50 mm	977718-C6	42.90
.8 mm .0314	<b>4.00 mm</b> (5x)	5	4 mm	50 mm	980118-C6	54.00
.8 mm .0314	<b>6.50 mm</b> (8x)	5	4 mm	50 mm	981718-C6	55.60
.9 mm .0354	<b>2.70 mm</b> (3x)	5	4 mm	50 mm	977720-C6	42.90

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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Finishers – Square (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .010" - .000" + .25mm - .00mm					
1.0 mm		.0393	<b>1.50 mm</b> (1.5x)	5	4 mm	50 mm	778522-C6	43.30
1.0 mm		.0393	<b>3.00 mm</b> (3x)	5	4 mm	50 mm	977722-C6	43.30
1.0 mm		.0393	<b>5.00 mm</b> (5x)	5	4 mm	50 mm	980122-C6	53.50
1.0 mm		.0393	<b>8.00 mm</b> (8x)	5	4 mm	50 mm	981722-C6	55.60
.040		.0400	<b>.060</b> (1.5x)	5	1/8	1-1/2	935940-C6	37.40
.040		.0400	<b>.120</b> (3x)	5	1/8	1-1/2	24340-C6	37.40
.040		.0400	<b>.160</b> (4x)	5	1/8	2-1/2	835340-C6	52.20
.040		.0400	<b>.203</b> (5x)	5	1/8	2-1/2	53340-C6	52.20
.040		.0400	<b>.325</b> (8x)	5	1/8	2-1/2	62840-C6	53.20
1.1 mm		.0433	<b>3.00 mm</b> (3x)	5	4 mm	50 mm	977724-C6	43.30
.047 (3/64)		.0470	<b>.071</b> (1.5x)	5	1/8	1-1/2	935947-C6	37.10
.047 (3/64)		.0470	<b>.141</b> (3x)	5	1/8	1-1/2	24347-C6	37.10
.047 (3/64)		.0470	<b>.187</b> (4x)	5	1/8	2-1/2	835347-C6	47.90
.047 (3/64)		.0470	<b>.250</b> (5x)	5	1/8	2-1/2	53347-C6	52.20
.047 (3/64)		.0470	<b>.375</b> (8x)	5	1/8	2-1/2	62847-C6	53.20
.047 (3/64)		.0470	<b>.480</b> (10x)	5	1/8	2-1/2	882447-C6	61.50
.047 (3/64)		.0470	<b>.570</b> (12x)	5	1/8	2-1/2	68547-C6	66.20
1.2 mm		.0472	<b>3.50 mm</b> (3x)	5	4 mm	50 mm	977727-C6	42.90
1.2 mm		.0472	<b>6.00 mm</b> (5x)	5	4 mm	50 mm	980127-C6	54.00
1.2 mm		.0472	<b>9.50 mm</b> (8x)	5	4 mm	50 mm	981727-C6	55.60
.050		.0500	<b>.075</b> (1.5x)	5	1/8	1-1/2	935950-C6	37.80
.050		.0500	<b>.150</b> (3x)	5	1/8	1-1/2	24350-C6	37.40
.050		.0500	<b>.250</b> (5x)	5	1/8	2-1/2	53350-C6	52.20
.050		.0500	<b>.400</b> (8x)	5	1/8	2-1/2	62850-C6	53.20
1.3 mm		.0511	<b>4.00 mm</b> (3x)	5	4 mm	50 mm	977729-C6	43.30
1.4 mm		.0551	<b>4.00 mm</b> (3x)	5	4 mm	50 mm	977731-C6	43.30
1.4 mm		.0551	<b>7.00 mm</b> (5x)	5	4 mm	50 mm	980131-C6	54.00
1.4 mm		.0551	<b>11.00 mm</b> (8x)	5	4 mm	50 mm	981731-C6	55.60
1.5 mm		.0590	<b>4.50 mm</b> (3x)	5	4 mm	50 mm	977733-C6	41.40
1.5 mm		.0590	<b>7.50 mm</b> (5x)	5	4 mm	50 mm	980133-C6	52.40
1.5 mm		.0590	<b>12.00 mm</b> (8x)	5	4 mm	50 mm	981733-C6	53.80
.060		.0600	<b>.090</b> (1.5x)	5	1/8	1-1/2	935960-C6	37.80
.060		.0600	<b>.180</b> (3x)	5	1/8	1-1/2	24360-C6	37.40
.060		.0600	<b>.312</b> (5x)	5	1/8	2-1/2	53360-C6	52.20
.060		.0600	<b>.500</b> (8x)	5	1/8	2-1/2	62860-C6	53.20
.062 (1/16)		.0620	<b>.093</b> (1.5x)	5	1/8	1-1/2	935962-C6	34.90
.062 (1/16)		.0620	<b>.186</b> (3x)	5	1/8	1-1/2	24362-C6	34.90
.062 (1/16)		.0620	<b>.250</b> (4x)	5	1/8	2-1/2	835362-C6	48.70
.062 (1/16)		.0620	<b>.312</b> (5x)	5	1/8	2-1/2	53362-C6	49.20
.062 (1/16)		.0620	<b>.375</b> (6x)	5	1/8	2-1/2	778362-C6	49.20
.062 (1/16)		.0620	<b>.500</b> (8x)	5	1/8	2-1/2	62862-C6	49.90
.062 (1/16)		.0620	<b>.625</b> (10x)	5	1/8	2-1/2	882462-C6	62.10
.062 (1/16)		.0620	<b>.750</b> (12x)	5	1/8	2-1/2	68562-C6	70.00
.062 (1/16)		.0620	<b>.950</b> (15x)	5	1/8	2-1/2	68962-C6	88.30
1.6 mm		.0629	<b>5.00 mm</b> (3x)	5	4 mm	50 mm	977736-C6	41.40
1.6 mm		.0629	<b>8.00 mm</b> (5x)	5	4 mm	50 mm	980136-C6	52.20
1.6 mm		.0629	<b>13.00 mm</b> (8x)	5	4 mm	50 mm	981736-C6	53.70
1.7 mm		.0669	<b>5.00 mm</b> (3x)	5	4 mm	50 mm	977738-C6	41.40

MEDIUM ALLOY STEELS

continued on next page

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Finishers – Square (cont.)

continued from previous page

MEDIUM ALLOY STEELS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm					
.070		.0700	<b>.210</b> (3x)	5	1/8	1-1/2	24370-C6	35.20
.070		.0700	<b>.375</b> (5x)	5	1/8	2-1/2	53370-C6	49.20
.070		.0700	<b>.570</b> (8x)	5	1/8	2-1/2	62870-C6	50.40
	1.8 mm	.0708	<b>5.50 mm</b> (3x)	5	4 mm	50 mm	977740-C6	41.80
	1.8 mm	.0708	<b>9.00 mm</b> (5x)	5	4 mm	50 mm	980140-C6	52.40
	1.8 mm	.0708	<b>14.00 mm</b> (8x)	5	4 mm	50 mm	981740-C6	54.30
	1.9 mm	.0748	<b>5.50 mm</b> (3x)	5	4 mm	50 mm	977742-C6	41.80
.078 (5/64)		.0780	<b>.117</b> (1.5x)	5	1/8	1-1/2	935978-C6	34.90
.078 (5/64)		.0780	<b>.234</b> (3x)	5	1/8	1-1/2	24378-C6	34.90
.078 (5/64)		.0780	<b>.312</b> (4x)	5	1/8	2-1/2	835378-C6	44.90
.078 (5/64)		.0780	<b>.406</b> (5x)	5	1/8	2-1/2	53378-C6	49.20
.078 (5/64)		.0780	<b>.475</b> (6x)	5	1/8	2-1/2	778378-C6	49.20
.078 (5/64)		.0780	<b>.625</b> (8x)	5	1/8	2-1/2	62878-C6	49.90
.078 (5/64)		.0780	<b>.800</b> (10x)	5	1/8	2-1/2	882478-C6	62.70
.078 (5/64)		.0780	<b>.940</b> (12x)	5	1/8	2-1/2	68578-C6	70.00
.078 (5/64)		.0780	<b>1.187</b> (15x)	5	1/8	2-1/2	68978-C6	89.10
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	5	4 mm	50 mm	977745-C6	41.40
	2.0 mm	.0787	<b>10.00 mm</b> (5x)	5	4 mm	50 mm	980145-C6	51.90
	2.0 mm	.0787	<b>16.00 mm</b> (8x)	5	4 mm	50 mm	981745-C6	54.30
.080		.0800	<b>.120</b> (1.5x)	5	1/8	1-1/2	935980-C6	35.60
.080		.0800	<b>.240</b> (3x)	5	1/8	1-1/2	24380-C6	35.20
.080		.0800	<b>.406</b> (5x)	5	1/8	2-1/2	53380-C6	49.20
.080		.0800	<b>.650</b> (8x)	5	1/8	2-1/2	62880-C6	50.40
.090		.0900	<b>.270</b> (3x)	5	1/8	1-1/2	24390-C6	35.20
.090		.0900	<b>.450</b> (5x)	5	1/8	2-1/2	53390-C6	49.20
.090		.0900	<b>.750</b> (8x)	5	1/8	2-1/2	62890-C6	50.40
.093 (3/32)		.0930	<b>.140</b> (1.5x)	5	1/8	1-1/2	935993-C6	34.90
.093 (3/32)		.0930	<b>.279</b> (3x)	5	1/8	1-1/2	24393-C6	34.90
.093 (3/32)		.0930	<b>.375</b> (4x)	5	1/8	2-1/2	835393-C6	48.70
.093 (3/32)		.0930	<b>.500</b> (5x)	5	1/8	2-1/2	53393-C6	49.20
.093 (3/32)		.0930	<b>.585</b> (6x)	5	1/8	2-1/2	778393-C6	49.20
.093 (3/32)		.0930	<b>.750</b> (8x)	5	1/8	2-1/2	62893-C6	49.90
.093 (3/32)		.0930	<b>.950</b> (10x)	5	1/8	2-1/2	882493-C6	62.10
.093 (3/32)		.0930	<b>1.125</b> (12x)	5	1/8	2-1/2	68593-C6	70.70
.093 (3/32)		.0930	<b>1.400</b> (15x)	5	1/8	3	68993-C6	89.80
	2.5 mm	.0984	<b>7.50 mm</b> (3x)	5	4 mm	50 mm	977751-C6	41.40
	2.5 mm	.0984	<b>12.00 mm</b> (5x)	5	4 mm	50 mm	980151-C6	52.00
.100		.1000	<b>.150</b> (1.5x)	5	1/8	1-1/2	936000-C6	35.60
.100		.1000	<b>.300</b> (3x)	5	1/8	1-1/2	24399-C6	35.20
.100		.1000	<b>.500</b> (5x)	5	1/8	2-1/2	53399-C6	49.20
.100		.1000	<b>.800</b> (8x)	5	1/8	2-1/2	53400-C6	50.40
.109 (7/64)		.1090	<b>.327</b> (3x)	5	1/8	1-1/2	24402-C6	35.40
.109 (7/64)		.1090	<b>.570</b> (5x)	5	1/8	2-1/2	63502-C6	49.20
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	5	4 mm	50 mm	977757-C6	41.40
	3.0 mm	.1181	<b>15.00 mm</b> (5x)	5	4 mm	50 mm	980157-C6	51.50
	3.0 mm	.1181	<b>24.00 mm</b> (8x)	5	4 mm	50 mm	981757-C6	54.00

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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Finishers – Square (cont.)

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CUTTER DIAMETER		LENGTH OF CUT L <sub>2</sub> <sup>+0.030"</sup> <sub>-.000"</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AITIN NANO COATED	
D <sub>1</sub> <sup>+0.000"</sup> <sub>-.002"</sub>	decimal equivalent					TOOL #	PRICE
.125 (1/8)	.1250	<b>.187</b> (1.5x)	5	1/8	1-1/2	936008-C6	31.00
.125 (1/8)	.1250	<b>.375</b> (3x)	5	1/8	1-1/2	795408-C6	31.30
.125 (1/8)	.1250	<b>.500</b> (4x)	5	1/8	1-1/2	24408-C6	31.00
.125 (1/8)	.1250	<b>.625</b> (5x)	5	1/8	2-1/2	776908-C6	47.60
.125 (1/8)	.1250	<b>.750</b> (6x)	5	1/8	2-1/2	63508-C6	47.60
.125 (1/8)	.1250	<b>1.000</b> (8x)	5	1/8	2-1/2	53408-C6	49.20
.125 (1/8)	.1250	<b>1.125</b> (10x)	5	1/8	2-1/2	882508-C6	61.10
.125 (1/8)	.1250	<b>1.500</b> (12x)	5	1/8	3	68608-C6	69.70
.125 (1/8)	.1250	<b>1.875</b> (15x)	5	1/8	3	69008-C6	87.90
.140 (9/64)	.1406	<b>.500</b> (3x)	5	3/16	2	24409-C6	46.50
.140 (9/64)	.1406	<b>.750</b> (5x)	5	3/16	3	63509-C6	48.50
.156 (5/32)	.1562	<b>.235</b> (1.5x)	5	3/16	2	936010-C6	38.50
.156 (5/32)	.1562	<b>.562</b> (3x)	5	3/16	2	24410-C6	38.20
.156 (5/32)	.1562	<b>.625</b> (4x)	5	3/16	3	835410-C6	51.20
.156 (5/32)	.1562	<b>.875</b> (5x)	5	3/16	3	63510-C6	51.70
.156 (5/32)	.1562	<b>1.250</b> (8x)	5	3/16	3	53410-C6	52.50
.187 (3/16)	.1875	<b>.285</b> (1.5x)	5	3/16	2	936012-C6	35.60
.187 (3/16)	.1875	<b>.625</b> (3x)	5	3/16	2	24412-C6	35.60
.187 (3/16)	.1875	<b>.750</b> (4x)	5	3/16	3	835412-C6	46.20
.187 (3/16)	.1875	<b>1.000</b> (5x)	5	3/16	3	63512-C6	51.70
.187 (3/16)	.1875	<b>1.500</b> (8x)	5	3/16	3	53412-C6	52.50
.250 (1/4)	.2500	<b>.375</b> (1.5x)	5	1/4	2-1/2	936016-C6	45.30
.250 (1/4)	.2500	<b>.750</b> (3x)	5	1/4	2-1/2	24416-C6	45.30
.250 (1/4)	.2500	<b>1.250</b> (5x)	5	1/4	4	63516-C6	63.10
.250 (1/4)	.2500	<b>2.000</b> (8x)	5	1/4	4	53416-C6	64.30
.375 (3/8)	.3750	<b>1.125</b> (3x)	5	3/8	2-1/2	24424-C6	72.10
.500 (1/2)	.5000	<b>.750</b> (1.5x)	5	1/2	3	936032-C6	96.90
.500 (1/2)	.5000	<b>1.500</b> (3x)	5	1/2	3	24432-C6	93.80
.500 (1/2)	.5000	<b>2.625</b> (5x)	5	1/2	4	63532-C6	104.40

MEDIUM ALLOY STEELS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 182**

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

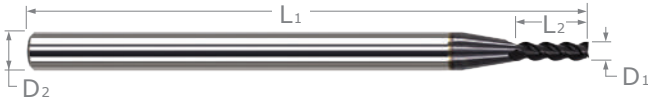
## Finishers

MEDIUM ALLOY STEELS

SPEEDS & FEEDS (High-Helix Finishers for Medium Alloy Steels)														
Material	Hardness (HBn)	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter									Depth of Cut	
				.015	.031	.047	.062	.078	.093	.125	.187	.250	Radial	Axial
<b>Carbon Steels:</b> 1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx	225 - 250 250 - 275	600 550	Finishing (1.5x LOC)	.00020	.00041	.00062	.00082	.00103	.00123	.00165	.00247	.00330	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00018	.00037	.00056	.00074	.00094	.00112	.00150	.00224	.00300	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00016	.00032	.00049	.00065	.00081	.00097	.00131	.00195	.00261	< .09x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.00014	.00028	.00042	.00056	.00070	.00084	.00113	.00168	.00225	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00011	.00023	.00035	.00047	.00059	.00070	.00094	.00140	.00188	< .07x Dia	.5x - 5x Dia
			Finishing (8x LOC)	.00010	.00020	.00031	.00041	.00051	.00061	.00083	.00123	.00165	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00019	.00029	.00039	.00049	.00058	.00078	.00117	.00156	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.00019	.00028	.00037	.00047	.00056	.00075	.00112	.00150	< .04x Dia	.5x - 12x Dia
	Finishing (15x LOC)	-	-	-	.00033	.00042	.00050	.00068	.00101	.00135	< .02x Dia	.5x - 15x Dia		
	275 - 300	500	Finishing (1.5x LOC)	.00018	.00038	.00057	.00075	.00094	.00113	.00151	.00226	.00303	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00017	.00034	.00052	.00068	.00086	.00102	.00138	.00206	.00275	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00014	.00030	.00045	.00059	.00075	.00089	.00120	.00179	.00239	< .09x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.00012	.00026	.00039	.00051	.00064	.00077	.00103	.00154	.00206	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00010	.00021	.00032	.00043	.00054	.00064	.00086	.00129	.00172	< .07x Dia	.5x - 5x Dia
			Finishing (8x LOC)	.00009	.00019	.00028	.00038	.00047	.00056	.00076	.00113	.00151	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00018	.00027	.00035	.00045	.00053	.00072	.00107	.00143	< .04x Dia	.5x - 10x Dia
Finishing (12x LOC)			-	.00017	.00026	.00034	.00043	.00051	.00069	.00103	.00138	< .04x Dia	.5x - 12x Dia	
Finishing (15x LOC)	-	-	-	.00031	.00039	.00046	.00062	.00093	.00124	< .02x Dia	.5x - 15x Dia			
<b>Stainless Steels:</b> 201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 414, 42x, 43x, 44x, 501, 502  <b>Tool Steels:</b> A, L, O, P, W series	225 - 250 250 - 275	500 500	Finishing (1.5x LOC)	.00017	.00034	.00052	.00068	.00086	.00102	.00138	.00206	.00275	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00015	.00031	.00047	.00062	.00078	.00093	.00125	.00187	.00250	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00013	.00027	.00041	.00054	.00068	.00081	.00109	.00163	.00218	< .09x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.00011	.00023	.00035	.00047	.00059	.00070	.00094	.00140	.00188	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00009	.00019	.00029	.00039	.00049	.00058	.00078	.00117	.00156	< .07x Dia	.5x - 5x Dia
			Finishing (8x LOC)	.00008	.00017	.00026	.00034	.00043	.00051	.00069	.00103	.00138	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00016	.00024	.00032	.00041	.00048	.00065	.00097	.00130	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.00014	.00021	.00028	.00035	.00042	.00056	.00084	.00113	< .04x Dia	.5x - 12x Dia
	Finishing (15x LOC)	-	-	-	.00028	.00035	.00042	.00056	.00084	.00113	< .02x Dia	.5x - 15x Dia		
	275 - 300 300 - 350	500 500	Finishing (1.5x LOC)	.00015	.00031	.00047	.00061	.00077	.00092	.00124	.00185	.00248	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.00014	.00028	.00042	.00056	.00070	.00084	.00113	.00168	.00225	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.00012	.00024	.00037	.00049	.00061	.00073	.00098	.00146	.00196	< .09x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.00010	.00021	.00032	.00042	.00053	.00063	.00084	.00126	.00169	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.00008	.00017	.00026	.00035	.00044	.00052	.00070	.00105	.00141	< .07x Dia	.5x - 5x Dia
			Finishing (8x LOC)	.00007	.00015	.00023	.00031	.00039	.00046	.00062	.00093	.00124	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.00015	.00022	.00029	.00037	.00044	.00059	.00088	.00117	< .04x Dia	.5x - 10x Dia
Finishing (12x LOC)			-	.00014	.00021	.00028	.00035	.00042	.00056	.00084	.00113	< .04x Dia	.5x - 12x Dia	
Finishing (15x LOC)	-	-	-	.00025	.00032	.00038	.00051	.00076	.00101	< .02x Dia	.5x - 15x Dia			

# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

Square



- Optimized for free machining varieties of carbon steels and stainless steels
- Variable helix design (approx. 38°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .010"					
- .0005"	- .02mm	equivalent	- .000"					
			+ .25mm					
			- .00mm					
.015 (1/64)		.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	939815-C3	45.60
.015 (1/64)		.0150	<b>.045</b> (3x)	3	1/8	1-1/2	945715-C3	44.80
	.5 mm	.0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	952411-C3	44.20
.020		.0200	<b>.060</b> (3x)	3	1/8	1-1/2	945720-C3	41.20
.025		.0250	<b>.075</b> (3x)	3	1/8	1-1/2	945725-C3	39.70
.031 (1/32)		.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	939831-C3	32.40
.031 (1/32)		.0310	<b>.093</b> (3x)	3	1/8	1-1/2	945731-C3	32.40
.031 (1/32)		.0310	<b>.156</b> (5x)	3	1/8	2-1/2	900531-C3	41.70
	1.0 mm	.0393	<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	926022-C3	36.60
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	952422-C3	36.90
.040		.0400	<b>.120</b> (3x)	3	1/8	1-1/2	945740-C3	33.40
.047 (3/64)		.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	939847-C3	33.00
.047 (3/64)		.0470	<b>.141</b> (3x)	3	1/8	1-1/2	945747-C3	32.40
	1.5 mm	.0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	952433-C3	34.90
.062 (1/16)		.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	939862-C3	30.30
.062 (1/16)		.0620	<b>.186</b> (3x)	3	1/8	1-1/2	945762-C3	30.30
.062 (1/16)		.0620	<b>.312</b> (5x)	3	1/8	2-1/2	900562-C3	39.80
.078 (5/64)		.0780	<b>.118</b> (1.5x)	3	1/8	1-1/2	939878-C3	30.30
.078 (5/64)		.0780	<b>.234</b> (3x)	3	1/8	1-1/2	945778-C3	30.30
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	3	4 mm	50 mm	952445-C3	34.90
.093 (3/32)		.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	939893-C3	30.30
.093 (3/32)		.0930	<b>.279</b> (3x)	3	1/8	1-1/2	945793-C3	30.30
.093 (3/32)		.0930	<b>.500</b> (5x)	3	1/8	2-1/2	900593-C3	39.80
	3.0 mm	.1181	<b>4.50 mm</b> (1.5x)	3	4 mm	50 mm	926057-C3	34.60
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	952457-C3	34.60

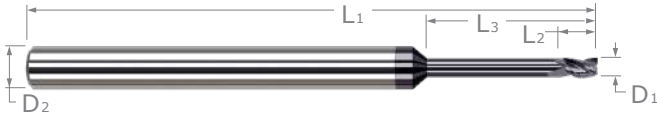
CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000"		decimal	+ .030"					
- .002"		equivalent	- .000"					
.125 (1/8)		.1250	<b>.187</b> (1.5x)	4	1/8	1-1/2	939908-C3	28.40
.125 (1/8)		.1250	<b>.375</b> (3x)	4	1/8	1-1/2	945808-C3	28.40
.125 (1/8)		.1250	<b>.625</b> (5x)	4	1/8	2-1/2	900608-C3	39.60
.156 (5/32)		.1562	<b>.235</b> (1.5x)	4	3/16	2	939910-C3	32.50
.156 (5/32)		.1562	<b>.470</b> (3x)	4	3/16	2	945810-C3	32.50
.187 (3/16)		.1875	<b>.285</b> (1.5x)	4	3/16	2	939912-C3	30.60
.187 (3/16)		.1875	<b>.562</b> (3x)	4	3/16	2	945812-C3	30.90
.250 (1/4)		.2500	<b>.375</b> (1.5x)	4	1/4	2-1/2	939916-C3	39.20
.250 (1/4)		.2500	<b>.750</b> (3x)	4	1/4	2-1/2	945816-C3	39.20

PLEASE SEE SPEEDS & FEEDS ON PAGE 186

FREE MACHINING STEELS

# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

## Square – Long Reach, Stub Flute



- Optimized for free machining varieties of carbon steels and stainless steels
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 38°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

FREE MACHINING STEELS

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.015 (1/64)	.023	<b>.078</b> (5x)	3	1/8	2-1/2	915015-C3	59.30
.015 (1/64)	.023	<b>.125</b> (8x)	3	1/8	2-1/2	920215-C3	60.50
.020	.030	<b>.100</b> (5x)	3	1/8	2-1/2	915020-C3	56.00
.020	.030	<b>.160</b> (8x)	3	1/8	2-1/2	920220-C3	58.50
.025	.038	<b>.125</b> (5x)	3	1/8	2-1/2	915025-C3	55.60
.025	.038	<b>.203</b> (8x)	3	1/8	2-1/2	920225-C3	55.80
.031 (1/32)	.047	<b>.093</b> (3x)	3	1/8	1-1/2	927331-C3	51.00
.031 (1/32)	.047	<b>.156</b> (5x)	3	1/8	2-1/2	915031-C3	52.40
.031 (1/32)	.047	<b>.250</b> (8x)	3	1/8	2-1/2	920231-C3	53.70
.031 (1/32)	.047	<b>.312</b> (10x)	3	1/8	2-1/2	909531-C3	55.60
.047 (3/64)	.071	<b>.250</b> (5x)	3	1/8	2-1/2	915047-C3	52.40
.047 (3/64)	.071	<b>.375</b> (8x)	3	1/8	2-1/2	920247-C3	52.70
.062 (1/16)	.093	<b>.186</b> (3x)	3	1/8	1-1/2	927362-C3	52.00
.062 (1/16)	.093	<b>.312</b> (5x)	3	1/8	2-1/2	915062-C3	51.40
.062 (1/16)	.093	<b>.500</b> (8x)	3	1/8	2-1/2	920262-C3	52.40
.062 (1/16)	.093	<b>.625</b> (10x)	3	1/8	2-1/2	909562-C3	55.60
.078 (5/64)	.118	<b>.406</b> (5x)	3	1/8	2-1/2	915078-C3	51.40
.078 (5/64)	.118	<b>.625</b> (8x)	3	1/8	2-1/2	920278-C3	52.40
.093 (3/32)	.140	<b>.279</b> (3x)	3	1/8	1-1/2	927393-C3	51.00
.093 (3/32)	.140	<b>.500</b> (5x)	3	1/8	2-1/2	915093-C3	51.40
.093 (3/32)	.140	<b>.750</b> (8x)	3	1/8	2-1/2	920293-C3	52.40
.093 (3/32)	.140	<b>.950</b> (10x)	3	1/8	2-1/2	909593-C3	55.60

continued on next page



# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

Square – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
						TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>		
.125 (1/8)	.187	<b>.375</b> (3x)	4	1/8	1-1/2	927408-C3	52.00
.125 (1/8)	.187	<b>.625</b> (5x)	4	1/8	2-1/2	915108-C3	52.40
.125 (1/8)	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	920308-C3	53.40
.125 (1/8)	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	909608-C3	54.60
.156 (5/32)	.235	<b>.750</b> (5x)	4	3/16	3	915110-C3	55.60
.187 (3/16)	.285	<b>1.000</b> (5x)	4	3/16	3	915112-C3	55.60
.250 (1/4)	.375	<b>1.250</b> (5x)	4	1/4	4	915116-C3	62.50

FREE MACHINING STEELS

## SPEEDS & FEEDS (Variable Helix – Long Reach, Stub Flute for Free Machining Steels)

**Important Note:** Values in table are in inches and are based on reached (8x Dia) end mills. For shorter reaches, table values of IPT must be increased (for 3x, increase to 135%; for 5x, increase to 125%). For longer reaches, table values of IPT and DOC must be reduced (for 10x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter												
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	
<b>Carbon Steels:</b> 10xx - 1030, 10Lxx, 11xx - 1140, 11Lxx, 12xx - 1215, 12Lxx  <b>Stainless Steels:</b> 203 EZ, 303 (all types), 416, 416 Se, 416 Plus X., 420 F, 420 F Se	100-125	500	Slotting	.00010	.00021	.00031	.00041	.00052	.00062	.00079	.00118	.00158	.00207	.00249	.00332
	125-150	425	Roughing	.00012	.00025	.00038	.00050	.00063	.00075	.00096	.00144	.00192	.00252	.00302	.00403
	150-175	400	Finishing	.00014	.00030	.00045	.00060	.00075	.00090	.00115	.00172	.00230	.00301	.00362	.00483
	175-200	375	Max	.00019	.00039	.00058	.00077	.00097	.00116	.00148	.00221	.00296	.00388	.00466	.00622
200-225	350		<b>Radial Depth of Cut*:</b>						<b>Axial Depth of Cut*:</b>						
			Slotting: 1x Dia						Slotting: .35x Dia						
			Roughing: .35x Dia						Roughing: .5x - 1x Dia						
			Finishing: .1x Dia						Finishing: .5x - 1x Dia						

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.

# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

## Ball



FREE MACHINING STEELS

- Optimized for free machining varieties of carbon steels and stainless steels
- Variable helix design (approx. 38°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.015 (1/64)	.045 (3x)	3	1/8	1-1/2	950015-C3	54.30
.031 (1/32)	.047 (1.5x)	3	1/8	1-1/2	911531-C3	40.10
.031 (1/32)	.093 (3x)	3	1/8	1-1/2	950031-C3	40.90
.047 (3/64)	.141 (3x)	3	1/8	1-1/2	950047-C3	40.90
.062 (1/16)	.093 (1.5x)	3	1/8	1-1/2	911562-C3	40.10
.062 (1/16)	.186 (3x)	3	1/8	1-1/2	950062-C3	39.00
.078 (5/64)	.234 (3x)	3	1/8	1-1/2	950078-C3	37.90
.093 (3/32)	.140 (1.5x)	3	1/8	1-1/2	911593-C3	38.60
.093 (3/32)	.279 (3x)	3	1/8	1-1/2	950093-C3	37.90

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.187 (1.5x)	4	1/8	1-1/2	911608-C3	35.40
.125 (1/8)	.375 (3x)	4	1/8	1-1/2	950108-C3	35.40
.156 (5/32)	.470 (3x)	4	3/16	2	950110-C3	41.20
.187 (3/16)	.562 (3x)	4	3/16	2	950112-C3	38.10
.250 (1/4)	.750 (3x)	4	1/4	2-1/2	950116-C3	46.60

### SPEEDS & FEEDS (Variable Helix for Free Machining Steels)

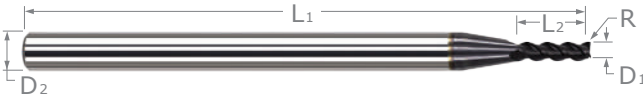
**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 1.5x, increase to 112%). For longer lengths of cut, table values of IPT and DOC must be reduced (for 5x, reduce to 70%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter												
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	
<b>Carbon Steels:</b> 10xx - 1030, 10Lxx, 11xx - 1140, 11Lxx, 12xx - 1215, 12Lxx	100-125	500	Slotting	.00013	.00026	.00040	.00053	.00067	.00079	.00099	.00148	.00198	.00259	.00311	.00415
	125-150	425	Roughing	.00016	.00032	.00049	.00064	.00081	.00096	.00120	.00180	.00240	.00314	.00378	.00504
			Finishing	.00019	.00039	.00058	.00077	.00097	.00116	.00144	.00215	.00288	.00377	.00453	.00604
	<b>Stainless Steels:</b> 203 EZ, 303 (all types), 416, 416 Se, 416 Plus X, 420 F, 420 F Se	150-175	400	Max	.00024	.00050	.00075	.00099	.00125	.00149	.00185	.00277	.00370	.00485	.00583
175-200		375	<b>Radial Depth of Cut*:</b>						<b>Axial Depth of Cut*:</b>						
200-225		350	Slotting: 1x Dia Roughing: .5x Dia Finishing: .1x Dia						Slotting: .5x Dia Roughing: .5x - 1x Dia Finishing: .5x - 1x Dia						

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.

# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

## Corner Radius



- Optimized for free machining varieties of carbon steels and stainless steels
- Variable helix design (approx. 38°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
D <sub>1</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	R	L <sub>2</sub>				TOOL #	PRICE
+ .0005" / - .0005"	+ .00mm / - .02mm	decimal equivalent	+ .001" / - .001" / + .25mm / - .25mm	+ .010" / - .000" / + .25mm / - .00mm					
.015 (1/64)	.0150	.0150	<b>.002</b>	.023 (1.5x)	3	1/8	1-1/2	969415-C3	47.20
.015 (1/64)	.0150	.0150	<b>.002</b>	.045 (3x)	3	1/8	1-1/2	971215-C3	47.20
.015 (1/64)	.0150	.0150	<b>.002</b>	.078 (5x)	3	1/8	2-1/2	980315-C3	57.20
.015 (1/64)	.0150	.0150	<b>.005</b>	.045 (3x)	3	1/8	1-1/2	859815-C3	47.20
.020	.0200	.0200	<b>.002</b>	.060 (3x)	3	1/8	1-1/2	971220-C3	41.50
.020	.0200	.0200	<b>.005</b>	.060 (3x)	3	1/8	1-1/2	859820-C3	41.00
.025	.0250	.0250	<b>.002</b>	.075 (3x)	3	1/8	1-1/2	971225-C3	40.00
.025	.0250	.0250	<b>.005</b>	.075 (3x)	3	1/8	1-1/2	859825-C3	40.00
.031 (1/32)	.0310	.0310	<b>.003</b>	.047 (1.5x)	3	1/8	1-1/2	969431-C3	33.20
.031 (1/32)	.0310	.0310	<b>.003</b>	.093 (3x)	3	1/8	1-1/2	971231-C3	33.20
.031 (1/32)	.0310	.0310	<b>.003</b>	.156 (5x)	3	1/8	2-1/2	980331-C3	41.70
.031 (1/32)	.0310	.0310	<b>.005</b>	.093 (3x)	3	1/8	1-1/2	859831-C3	33.80
.031 (1/32)	.0310	.0310	<b>.010</b>	.093 (3x)	3	1/8	1-1/2	856631-C3	36.20
1.0 mm	.0393	.0393	<b>.08 mm</b>	3.00 mm (3x)	3	4 mm	50 mm	901822-C3	37.30
.040	.0400	.0400	<b>.003</b>	.120 (3x)	3	1/8	1-1/2	971240-C3	33.90
.040	.0400	.0400	<b>.005</b>	.120 (3x)	3	1/8	1-1/2	859840-C3	33.80
.047 (3/64)	.0470	.0470	<b>.003</b>	.071 (1.5x)	3	1/8	1-1/2	969447-C3	33.20
.047 (3/64)	.0470	.0470	<b>.003</b>	.141 (3x)	3	1/8	1-1/2	971247-C3	33.20
.047 (3/64)	.0470	.0470	<b>.003</b>	.250 (5x)	3	1/8	2-1/2	980347-C3	41.70
.047 (3/64)	.0470	.0470	<b>.005</b>	.141 (3x)	3	1/8	1-1/2	859847-C3	33.80
.047 (3/64)	.0470	.0470	<b>.010</b>	.141 (3x)	3	1/8	1-1/2	856647-C3	33.80
.047 (3/64)	.0470	.0470	<b>.015</b>	.141 (3x)	3	1/8	1-1/2	857447-C3	36.20
.050	.0500	.0500	<b>.003</b>	.150 (3x)	3	1/8	1-1/2	971250-C3	33.80
.050	.0500	.0500	<b>.005</b>	.150 (3x)	3	1/8	1-1/2	859850-C3	33.80
.060	.0600	.0600	<b>.005</b>	.180 (3x)	3	1/8	1-1/2	971260-C3	33.80
.060	.0600	.0600	<b>.010</b>	.180 (3x)	3	1/8	1-1/2	856660-C3	33.80
.062 (1/16)	.0620	.0620	<b>.005</b>	.093 (1.5x)	3	1/8	1-1/2	969462-C3	30.80
.062 (1/16)	.0620	.0620	<b>.005</b>	.186 (3x)	3	1/8	1-1/2	971262-C3	30.80
.062 (1/16)	.0620	.0620	<b>.005</b>	.312 (5x)	3	1/8	2-1/2	980362-C3	40.10
.062 (1/16)	.0620	.0620	<b>.010</b>	.186 (3x)	3	1/8	1-1/2	856662-C3	31.40
.062 (1/16)	.0620	.0620	<b>.020</b>	.186 (3x)	3	1/8	1-1/2	858262-C3	33.90
.078 (5/64)	.0780	.0780	<b>.005</b>	.118 (1.5x)	3	1/8	1-1/2	969478-C3	30.80
.078 (5/64)	.0780	.0780	<b>.005</b>	.234 (3x)	3	1/8	1-1/2	971278-C3	30.80
.078 (5/64)	.0780	.0780	<b>.005</b>	.406 (5x)	3	1/8	2-1/2	980378-C3	40.90
.078 (5/64)	.0780	.0780	<b>.010</b>	.234 (3x)	3	1/8	1-1/2	856678-C3	30.80
.078 (5/64)	.0780	.0780	<b>.020</b>	.234 (3x)	3	1/8	1-1/2	858278-C3	33.20

continued on next page

FREE MACHINING STEELS

# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

## Corner Radius (cont.)

continued from previous page

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
D <sub>1</sub> + .0005" - .0005" + .00mm - .02mm decimal equivalent			R + .001" - .001" + .25mm - .25mm	L <sub>2</sub> + .010" - .000" + .25mm - .00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
2.0 mm	.0787		<b>.10 mm</b>	6.00 mm (3x)	3	4 mm	50 mm	901845-C3	35.20
.093 (3/32)	.0930		<b>.005</b>	.140 (1.5x)	3	1/8	1-1/2	969493-C3	30.80
.093 (3/32)	.0930		<b>.005</b>	.279 (3x)	3	1/8	1-1/2	971293-C3	30.80
.093 (3/32)	.0930		<b>.005</b>	.500 (5x)	3	1/8	2-1/2	980393-C3	40.10
.093 (3/32)	.0930		<b>.010</b>	.279 (3x)	3	1/8	1-1/2	856693-C3	30.80
.093 (3/32)	.0930		<b>.030</b>	.279 (3x)	3	1/8	1-1/2	859093-C3	33.90
.100	.1000		<b>.005</b>	.300 (3x)	3	1/8	1-1/2	971300-C3	31.40
3.0 mm	.1181		<b>.10 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	901857-C3	35.20

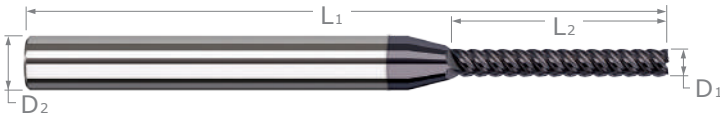
FREE MACHINING STEELS

D <sub>1</sub> + .000" - .002" decimal equivalent		R + .001" - .001"	L <sub>2</sub> + .030" - .000"		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.1250	<b>.005</b>	.187 (1.5x)	4	1/8	1-1/2	969508-C3	28.80
.125 (1/8)	.1250	<b>.005</b>	.375 (3x)	4	1/8	1-1/2	971308-C3	28.80
.125 (1/8)	.1250	<b>.005</b>	.625 (5x)	4	1/8	2-1/2	980408-C3	40.10
.125 (1/8)	.1250	<b>.010</b>	.375 (3x)	4	1/8	1-1/2	856708-C3	31.40
.125 (1/8)	.1250	<b>.030</b>	.375 (3x)	4	1/8	1-1/2	859108-C3	33.90
.156 (5/32)	.1562	<b>.010</b>	.235 (1.5x)	4	3/16	2	969510-C3	33.40
.156 (5/32)	.1562	<b>.010</b>	.470 (3x)	4	3/16	2	971310-C3	34.10
.156 (5/32)	.1562	<b>.010</b>	.750 (5x)	4	3/16	3	980410-C3	44.20
.187 (3/16)	.1875	<b>.010</b>	.285 (1.5x)	4	3/16	2	969512-C3	31.30
.187 (3/16)	.1875	<b>.010</b>	.562 (3x)	4	3/16	2	971312-C3	31.60
.187 (3/16)	.1875	<b>.010</b>	1.000 (5x)	4	3/16	3	980412-C3	44.20
.250 (1/4)	.2500	<b>.010</b>	.375 (1.5x)	4	1/4	2-1/2	969516-C3	39.80
.250 (1/4)	.2500	<b>.010</b>	.750 (3x)	4	1/4	2-1/2	971316-C3	39.80
.250 (1/4)	.2500	<b>.010</b>	1.250 (5x)	4	1/4	4	980416-C3	54.90
.312 (5/16)	.3125	<b>.010</b>	.470 (1.5x)	4	5/16	2-1/2	969520-C3	59.60
.312 (5/16)	.3125	<b>.010</b>	1.000 (3x)	4	5/16	2-1/2	971320-C3	58.50
.375 (3/8)	.3750	<b>.010</b>	.570 (1.5x)	4	3/8	2-1/2	969524-C3	67.30
.375 (3/8)	.3750	<b>.010</b>	1.125 (3x)	4	3/8	2-1/2	971324-C3	67.30
.500 (1/2)	.5000	<b>.015</b>	.750 (1.5x)	4	1/2	3	969532-C3	87.90

PLEASE SEE SPEEDS & FEEDS ON PAGE 186

# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

Finishers – Square



- Optimized for free machining varieties of carbon steels and stainless steels
- Variable helix design (approx. 47°) reduces chatter and harmonics, improving finish
- High helix for effective chip evacuation
- h6 shank tolerance for high precision tool holders
- End cutting (not center cutting)
- Solid carbide
- CNC ground in the USA

FREE MACHINING STEELS

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI 316 COATED	
					TOOL #	PRICE
D <sub>1</sub> +0.005" -0.005"	L <sub>2</sub> +0.010" -0.000" +0.25mm -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
+0.005" -0.005"	+0.00mm -0.02mm	decimal equivalent				
.015 (1/64)	.0150	<b>.045</b> (3x)	4	1/8	1-1/2	967815-C3 46.00
.015 (1/64)	.0150	<b>.078</b> (5x)	4	1/8	2-1/2	972415-C3 56.50
.015 (1/64)	.0150	<b>.125</b> (8x)	4	1/8	2-1/2	983615-C3 57.80
.020	.0200	<b>.060</b> (3x)	4	1/8	1-1/2	967820-C3 45.20
.020	.0200	<b>.100</b> (5x)	4	1/8	2-1/2	972420-C3 56.70
.025	.0250	<b>.075</b> (3x)	4	1/8	1-1/2	967825-C3 42.50
.025	.0250	<b>.125</b> (5x)	4	1/8	2-1/2	972425-C3 54.30
.031 (1/32)	.0310	<b>.047</b> (1.5x)	5	1/8	1-1/2	935131-C3 37.40
.031 (1/32)	.0310	<b>.093</b> (3x)	5	1/8	1-1/2	967831-C3 37.40
.031 (1/32)	.0310	<b>.156</b> (5x)	5	1/8	2-1/2	972431-C3 52.20
.031 (1/32)	.0310	<b>.250</b> (8x)	5	1/8	2-1/2	983631-C3 53.20
1.0 mm	.0393	<b>3.00 mm</b> (3x)	5	4 mm	50 mm	921922-C3 43.30
1.0 mm	.0393	<b>5.00 mm</b> (5x)	5	4 mm	50 mm	916422-C3 54.00
.040	.0400	<b>.120</b> (3x)	5	1/8	1-1/2	967840-C3 38.50
.040	.0400	<b>.203</b> (5x)	5	1/8	2-1/2	972440-C3 53.40
.047 (3/64)	.0470	<b>.141</b> (3x)	5	1/8	1-1/2	967847-C3 37.80
.047 (3/64)	.0470	<b>.250</b> (5x)	5	1/8	2-1/2	972447-C3 52.20
.047 (3/64)	.0470	<b>.375</b> (8x)	5	1/8	2-1/2	983647-C3 53.20
.050	.0500	<b>.150</b> (3x)	5	1/8	1-1/2	967850-C3 38.20
.050	.0500	<b>.250</b> (5x)	5	1/8	2-1/2	972450-C3 53.40
.060	.0600	<b>.180</b> (3x)	5	1/8	1-1/2	967860-C3 38.50
.060	.0600	<b>.312</b> (5x)	5	1/8	2-1/2	972460-C3 53.40
.062 (1/16)	.0620	<b>.093</b> (1.5x)	5	1/8	1-1/2	935162-C3 35.60
.062 (1/16)	.0620	<b>.186</b> (3x)	5	1/8	1-1/2	967862-C3 35.20
.062 (1/16)	.0620	<b>.312</b> (5x)	5	1/8	2-1/2	972462-C3 49.20
.062 (1/16)	.0620	<b>.500</b> (8x)	5	1/8	2-1/2	983662-C3 49.90
.078 (5/64)	.0780	<b>.234</b> (3x)	5	1/8	1-1/2	967878-C3 35.20
.078 (5/64)	.0780	<b>.406</b> (5x)	5	1/8	2-1/2	972478-C3 49.20
.078 (5/64)	.0780	<b>.625</b> (8x)	5	1/8	2-1/2	983678-C3 50.40
2.0 mm	.0787	<b>6.00 mm</b> (3x)	5	4 mm	50 mm	921945-C3 41.40
2.0 mm	.0787	<b>10.00 mm</b> (5x)	5	4 mm	50 mm	916445-C3 52.40

continued on next page

# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

## Finishers – Square (cont.)

continued from previous page

FREE MACHINING STEELS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.0005"	+0.00mm	decimal equivalent	+0.010"					
-0.0005"	-0.02mm		-0.000"					
			+0.25mm					
			-0.00mm					
.093 (3/32)		.0930	<b>.140</b> (1.5x)	5	1/8	1-1/2	935193-C3	35.20
.093 (3/32)		.0930	<b>.279</b> (3x)	5	1/8	1-1/2	967893-C3	35.20
.093 (3/32)		.0930	<b>.500</b> (5x)	5	1/8	2-1/2	972493-C3	49.20
.093 (3/32)		.0930	<b>.750</b> (8x)	5	1/8	2-1/2	983693-C3	49.90
.100		.1000	<b>.300</b> (3x)	5	1/8	1-1/2	967900-C3	36.10
.100		.1000	<b>.500</b> (5x)	5	1/8	2-1/2	972500-C3	49.70
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	5	4 mm	50 mm	921957-C3	41.40
	3.0 mm	.1181	<b>15.00 mm</b> (5x)	5	4 mm	50 mm	916457-C3	51.90

D <sub>1</sub>	decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.000"		+0.030"					
-0.002"		-0.000"					
.125 (1/8)	.1250	<b>.187</b> (1.5x)	5	1/8	1-1/2	935208-C3	33.80
.125 (1/8)	.1250	<b>.375</b> (3x)	5	1/8	1-1/2	967908-C3	33.40
.125 (1/8)	.1250	<b>.625</b> (5x)	5	1/8	2-1/2	972508-C3	48.00
.125 (1/8)	.1250	<b>1.000</b> (8x)	5	1/8	2-1/2	983708-C3	49.20
.156 (5/32)	.1562	<b>.470</b> (3x)	5	3/16	2	967910-C3	38.50
.156 (5/32)	.1562	<b>.750</b> (5x)	5	3/16	3	972510-C3	51.20
.187 (3/16)	.1875	<b>.570</b> (3x)	5	3/16	2	967912-C3	38.20
.187 (3/16)	.1875	<b>1.000</b> (5x)	5	3/16	3	972512-C3	51.20
.187 (3/16)	.1875	<b>1.500</b> (8x)	5	3/16	3	983712-C3	52.50
.250 (1/4)	.2500	<b>.750</b> (3x)	5	1/4	2-1/2	967916-C3	48.90
.250 (1/4)	.2500	<b>1.250</b> (5x)	5	1/4	4	972516-C3	63.10
.250 (1/4)	.2500	<b>2.000</b> (8x)	5	1/4	4	983716-C3	64.30

### SPEEDS & FEEDS (High-Helix Finishers for Free Machining Steels)

Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter										Depth of Cut	
			.015	.031	.047	.062	.078	.093	.125	.187	.250	Radial	Axial	
<b>Carbon Steels:</b> 10xx - 1030 & all 10Lxx, 11xx - 1140 & all 11Lxx, 12xx - 1215 & all 12Lxx	100 - 125	500	Finishing (1.5x LOC)	.00025	.00051	.00078	.00102	.00129	.00153	.00206	.00309	.00413	< .10x Dia	.5x - 1.5x Dia
	125 - 150	425	Finishing (3x LOC)	.00023	.00047	.00071	.00093	.00117	.00140	.00188	.00281	.00375	< .10x Dia	.5x - 3x Dia
	150 - 175	400												
<b>Stainless Steels:</b> 203 EZ, 303 (all types), 416, 416 Se, 416 Plus X, 420 F, 420 F Se, 440 F, 440 F Se	175 - 200	375	Finishing (5x LOC)	.00017	.00035	.00053	.00070	.00088	.00105	.00141	.00210	.00281	< .07x Dia	.5x - 5x Dia
	200 - 225	350	Finishing (8x LOC)	.00012	.00026	.00039	.00051	.00064	.00077	.00103	.00154	.00206	< .05x Dia	.5x - 8x Dia

## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

### Chipbreaker Roughers – Square



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Chipbreaker geometry to improve chip management
- Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- h6 shank tolerance for high precision tool holders
- 3 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE
D <sub>1</sub> $\begin{matrix} +.0005'' \\ - .0005'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.010'' \\ - .000'' \end{matrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>				
.062 (1/16)	.186 (3x)	3	1/8	1-1/2	769062	28.80	769062-C8	36.40
.078 (5/64)	.234 (3x)	3	1/8	1-1/2	769078	29.30	769078-C8	36.90
.093 (3/32)	.279 (3x)	3	1/8	1-1/2	769093	29.30	769093-C8	36.90
D <sub>1</sub> $\begin{matrix} +.000'' \\ - .002'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.030'' \\ - .000'' \end{matrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>				
.125 (1/8)	.375 (3x)	3	1/8	1-1/2	769108	28.10	769108-C8	35.70
.187 (3/16)	.562 (3x)	3	3/16	2	769112	31.30	769112-C8	38.90
.250 (1/4)	.750 (3x)	3	1/4	2-1/2	769116	39.10	769116-C8	47.30

ALUMINUM ALLOYS



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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Square



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 42°) reduces chatter and harmonics, and increases material removal rates
- h6 shank tolerance for high precision tool holders • Center cutting
- Solid carbide • CNC ground in the USA

ALUMINUM ALLOYS

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND		ZrN COATED	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> + .0005" / - .0005" / +.00mm / -.02mm decimal equiv.	L <sub>2</sub> +.010" / -.000" / +.25mm / -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>								
.010	.0100	<b>.015</b> (1.5x)	3	1/8	1-1/2	968710	50.60	968710-C8	58.20			
.010	.0100	<b>.030</b> (3x)	3	1/8	1-1/2	942210	50.60	942210-C8	58.20			
.015 (1/64)	.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	968715	40.70	968715-C8	48.30			
.015 (1/64)	.0150	<b>.045</b> (3x)	3	1/8	1-1/2	942215	40.70	942215-C8	48.30	942215-C4	53.80	
.015 (1/64)	.0150	<b>.078</b> (5x)	3	1/8	2-1/2	923015	51.50	923015-C8	59.10			
0.5 mm	.0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	900411	41.00	900411-C8	49.00			
.020	.0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	968720	35.90	968720-C8	42.70	968720-C4	49.00	
.020	.0200	<b>.060</b> (3x)	3	1/8	1-1/2	942220	35.90	942220-C8	42.70	942220-C4	49.00	
.020	.0200	<b>.100</b> (5x)	3	1/8	2-1/2	923020	46.50	923020-C8	54.10			
.025	.0250	<b>.038</b> (1.5x)	3	1/8	1-1/2	968725	35.90	968725-C8	42.70			
.025	.0250	<b>.075</b> (3x)	3	1/8	1-1/2	942225	35.90	942225-C8	42.70	942225-C4	49.00	
.025	.0250	<b>.125</b> (5x)	3	1/8	2-1/2	923025	46.50	923025-C8	54.10			
.030	.0300	<b>.045</b> (1.5x)	3	1/8	1-1/2	968730	35.90	968730-C8	42.70			
.030	.0300	<b>.090</b> (3x)	3	1/8	1-1/2	942230	35.90	942230-C8	42.70	942230-C4	49.00	
.030	.0300	<b>.156</b> (5x)	3	1/8	2-1/2	923030	46.50	923030-C8	54.10			
.031 (1/32)	.0310	<b>.025</b> (.8x)	3	1/8	1-1/2	873531	31.60	873531-C8	39.20			
.031 (1/32)	.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	968731	28.60	968731-C8	35.30	968731-C4	41.70	
.031 (1/32)	.0310	<b>.093</b> (3x)	2	1/8	1-1/2	792131	28.60	792131-C8	36.20			
.031 (1/32)	.0310	<b>.093</b> (3x)	3	1/8	1-1/2	942231	28.60	942231-C8	35.30	942231-C4	41.70	942231-C7 34.50
.031 (1/32)	.0310	<b>.125</b> (4x)	3	1/8	2-1/2	857231	39.30	857231-C8	46.90			
.031 (1/32)	.0310	<b>.156</b> (5x)	3	1/8	2-1/2	923031	39.30	923031-C8	46.10	923031-C4	52.40	
.031 (1/32)	.0310	<b>.250</b> (8x)	3	1/8	2-1/2	746031	43.10	746031-C8	50.70			
0.8 mm	.0314	<b>2.40 mm</b> (3x)	3	4 mm	50 mm	900418	32.00	900418-C8	40.00			
.035	.0350	<b>.105</b> (3x)	3	1/8	1-1/2	942235	33.30	942235-C8	40.90			
1.0 mm	.0393	<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	858422	32.00	858422-C8	40.00			
1.0 mm	.0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	900422	31.70	900422-C8	38.20	900422-C4	49.80	
1.0 mm	.0393	<b>5.00 mm</b> (5x)	3	4 mm	50 mm	845922	33.60	845922-C8	41.60			
.040	.0400	<b>.060</b> (1.5x)	3	1/8	1-1/2	968740	28.80	968740-C8	35.30			
.040	.0400	<b>.120</b> (3x)	3	1/8	1-1/2	942240	28.80	942240-C8	35.30	942240-C4	41.10	
.040	.0400	<b>.160</b> (4x)	3	1/8	2-1/2	857240	39.30	857240-C8	46.90			
.040	.0400	<b>.203</b> (5x)	3	1/8	2-1/2	923040	39.30	923040-C8	46.10	923040-C4	52.40	
.045	.0450	<b>.135</b> (3x)	3	1/8	1-1/2	942245	28.80	942245-C8	36.40			
.047 (3/64)	.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	968747	28.60	968747-C8	35.30	968747-C4	41.70	
.047 (3/64)	.0470	<b>.141</b> (3x)	2	1/8	1-1/2	792147	28.60	792147-C8	36.20			
.047 (3/64)	.0470	<b>.141</b> (3x)	3	1/8	1-1/2	942247	28.60	942247-C8	35.30	942247-C4	41.70	942247-C7 34.50
.047 (3/64)	.0470	<b>.187</b> (4x)	3	1/8	2-1/2	857247	39.30	857247-C8	46.90			
.047 (3/64)	.0470	<b>.250</b> (5x)	3	1/8	2-1/2	923047	39.30	923047-C8	46.10	923047-C4	52.40	

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square (cont.)

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CUTTER DIAMETER		LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND		ZrN COATED	
D <sub>1</sub>	decimal equiv.	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
.050	.0500	<b>.075</b> (1.5x)	3	1/8	1-1/2	968750	28.80	968750-C8	35.30				
.050	.0500	<b>.150</b> (3x)	3	1/8	1-1/2	942250	29.30	942250-C8	35.90	942250-C4	41.90		
.050	.0500	<b>.250</b> (5x)	3	1/8	2-1/2	923050	39.30	923050-C8	46.10				
.055	.0550	<b>.083</b> (1.5x)	3	1/8	1-1/2	968755	28.80	968755-C8	36.40				
.055	.0550	<b>.165</b> (3x)	3	1/8	1-1/2	942255	28.80	942255-C8	36.40	942255-C4	41.90		
.055	.0550	<b>.275</b> (5x)	3	1/8	2-1/2	923055	40.00	923055-C8	47.60				
1.5 mm	.0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	900433	33.60	900433-C8	41.60				
.060	.0600	<b>.090</b> (1.5x)	3	1/8	1-1/2	968760	26.70	968760-C8	34.30				
.060	.0600	<b>.180</b> (3x)	3	1/8	1-1/2	942260	28.80	942260-C8	35.30	942260-C4	41.10		
.060	.0600	<b>.250</b> (4x)	3	1/8	2-1/2	857260	40.00	857260-C8	47.60				
.060	.0600	<b>.312</b> (5x)	3	1/8	2-1/2	923060	39.30	923060-C8	46.10				
NEW .062 (1/16)	.0620	<b>.050</b> (.8x)	3	1/8	1-1/2	873562	28.60	873562-C8	36.20	873562-C4	41.70		
.062 (1/16)	.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	968762	26.60	968762-C8	33.00	968762-C4	38.80		
.062 (1/16)	.0620	<b>.186</b> (3x)	2	1/8	1-1/2	792162	26.60	792162-C8	34.20				
NEW .062 (1/16)	.0620	<b>.186</b> (3x)	3	1/8	1-1/2	942262	26.60	942262-C8	33.00	942262-C4	38.80	942262-C7 32.50	
.062 (1/16)	.0620	<b>.250</b> (4x)	3	1/8	2-1/2	857262	37.10	857262-C8	44.70	857262-C4	50.20		
.062 (1/16)	.0620	<b>.312</b> (5x)	3	1/8	2-1/2	923062	37.10	923062-C8	43.70	923062-C4	50.20		
.062 (1/16)	.0620	<b>.500</b> (8x)	3	1/8	2-1/2	746062	40.10	746062-C8	47.70				
.070	.0700	<b>.105</b> (1.5x)	3	1/8	1-1/2	968770	26.70	968770-C8	34.30				
.070	.0700	<b>.210</b> (3x)	3	1/8	1-1/2	942270	26.70	942270-C8	33.00	942270-C4	38.80		
.070	.0700	<b>.375</b> (5x)	3	1/8	2-1/2	923070	37.10	923070-C8	43.70				
.075	.0750	<b>.225</b> (3x)	3	1/8	1-1/2	942275	26.70	942275-C8	34.30				
.078 (5/64)	.0780	<b>.117</b> (1.5x)	3	1/8	1-1/2	968778	26.60	968778-C8	33.00	968778-C4	38.80		
.078 (5/64)	.0780	<b>.234</b> (3x)	2	1/8	1-1/2	792178	26.60	792178-C8	34.20				
NEW .078 (5/64)	.0780	<b>.234</b> (3x)	3	1/8	1-1/2	942278	26.60	942278-C8	33.00	942278-C4	38.80	942278-C7 32.50	
.078 (5/64)	.0780	<b>.312</b> (4x)	3	1/8	2-1/2	857278	37.10	857278-C8	44.70				
.078 (5/64)	.0780	<b>.406</b> (5x)	3	1/8	2-1/2	923078	37.10	923078-C8	43.70	923078-C4	50.20		
2.0 mm	.0787	<b>3.00 mm</b> (1.5x)	3	4 mm	50 mm	858445	29.80	858445-C8	37.80				
2.0 mm	.0787	<b>6.00 mm</b> (3x)	3	4 mm	50 mm	900445	29.60	900445-C8	36.00	900445-C4	47.70		
2.0 mm	.0787	<b>10.00 mm</b> (5x)	3	4 mm	50 mm	845945	31.50	845945-C8	39.50				
.080	.0800	<b>.120</b> (1.5x)	3	1/8	1-1/2	968780	26.70	968780-C8	34.30				
.080	.0800	<b>.240</b> (3x)	3	1/8	1-1/2	942280	26.70	942280-C8	33.00	942280-C4	38.80		
.080	.0800	<b>.406</b> (5x)	3	1/8	2-1/2	923080	37.10	923080-C8	43.70				
.090	.0900	<b>.135</b> (1.5x)	3	1/8	1-1/2	968790	26.70	968790-C8	34.30				
.090	.0900	<b>.270</b> (3x)	3	1/8	1-1/2	942290	26.70	942290-C8	33.00	942290-C4	38.80		
.090	.0900	<b>.450</b> (5x)	3	1/8	2-1/2	923090	37.10	923090-C8	43.70				
.093 (3/32)	.0930	<b>.074</b> (.8x)	3	1/8	1-1/2	873593	28.60	873593-C8	36.20				
.093 (3/32)	.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	968793	26.60	968793-C8	33.00	968793-C4	38.80		
.093 (3/32)	.0930	<b>.279</b> (3x)	2	1/8	1-1/2	792193	26.60	792193-C8	34.20				
NEW .093 (3/32)	.0930	<b>.279</b> (3x)	3	1/8	1-1/2	942293	26.60	942293-C8	33.00	942293-C4	38.80	942293-C7 32.50	
.093 (3/32)	.0930	<b>.375</b> (4x)	3	1/8	2-1/2	857293	37.10	857293-C8	44.70	857293-C4	50.20		
.093 (3/32)	.0930	<b>.500</b> (5x)	3	1/8	2-1/2	923093	37.10	923093-C8	43.70	923093-C4	50.20		
.093 (3/32)	.0930	<b>.750</b> (8x)	3	1/8	2-1/2	746093	40.10	746093-C8	47.70				
2.5 mm	.0984	<b>7.50 mm</b> (3x)	3	4 mm	50 mm	900451	31.80	900451-C8	39.80				

ALUMINUM ALLOYS

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square (cont.)

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CUTTER DIAMETER		LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED	TiB <sub>2</sub> COATED	AMORPHOUS DIAMOND	ZrN COATED
D <sub>1</sub>	decimal equiv.	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL # PRICE	TOOL # PRICE	TOOL # PRICE	TOOL # PRICE
<small>+0.005" -0.005"</small>	<small>+0.00mm -0.02mm</small>	<small>+0.010" -0.000" +0.25mm -0.00mm</small>							
.100	.1000	<b>.150</b> (1.5x)	3	1/8	1-1/2	968800 26.70	968800-C8 33.00		
.100	.1000	<b>.300</b> (3x)	3	1/8	1-1/2	942300 26.70	942300-C8 33.00	942300-C4 38.80	
.100	.1000	<b>.500</b> (5x)	3	1/8	2-1/2	923100 37.10	923100-C8 43.70		
.109 (7/64)	.1090	<b>.164</b> (1.5x)	3	1/8	1-1/2	968802 26.70	968802-C8 33.00		
.109 (7/64)	.1090	<b>.327</b> (3x)	3	1/8	1-1/2	942302 26.70	942302-C8 33.00	942302-C4 39.80	
.109 (7/64)	.1090	<b>.570</b> (5x)	3	1/8	2-1/2	923102 37.10	923102-C8 43.70		
3.0 mm	.1181	<b>4.50 mm</b> (1.5x)	3	4 mm	50mm	858457 29.90	858457-C8 37.90		
3.0 mm	.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	900457 29.60	900457-C8 36.00	900457-C4 47.70	
3.0 mm	.1181	<b>12.00 mm</b> (4x)	3	4 mm	50 mm	770057 31.50	770057-C8 39.50		
3.0 mm	.1181	<b>15.00 mm</b> (5x)	3	4 mm	50 mm	845957 33.20	845957-C8 41.20		
.125 (1/8)	.1250	<b>.100</b> (.8x)	3	1/8	1-1/2	873608 29.40	873608-C8 37.00	873608-C4 42.50	NEW
.125 (1/8)	.1250	<b>.187</b> (1.5x)	3	1/8	1-1/2	968808 24.90	968808-C8 32.50	968808-C4 38.00	
.125 (1/8)	.1250	<b>.375</b> (3x)	2	1/8	1-1/2	792208 24.90	792208-C8 32.50		
.125 (1/8)	.1250	<b>.375</b> (3x)	3	1/8	1-1/2	942308 24.90	942308-C8 32.50	942308-C4 38.00	942308-C7 30.80 NEW
.125 (1/8)	.1250	<b>.500</b> (4x)	3	1/8	2-1/2	857308 36.80	857308-C8 44.40	857308-C4 49.90	
.125 (1/8)	.1250	<b>.625</b> (5x)	3	1/8	2-1/2	923108 36.80	923108-C8 43.70	923108-C4 49.90	
.125 (1/8)	.1250	<b>1.000</b> (8x)	3	1/8	2-1/2	746108 39.80	746108-C8 47.40		
.140 (9/64)	.1406	<b>.220</b> (1.5x)	3	3/16	2	968809 27.40	968809-C8 35.00		
.140 (9/64)	.1406	<b>.425</b> (3x)	3	3/16	2	942309 27.40	942309-C8 35.00		
.140 (9/64)	.1406	<b>.750</b> (5x)	3	3/16	3	923109 38.10	923109-C8 45.70		
.156 (5/32)	.1562	<b>.235</b> (1.5x)	3	3/16	2	968810 27.60	968810-C8 35.20	968810-C4 45.70	
.156 (5/32)	.1562	<b>.469</b> (3x)	3	3/16	2	942310 27.60	942310-C8 35.20	942310-C4 45.70	
.156 (5/32)	.1562	<b>.750</b> (5x)	3	3/16	3	923110 38.10	923110-C8 45.70	923110-C4 56.20	
4.0 mm	.1574	<b>12.00 mm</b> (3x)	3	6 mm	63 mm	900461 41.20	900461-C8 49.40		
.187 (3/16)	.1875	<b>.150</b> (.8x)	3	3/16	2	873612 30.60	873612-C8 38.20		
.187 (3/16)	.1875	<b>.285</b> (1.5x)	3	3/16	2	968812 26.70	968812-C8 34.30	968812-C4 44.80	
.187 (3/16)	.1875	<b>.562</b> (3x)	2	3/16	2	792212 26.70	792212-C8 34.30		
.187 (3/16)	.1875	<b>.562</b> (3x)	3	3/16	2	942312 26.70	942312-C8 34.30	942312-C4 44.80	942312-C7 33.10 NEW
.187 (3/16)	.1875	<b>.750</b> (4x)	3	3/16	3	857312 30.80	857312-C8 38.40		
.187 (3/16)	.1875	<b>1.000</b> (5x)	3	3/16	3	923112 38.10	923112-C8 45.70	923112-C4 56.20	
5.0 mm	.1968	<b>15.00 mm</b> (3x)	3	6 mm	63 mm	900464 41.20	900464-C8 49.40		
.218 (7/32)	.2187	<b>.625</b> (3x)	3	1/4	2-1/2	942314 39.50	942314-C8 47.70		
6.0 mm	.2362	<b>18.00 mm</b> (3x)	3	6 mm	63 mm	900466 40.80	900466-C8 49.00		
.250 (1/4)	.2500	<b>.200</b> (.8x)	3	1/4	2-1/2	873616 38.90	873616-C8 47.10		
.250 (1/4)	.2500	<b>.375</b> (1.5x)	3	1/4	2-1/2	968816 32.30	968816-C8 40.50	968816-C4 52.90	
.250 (1/4)	.2500	<b>.750</b> (3x)	3	1/4	2-1/2	942316 32.60	942316-C8 40.80	942316-C4 53.20	942316-C7 41.70 NEW
.250 (1/4)	.2500	<b>1.000</b> (4x)	3	1/4	4	857316 36.50	857316-C8 45.70		
.250 (1/4)	.2500	<b>1.250</b> (5x)	3	1/4	4	923116 45.20	923116-C8 54.40	923116-C4 65.80	

ALUMINUM ALLOYS

continued on next page

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND		ZrN COATED	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> + .000" - .002"	decimal equiv. L <sub>2</sub> + .030" - .000" + .75mm - .00mm		D <sub>2</sub> (h6)	L <sub>1</sub>								
.312 (5/16)	.3125	<b>1.000</b> (3x)	3	5/16	2-1/2	942320	40.90	942320-C8	58.30			
.375 (3/8)	.3750	<b>.570</b> (1.5x)	3	3/8	2-1/2	968824	44.50	968824-C8	65.60			
.375 (3/8)	.3750	<b>1.125</b> (3x)	3	3/8	2-1/2	942324	44.50	942324-C8	65.60	942324-C4	69.30	942324-C7 53.60
.375 (3/8)	.3750	<b>2.000</b> (5x)	3	3/8	4	923124	49.00	923124-C8	73.80			
.500 (1/2)	.5000	<b>.750</b> (1.5x)	3	1/2	3	968832	47.10	968832-C8	71.90			
.500 (1/2)	.5000	<b>1.500</b> (3x)	3	1/2	3	942332	46.60	942332-C8	71.40	942332-C4	77.00	942332-C7 62.50
.500 (1/2)	.5000	<b>2.625</b> (5x)	3	1/2	4	923132	51.40	923132-C8	74.10			

ALUMINUM ALLOYS

## SPEEDS & FEEDS (Variable Helix for Aluminum & Non-Ferrous Alloys)

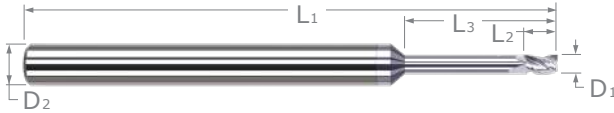
**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For 2 flutes, table values of IPT must be increased to 110% before adjustments for different lengths of cut. For shorter lengths of cut, table values of IPT must be increased (for 0.8x, increase to 125%; for 1.5x, increase to 115%). For longer lengths of cut, table values of IPT must be reduced (for 4x, reduce to 85%; for 5x, reduce to 70%; for 8x, reduce to 58%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Cutter Series	Material	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter									
			.015	.031	.047	.062	.078	.093	.125	.187	.250	
Uncoated	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	750	Slotting	.00020	.00041	.00062	.00082	.00103	.00123	.00165	.00247	.00330
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000	Roughing	.00023	.00048	.00072	.00095	.00120	.00143	.00193	.00288	.00385
	<b>Magnesium Alloys:</b> All alloys	1500	Finishing	.00025	.00051	.00078	.00102	.00129	.00153	.00206	.00309	.00413
	<b>Zinc Alloys:</b> All alloys	800	Max	.00026	.00055	.00083	.00109	.00137	.00164	.00220	.00329	.00440
	<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)	225	Slotting	.00016	.00033	.00050	.00065	.00082	.00098	.00132	.00197	.00264
	Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx)	500	Roughing	.00018	.00038	.00058	.00076	.00096	.00115	.00154	.00230	.00308
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225	Finishing	.00020	.00041	.00062	.00082	.00103	.00123	.00165	.00247	.00330
	Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500	Max	.00021	.00044	.00066	.00087	.00110	.00131	.00176	.00263	.00352
	Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	500	<b>Radial Depth of Cut*:</b>		<b>Axial Depth of Cut*:</b>							
	Copper Nicksels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225	Slotting: 1x Dia		Slotting: 5x Dia							
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	550	Roughing: 5x Dia		Roughing: .5x - 1x Dia								
		Finishing: 1x Dia		Finishing: 5x - 1x Dia								
TiB <sub>2</sub>	<b>Aluminum:</b> Casting (2xx, 5xx, 7xx, 8xx)	1000	Slotting	.00026	.00053	.00081	.00106	.00134	.00160	.00215	.00321	.00429
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1400	Roughing	.00030	.00062	.00094	.00124	.00156	.00186	.00250	.00374	.00501
	<b>Magnesium Alloys:</b> All alloys	2000	Finishing	.00032	.00066	.00101	.00133	.00167	.00199	.00268	.00401	.00536
	<b>Zinc Alloys:</b> All alloys	1100	Max	.00034	.00071	.00108	.00142	.00178	.00213	.00286	.00428	.00572
			<b>Radial Depth of Cut*:</b>		<b>Axial Depth of Cut*:</b>							
		Slotting: 1x Dia		Slotting: 5x Dia								
		Roughing: 5x Dia		Roughing: .5x - 1x Dia								
		Finishing: 1x Dia		Finishing: 5x - 1x Dia								
Amorphous Diamond	<b>Aluminum (High Silicon):</b> Casting - 3% - 5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	2500	Slotting	.00022	.00045	.00068	.00090	.00113	.00135	.00182	.00272	.00363
	Casting - 5% - 8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	2000	Roughing	.00025	.00053	.00080	.00105	.00132	.00158	.00212	.00317	.00424
	Casting - 8% - 12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	1500	Finishing	.00027	.00056	.00085	.00113	.00142	.00169	.00227	.00339	.00454
	Casting - 12% - 16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	1000	Max	.00029	.00060	.00091	.00120	.00151	.00180	.00242	.00362	.00484
	Wrought - 5% - 8% Si (4xxx)	2200	<b>Radial Depth of Cut*:</b>		<b>Axial Depth of Cut*:</b>							
	Wrought - 8% - 12% Si (4xxx)	1700	Slotting: 1x Dia		Slotting: 4x Dia							
	<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)	800	Roughing: 5x Dia		Roughing: .3x - .8x Dia							
	Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx)	1500	Finishing: 1x Dia		Finishing: 5x - 1x Dia							
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	800	Slotting	.00017	.00036	.00055	.00072	.00091	.00108	.00145	.00217	.00290
	Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	1000	Roughing	.00020	.00042	.00064	.00084	.00106	.00126	.00169	.00253	.00339
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	1000	Finishing	.00022	.00045	.00068	.00090	.00113	.00135	.00182	.00272	.00363	
Copper Nicksels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	800	Max	.00023	.00048	.00073	.00096	.00121	.00144	.00194	.00290	.00387	
Cast Copper Alloys (C80100-C82800, C86300, C90200-C91700, C96200-C96600, C99300)	150	<b>Radial Depth of Cut*:</b>		<b>Axial Depth of Cut*:</b>								
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	750	Slotting: 1x Dia		Slotting: 4x Dia								
		Roughing: 5x Dia		Roughing: .3x - .8x Dia								
		Finishing: 1x Dia		Finishing: 5x - 1x Dia								

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Square – Long Reach, Stub Flute



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- h6 shank tolerance for high precision tool holders
- 3 flutes • Center cutting • Solid carbide • CNC ground in the USA

ALUMINUM ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+0.0005" / -0.0005"	+0.02mm / -0.02mm	decimal equivalent	<sup>+0.010"</sup> / <sub>-0.000"</sub>	<sup>+0.010"</sup> / <sub>-0.000"</sub>									
.015 (1/64)		.0150	.023	<b>.078</b> (5x)	3	1/8	2-1/2	930815	53.00	930815-C8	60.60		
.015 (1/64)		.0150	.023	<b>.125</b> (8x)	3	1/8	2-1/2	927115	54.20	927115-C8	61.80		
.020		.0200	.030	<b>.100</b> (5x)	3	1/8	2-1/2	930820	50.70	930820-C8	58.30		
.020		.0200	.030	<b>.160</b> (8x)	3	1/8	2-1/2	927120	52.10	927120-C8	59.70		
.020		.0200	.030	<b>.200</b> (10x)	3	1/8	2-1/2	919320	54.70	919320-C8	62.30		
.025		.0250	.038	<b>.125</b> (5x)	3	1/8	2-1/2	930825	49.50	930825-C8	57.10		
.025		.0250	.038	<b>.203</b> (8x)	3	1/8	2-1/2	927125	50.70	927125-C8	58.30		
.030		.0300	.045	<b>.250</b> (8x)	3	1/8	2-1/2	927130	50.70	927130-C8	58.30		
.031 (1/32)		.0310	.047	<b>.093</b> (3x)	3	1/8	1-1/2	924531	45.80	924531-C8	53.40		
.031 (1/32)		.0310	.047	<b>.125</b> (4x)	3	1/8	2-1/2	814331	46.30	814331-C8	53.90		
.031 (1/32)		.0310	.047	<b>.156</b> (5x)	3	1/8	2-1/2	930831	46.30	930831-C8	53.90	930831-C4	59.40
.031 (1/32)		.0310	.047	<b>.186</b> (6x)	3	1/8	2-1/2	814131	46.30	814131-C8	53.90		
.031 (1/32)		.0310	.047	<b>.218</b> (7x)	3	1/8	2-1/2	813931	47.40	813931-C8	55.00		
.031 (1/32)		.0310	.047	<b>.250</b> (8x)	3	1/8	2-1/2	927131	47.40	927131-C8	55.00	927131-C4	60.50
.031 (1/32)		.0310	.047	<b>.312</b> (10x)	3	1/8	2-1/2	919331	49.90	919331-C8	57.50		
.031 (1/32)		.0310	.047	<b>.375</b> (12x)	3	1/8	2-1/2	879231	51.70	879231-C8	59.30		
	1.0 mm	.0393	1.5 mm	<b>8 mm</b> (8x)	3	4 mm	50 mm	795322	51.90	795322-C8	59.90		
.040		.0400	.060	<b>.325</b> (8x)	3	1/8	2-1/2	927140	49.80	927140-C8	57.40		
.047 (3/64)		.0470	.071	<b>.250</b> (5x)	3	1/8	2-1/2	930847	46.30	930847-C8	53.90		
.047 (3/64)		.0470	.071	<b>.375</b> (8x)	3	1/8	2-1/2	927147	47.40	927147-C8	55.00		
.047 (3/64)		.0470	.071	<b>.480</b> (10x)	3	1/8	2-1/2	919347	50.20	919347-C8	57.80		
.050		.0500	.075	<b>.400</b> (8x)	3	1/8	2-1/2	927150	51.50	927150-C8	59.10		
.055		.0550	.083	<b>.450</b> (8x)	3	1/8	2-1/2	927155	51.50	927155-C8	59.10		
.060		.0600	.090	<b>.500</b> (8x)	3	1/8	2-1/2	927160	51.50	927160-C8	59.10		
.062 (1/16)		.0620	.093	<b>.186</b> (3x)	3	1/8	1-1/2	924562	45.80	924562-C8	53.40		
.062 (1/16)		.0620	.093	<b>.250</b> (4x)	3	1/8	2-1/2	814362	46.30	814362-C8	53.90		
.062 (1/16)		.0620	.093	<b>.312</b> (5x)	3	1/8	2-1/2	930862	46.30	930862-C8	53.90	930862-C4	59.40
.062 (1/16)		.0620	.093	<b>.375</b> (6x)	3	1/8	2-1/2	814162	47.10	814162-C8	54.70		
.062 (1/16)		.0620	.093	<b>.437</b> (7x)	3	1/8	2-1/2	813962	47.10	813962-C8	54.70		
.062 (1/16)		.0620	.093	<b>.500</b> (8x)	3	1/8	2-1/2	927162	47.10	927162-C8	54.70	927162-C4	60.20
.062 (1/16)		.0620	.093	<b>.625</b> (10x)	3	1/8	2-1/2	919362	49.90	919362-C8	57.50		
.062 (1/16)		.0620	.093	<b>.750</b> (12x)	3	1/8	2-1/2	879262	51.70	879262-C8	59.30		
.070		.0700	.105	<b>.570</b> (8x)	3	1/8	2-1/2	927170	48.20	927170-C8	55.80		

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.078 (5/64)		.0780	.118	<b>.406</b> (5x)	3	1/8	2-1/2	930878	46.30	930878-C8	53.90		
.078 (5/64)		.0780	.118	<b>.625</b> (8x)	3	1/8	2-1/2	927178	47.10	927178-C8	54.70		
.078 (5/64)		.0780	.118	<b>.800</b> (10x)	3	1/8	2-1/2	919378	50.20	919378-C8	57.80		
	2.0 mm	.0787	3 mm	<b>16 mm</b> (8x)	3	4 mm	50 mm	795345	51.90	795345-C8	59.90		
.080		.0800	.120	<b>.650</b> (8x)	3	1/8	2-1/2	927180	49.10	927180-C8	56.70		
.090		.0900	.135	<b>.750</b> (8x)	3	1/8	2-1/2	927190	49.10	927190-C8	56.70		
.093 (3/32)		.0930	.140	<b>.279</b> (3x)	3	1/8	1-1/2	924593	45.80	924593-C8	53.40		
.093 (3/32)		.0930	.140	<b>.375</b> (4x)	3	1/8	2-1/2	814393	46.30	814393-C8	53.90		
.093 (3/32)		.0930	.140	<b>.500</b> (5x)	3	1/8	2-1/2	930893	46.30	930893-C8	53.90	930893-C4	59.40
.093 (3/32)		.0930	.140	<b>.585</b> (6x)	3	1/8	2-1/2	814193	47.10	814193-C8	54.70		
.093 (3/32)		.0930	.140	<b>.670</b> (7x)	3	1/8	2-1/2	813993	47.10	813993-C8	54.70		
.093 (3/32)		.0930	.140	<b>.750</b> (8x)	3	1/8	2-1/2	927193	47.10	927193-C8	54.70	927193-C4	60.20
.093 (3/32)		.0930	.140	<b>.950</b> (10x)	3	1/8	2-1/2	919393	49.90	919393-C8	57.50		
.093 (3/32)		.0930	.140	<b>1.125</b> (12x)	3	1/8	2-1/2	879293	51.70	879293-C8	59.30		
.100		.1000	.150	<b>.800</b> (8x)	3	1/8	2-1/2	927200	51.50	927200-C8	59.10		
.109 (7/64)		.1090	.164	<b>.900</b> (8x)	3	1/8	2-1/2	927202	51.50	927202-C8	59.10		
	3.0 mm	.1181	4.50 mm	<b>24.0 mm</b> (8x)	3	4 mm	50 mm	795357	54.10	795357-C8	62.10		

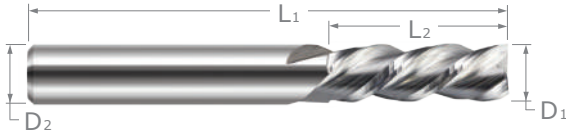
ALUMINUM ALLOYS

D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)	.1250	.187	<b>.375</b> (3x)	3	1/8	1-1/2	924608	45.80	924608-C8	53.40		
.125 (1/8)	.1250	.187	<b>.500</b> (4x)	3	1/8	2-1/2	814408	46.30	814408-C8	53.90		
.125 (1/8)	.1250	.187	<b>.625</b> (5x)	3	1/8	2-1/2	930908	46.30	930908-C8	53.90	930908-C4	59.40
.125 (1/8)	.1250	.187	<b>.750</b> (6x)	3	1/8	2-1/2	814208	47.10	814208-C8	54.70		
.125 (1/8)	.1250	.187	<b>.875</b> (7x)	3	1/8	2-1/2	814008	47.10	814008-C8	54.70		
.125 (1/8)	.1250	.187	<b>1.000</b> (8x)	3	1/8	2-1/2	927208	47.10	927208-C8	54.70	927208-C4	60.20
.125 (1/8)	.1250	.187	<b>1.250</b> (10x)	3	1/8	2-1/2	919408	49.90	919408-C8	57.50		
.125 (1/8)	.1250	.187	<b>1.500</b> (12x)	3	1/8	3	879308	51.70	879308-C8	59.30		
.140 (9/64)	.1406	.220	<b>1.125</b> (8x)	3	3/16	3	927209	54.60	927209-C8	62.20		
.156 (5/32)	.1562	.235	<b>.750</b> (5x)	3	3/16	3	930910	50.70	930910-C8	58.30		
.156 (5/32)	.1562	.235	<b>1.250</b> (8x)	3	3/16	3	927210	52.10	927210-C8	59.70		
.156 (5/32)	.1562	.235	<b>1.570</b> (10x)	3	3/16	3	919410	53.90	919410-C8	61.50		
.187 (3/16)	.1875	.285	<b>1.000</b> (5x)	3	3/16	3	930912	50.70	930912-C8	58.30	930912-C4	68.80
.187 (3/16)	.1875	.285	<b>1.156</b> (6x)	3	3/16	3	814212	50.70	814212-C8	58.30		
.187 (3/16)	.1875	.285	<b>1.312</b> (7x)	3	3/16	3	814012	52.10	814012-C8	59.70		
.187 (3/16)	.1875	.285	<b>1.500</b> (8x)	3	3/16	3	927212	52.10	927212-C8	59.70		
.187 (3/16)	.1875	.285	<b>1.875</b> (10x)	3	3/16	4	919412	53.90	919412-C8	62.10		
.250 (1/4)	.2500	.375	<b>1.250</b> (5x)	3	1/4	4	930916	54.10	930916-C8	63.30		
.250 (1/4)	.2500	.375	<b>2.000</b> (8x)	3	1/4	4	927216	55.30	927216-C8	64.50		
.250 (1/4)	.2500	.375	<b>2.500</b> (10x)	3	1/4	4	919416	57.20	919416-C8	66.40		
.375 (3/8)	.3750	.570	<b>2.000</b> (5x)	3	3/8	4	930924	64.60	930924-C8	89.40		
.500 (1/2)	.5000	.750	<b>2.500</b> (5x)	3	1/2	4	930932	78.30	930932-C8	101.00		

PLEASE SEE SPEEDS & FEEDS ON PAGE 210

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Square – Downcut



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- Prevents lifting of workpiece
- h6 shank tolerance for high precision tool holders
- 3 left hand spiral, right hand cut flutes
- Center cutting
- Solid carbide
- CNC ground in the USA

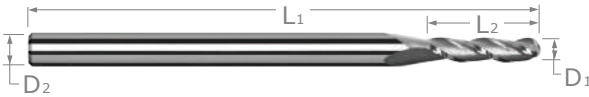
ALUMINUM ALLOYS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
$+0.0005''$ $-0.0005''$	$+0.00mm$ $-0.02mm$		$+0.010''$ $-0.000''$ L <sub>2</sub> $+0.25mm$ $-0.00mm$							
.015 (1/64)		.0150	.045 (3x)	3	1/8	1-1/2	896215	46.50	896215-C8	54.10
.031 (1/32)		.0310	.047 (1.5x)	3	1/8	1-1/2	858531	33.00	858531-C8	40.60
.031 (1/32)		.0310	.093 (3x)	3	1/8	1-1/2	896231	32.80	896231-C8	40.40
.047 (3/64)		.0470	.141 (3x)	3	1/8	1-1/2	896247	32.80	896247-C8	40.40
.062 (1/16)		.0620	.093 (1.5x)	3	1/8	1-1/2	858562	30.70	858562-C8	38.30
.062 (1/16)		.0620	.186 (3x)	3	1/8	1-1/2	896262	30.50	896262-C8	38.10
.078 (5/64)		.0780	.234 (3x)	3	1/8	1-1/2	896278	30.50	896278-C8	38.10
.093 (3/32)		.0930	.140 (1.5x)	3	1/8	1-1/2	858593	30.70	858593-C8	38.30
.093 (3/32)		.0930	.279 (3x)	3	1/8	1-1/2	896293	30.50	896293-C8	38.10
	3.00 mm	.1181	4.50 mm (1.5x)	3	4 mm	50 mm	756057	33.90	756057-C8	41.90
	3.00 mm	.1181	9.00 mm (3x)	3	4 mm	50 mm	754057	33.70	754057-C8	41.70
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
$+0.000''$ $-0.002''$	$+0.00mm$ $-0.04mm$		$+0.030''$ $-0.000''$ L <sub>2</sub> $+0.75mm$ $-0.00mm$							
.125 (1/8)		.1250	.187 (1.5x)	3	1/8	1-1/2	858608	30.40	858608-C8	38.00
.125 (1/8)		.1250	.375 (3x)	3	1/8	1-1/2	896308	30.20	896308-C8	37.80
.156 (5/32)		.1560	.235 (1.5x)	3	3/16	2	858610	34.50	858610-C8	42.10
.156 (5/32)		.1560	.469 (3x)	3	3/16	2	896310	34.30	896310-C8	41.90
.187 (3/16)		.1870	.285 (1.5x)	3	3/16	2	858612	31.80	858612-C8	39.40
.187 (3/16)		.1870	.562 (3x)	3	3/16	2	896312	31.60	896312-C8	39.20
	6.00 mm	.2362	9.00 mm (1.5x)	3	6 mm	63 mm	756066	42.90	756066-C8	51.10
	6.00 mm	.2362	18.00 mm (3x)	3	6 mm	63 mm	754066	42.50	754066-C8	50.70
.250 (1/4)		.2500	.375 (1.5x)	3	1/4	2-1/2	858616	39.80	858616-C8	48.00
.250 (1/4)		.2500	.750 (3x)	3	1/4	2-1/2	896316	39.40	896316-C8	47.60
.375 (3/8)		.3750	.570 (1.5x)	3	3/8	2-1/2	858624	53.20	858624-C8	74.30
.375 (3/8)		.3750	1.125 (3x)	3	3/8	2-1/2	896324	52.70	896324-C8	73.80
.500 (1/2)		.5000	.750 (1.5x)	3	1/2	3	858632	102.30	858632-C8	127.10
.500 (1/2)		.5000	1.500 (3x)	3	1/2	3	896332	104.30	896332-C8	129.10

PLEASE SEE SPEEDS & FEEDS ON PAGE 195

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Ball



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- h6 shank tolerance for high precision tool holders • 3 flutes
- Center cutting • Solid carbide
- CNC ground in the USA

CUTTER DIAMETER D <sub>1</sub> + .0005" / -.0005" / +.00mm / -.02mm / decimal equivalent	LENGTH OF CUT L <sub>2</sub> +.010" / -.000" / +.25mm / -.00mm	FLUTES	SHANK DIA. D <sub>2</sub> (h6)	OAL L <sub>1</sub>	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.2 mm .0078	<b>.60 mm</b> (3x)	3	4 mm	50 mm	977504	60.30	977504-C8	68.30		
.010 .0100	<b>.015</b> (1.5x)	3	1/8	1-1/2	958110	61.40	958110-C8	69.00		
.010 .0100	<b>.030</b> (3x)	3	1/8	1-1/2	989710	60.30	989710-C8	67.90		
.015 (1/64) .0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	958115	48.70	958115-C8	56.30		
.015 (1/64) .0150	<b>.045</b> (3x)	3	1/8	1-1/2	989715	48.70	989715-C8	56.30		
.4 mm .0157	<b>1.20 mm</b> (3x)	3	4 mm	50 mm	977509	48.70	977509-C8	56.70		
.5 mm .0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	977511	43.60	977511-C8	51.60		
.020 .0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	958120	42.60	958120-C8	50.20		
.020 .0200	<b>.060</b> (3x)	3	1/8	1-1/2	989720	42.60	989720-C8	50.20		
.020 .0200	<b>.100</b> (5x)	3	1/8	2-1/2	850020	44.00	850020-C8	51.60		
.6 mm .0236	<b>1.80 mm</b> (3x)	3	4 mm	50 mm	977513	41.00	977513-C8	49.00		
.025 .0250	<b>.075</b> (3x)	3	1/8	1-1/2	989725	41.00	989725-C8	48.60		
.030 .0300	<b>.090</b> (3x)	3	1/8	1-1/2	989730	36.00	989730-C8	43.60		
.031 (1/32) .0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	958131	35.60	958131-C8	43.20		
.031 (1/32) .0310	<b>.093</b> (3x)	3	1/8	1-1/2	989731	35.20	989731-C8	42.80	989731-C4	48.30
.031 (1/32) .0310	<b>.156</b> (5x)	3	1/8	2-1/2	850031	43.70	850031-C8	51.30		
.8 mm .0314	<b>2.40 mm</b> (3x)	3	4 mm	50 mm	977518	35.20	977518-C8	43.20		
1.0 mm .0393	<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	908322	35.60	908322-C8	43.60		
1.0 mm .0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	977522	35.60	977522-C8	43.60		
.040 .0400	<b>.060</b> (1.5x)	3	1/8	1-1/2	958140	38.70	958140-C8	46.30		
.040 .0400	<b>.120</b> (3x)	3	1/8	1-1/2	989740	37.60	989740-C8	45.20		
.047 (3/64) .0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	958147	35.60	958147-C8	43.20		
.047 (3/64) .0470	<b>.141</b> (3x)	3	1/8	1-1/2	989747	35.20	989747-C8	42.80		
.047 (3/64) .0470	<b>.250</b> (5x)	3	1/8	2-1/2	850047	43.70	850047-C8	51.30		
1.2 mm .0472	<b>3.50 mm</b> (3x)	3	4 mm	50 mm	977527	35.60	977527-C8	43.60		
.050 .0500	<b>.150</b> (3x)	3	1/8	1-1/2	989750	36.20	989750-C8	43.80		
1.4 mm .0551	<b>4.00 mm</b> (3x)	3	4 mm	50 mm	977531	35.60	977531-C8	43.60		
1.5 mm .0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	977533	33.00	977533-C8	41.00		
.060 .0600	<b>.180</b> (3x)	3	1/8	1-1/2	989760	35.40	989760-C8	43.00		
.062 (1/16) .0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	958162	33.30	958162-C8	40.90		
.062 (1/16) .0620	<b>.186</b> (3x)	3	1/8	1-1/2	989762	33.30	989762-C8	40.90	989762-C4	46.40
.062 (1/16) .0620	<b>.248</b> (4x)	3	1/8	2-1/2	791162	41.70	791162-C8	49.30		
.062 (1/16) .0620	<b>.312</b> (5x)	3	1/8	2-1/2	850062	41.70	850062-C8	49.30		
1.6 mm .0629	<b>5.00 mm</b> (3x)	3	4 mm	50 mm	977536	33.30	977536-C8	41.30		
1.8 mm .0708	<b>5.50 mm</b> (3x)	3	4 mm	50 mm	977540	33.00	977540-C8	41.00		

continued on next page

ALUMINUM ALLOYS

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Ball (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .010" - .000" + .25mm - .00mm									
.078 (5/64)		.0780	<b>.118</b> (1.5x)	3	1/8	1-1/2	958178	33.30	958178-C8	40.90		
.078 (5/64)		.0780	<b>.234</b> (3x)	3	1/8	1-1/2	989778	33.30	989778-C8	40.90		
.078 (5/64)		.0780	<b>.406</b> (5x)	3	1/8	2-1/2	850078	41.70	850078-C8	49.30		
	2.0 mm	.0787	<b>3.00 mm</b> (1.5x)	3	4 mm	50 mm	908345	33.00	908345-C8	41.00		
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	3	4 mm	50 mm	977545	33.00	977545-C8	41.00		
.093 (3/32)		.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	958193	33.30	958193-C8	40.90		
.093 (3/32)		.0930	<b>.279</b> (3x)	3	1/8	1-1/2	989793	33.30	989793-C8	40.90	989793-C4	46.40
.093 (3/32)		.0930	<b>.500</b> (5x)	3	1/8	2-1/2	850093	41.70	850093-C8	49.30		
.100		.1000	<b>.300</b> (3x)	3	1/8	1-1/2	989800	33.40	989800-C8	41.00		
.109 (7/64)		.1094	<b>.327</b> (3x)	3	1/8	1-1/2	989802	34.30	989802-C8	41.10		
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	977557	34.00	977557-C8	42.00		

ALUMINUM ALLOYS

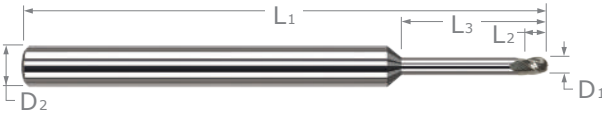
D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	FLUTES	SHANK DIA.	OAL	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+ .000" - .002"		+ .030" - .000"		D <sub>2</sub> (h6)	L <sub>1</sub>						
.125 (1/8)	.1250	<b>.187</b> (1.5x)	3	1/8	1-1/2	958208	31.30	958208-C8	38.90		
.125 (1/8)	.1250	<b>.375</b> (3x)	3	1/8	1-1/2	989808	31.30	989808-C8	38.90	989808-C4	44.40
.125 (1/8)	.1250	<b>.500</b> (4x)	3	1/8	2-1/2	791208	41.70	791208-C8	49.30		
.125 (1/8)	.1250	<b>.625</b> (5x)	3	1/8	2-1/2	850108	41.70	850108-C8	49.30		
.156 (5/32)	.1562	<b>.235</b> (1.5x)	3	3/16	2	958210	34.40	958210-C8	42.00		
.156 (5/32)	.1562	<b>.470</b> (3x)	3	3/16	2	989810	34.40	989810-C8	42.00		
.187 (3/16)	.1875	<b>.285</b> (1.5x)	3	3/16	2	958212	32.30	958212-C8	39.90		
.187 (3/16)	.1875	<b>.562</b> (3x)	3	3/16	2	989812	32.60	989812-C8	40.20	989812-C4	50.70
.187 (3/16)	.1875	<b>1.000</b> (5x)	3	3/16	3	850112	33.50	850112-C8	41.10		
.250 (1/4)	.2500	<b>.375</b> (1.5x)	3	1/4	2-1/2	958216	38.50	958216-C8	46.70		
.250 (1/4)	.2500	<b>.750</b> (3x)	3	1/4	2-1/2	989816	38.80	989816-C8	47.00	989816-C4	59.40
.250 (1/4)	.2500	<b>1.250</b> (5x)	3	1/4	4	850116	50.80	850116-C8	60.00		
.375 (3/8)	.3750	<b>.570</b> (1.5x)	3	3/8	2-1/2	958224	51.00	958224-C8	72.10		
.375 (3/8)	.3750	<b>1.125</b> (3x)	3	3/8	2-1/2	989824	51.00	989824-C8	72.10		
.500 (1/2)	.5000	<b>.750</b> (1.5x)	3	1/2	3	958232	53.60	958232-C8	78.40		
.500 (1/2)	.5000	<b>1.500</b> (3x)	3	1/2	3	989832	53.60	989832-C8	78.40		

PLEASE SEE SPEEDS & FEEDS ON PAGE 195



# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Ball – Long Reach, Stub Flute



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 42°) improves performance in off-center contour milling applications
- Reduced neck diameter to avoid heeling
- Ball end for profiling
- h6 shank tolerance for high precision tool holders
- 3 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIA	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
						3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
D <sub>1</sub> +.0005" - .0005" / +.00mm - .02mm / decimal equivalent	L <sub>2</sub> +.010" - .000" / +.25mm - .00mm	L <sub>3</sub> +.010" - .000" / +.25mm - .00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.015 (1/64)	.0150	.022	.078 (5x)	3	1/8 2-1/2	947015	53.80	947015-C8	61.40		
.015 (1/64)	.0150	.022	.125 (8x)	3	1/8 2-1/2	54415	62.50	54415-C8	70.10		
.020	.0200	.030	.100 (5x)	3	1/8 2-1/2	947020	57.90	947020-C8	65.50		
.020	.0200	.030	.160 (8x)	3	1/8 2-1/2	54420	59.00	54420-C8	66.60		
.025	.0250	.037	.125 (5x)	3	1/8 2-1/2	947025	56.90	947025-C8	64.50		
.025	.0250	.037	.203 (8x)	3	1/8 2-1/2	54425	58.30	54425-C8	65.90		
.031 (1/32)	.0310	.046	.156 (5x)	3	1/8 2-1/2	947031	53.20	947031-C8	60.80		
.031 (1/32)	.0310	.046	.250 (8x)	3	1/8 2-1/2	54431	56.00	54431-C8	63.60	54431-C4	69.10
.031 (1/32)	.0310	.046	.312 (10x)	3	1/8 2-1/2	925131	59.40	925131-C8	67.00		
.031 (1/32)	.0310	.046	.375 (12x)	3	1/8 2-1/2	879431	61.40	879431-C8	69.00		
1.0 mm	.0393	1.50 mm	5.0 mm (5x)	3	4 mm 50 mm	851322	59.70	851322-C8	67.70		
.047 (3/64)	.0470	.070	.250 (5x)	3	1/8 2-1/2	947047	53.20	947047-C8	60.80		
.047 (3/64)	.0470	.070	.375 (8x)	3	1/8 2-1/2	54447	53.80	54447-C8	61.40	54447-C4	66.90
.062 (1/16)	.0620	.093	.312 (5x)	3	1/8 2-1/2	947062	53.20	947062-C8	60.80		
.062 (1/16)	.0620	.093	.500 (8x)	3	1/8 2-1/2	54462	53.80	54462-C8	61.40	54462-C4	66.90
.062 (1/16)	.0620	.093	.625 (10x)	3	1/8 2-1/2	925162	59.40	925162-C8	67.00		
.062 (1/16)	.0620	.093	.750 (12x)	3	1/8 2-1/2	879462	62.50	879462-C8	70.10		
.078 (5/64)	.0780	.117	.406 (5x)	3	1/8 2-1/2	947078	53.20	947078-C8	60.80		
.078 (5/64)	.0780	.117	.625 (8x)	3	1/8 2-1/2	54478	53.80	54478-C8	61.40	54478-C4	66.90
2.0 mm	.0787	3.00 mm	10.0 mm (5x)	3	4 mm 50 mm	851345	55.50	851345-C8	63.50		
.093 (3/32)	.0930	.139	.500 (5x)	3	1/8 2-1/2	947093	53.20	947093-C8	60.80		
.093 (3/32)	.0930	.139	.750 (8x)	3	1/8 2-1/2	54493	53.80	54493-C8	61.40	54493-C4	66.90
.093 (3/32)	.0930	.139	.950 (10x)	3	1/8 2-1/2	925193	59.40	925193-C8	67.00		
.093 (3/32)	.0930	.139	1.125 (12x)	3	1/8 2-1/2	879493	62.50	879493-C8	70.10		
3.0 mm	.1181	4.50 mm	15.0 mm (5x)	3	4 mm 50 mm	851357	59.70	851357-C8	67.70		

D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	L <sub>3</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)	.1250	.187	.625 (5x)	3	1/8 2-1/2	947108	52.00	947108-C8	59.60		
.125 (1/8)	.1250	.187	1.000 (8x)	3	1/8 2-1/2	54508	53.20	54508-C8	60.80	54508-C4	66.30
.125 (1/8)	.1250	.187	1.250 (10x)	3	1/8 2-1/2	925208	59.40	925208-C8	67.00		
.125 (1/8)	.1250	.187	1.500 (12x)	3	1/8 3	879508	62.50	879508-C8	70.10		
.156 (5/32)	.1562	.234	.750 (5x)	3	3/16 3	947110	58.80	947110-C8	66.40		
.156 (5/32)	.1562	.234	1.250 (8x)	3	3/16 3	54510	59.00	54510-C8	66.60		
.187 (3/16)	.1875	.281	1.000 (5x)	3	3/16 3	947112	58.80	947112-C8	66.40		
.187 (3/16)	.1875	.281	1.500 (8x)	3	3/16 3	54512	59.30	54512-C8	66.90	54512-C4	77.40
.250 (1/4)	.2500	.375	1.250 (5x)	3	1/4 4	947116	61.00	947116-C8	70.20		
.250 (1/4)	.2500	.375	2.000 (8x)	3	1/4 4	54516	62.10	54516-C8	71.30	54516-C4	82.70

ALUMINUM ALLOYS

PLEASE SEE SPEEDS & FEEDS ON PAGE 210

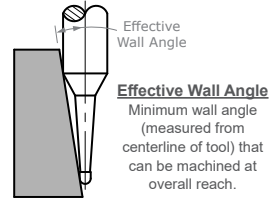
# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

## Ball – Tapered Reach (Mold Cutters)



▶ Excellent in Aluminum & Other Non-Ferrous Materials

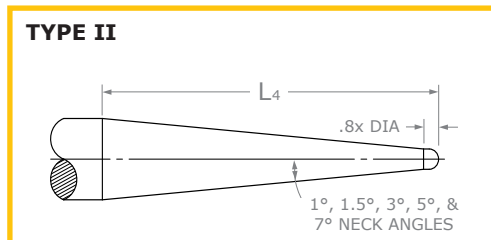
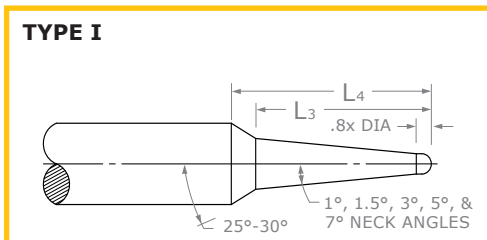
- Very short length of cut and solid tapered neck for maximum rigidity
- 1°, 1.5°, 3°, 5°, and 7° neck angles to address common draft angles for molds
- 45° helix, large flute valley, and sharper cutting edge for faster chip removal and better finish
- Offered with TiB<sub>2</sub> coating to minimize galling and enhance performance
- 2 flutes to center
- Solid carbide
- CNC ground in the USA



ALUMINUM ALLOYS

NECK ANGLE	CUTTER DIA.	LENGTH OF CUT	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		
								2 FL	PRICE	2 FL	PRICE	
A <sub>1</sub> <sup>+0°00'</sup> / <sub>-0°30'</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>					
1°	.062 (1/16)	.050	I	.500	<b>.595</b>	6.4°	3/16	2	925049	54.00	925049-C8	61.60
	.062 (1/16)	.050	I	1.000	<b>1.080</b>	3.5°	3/16	2-1/2	925056	54.00	925056-C8	61.60
	.093 (3/32)	.074	I	.750	<b>.811</b>	3.6°	3/16	2	925070	51.70	925070-C8	59.30
	.093 (3/32)	.074	I	1.125	<b>1.175</b>	2.4°	3/16	2-1/2	925072	54.00	925072-C8	61.60
	.125 (1/8)	.100	I	1.000	<b>1.027</b>	1.9°	3/16	2	925091	65.40	925091-C8	73.00
	.125 (1/8)	.100	II	1.890	<b>1.890</b>	1.0°	3/16	3	925077	67.60	925077-C8	75.20
	.187 (3/16)	.150	II	1.940	<b>1.940</b>	1.0°	1/4	4	925087	68.10	925087-C8	77.30
	.250 (1/4)	.200	II	1.990	<b>1.990</b>	1.0°	5/16	4	925092	73.00	925092-C8	94.10
1.5°	.015 (1/64)	.012	I	.125	<b>.269</b>	18.2°	3/16	2	997807	61.10	997807-C8	68.70
	.015 (1/64)	.012	I	.250	<b>.389</b>	12.8°	3/16	2	997814	60.50	997814-C8	68.10
	.031 (1/32)	.025	I	.250	<b>.375</b>	12.3°	3/16	2	997821	55.60	997821-C8	63.20
	.031 (1/32)	.025	I	.500	<b>.614</b>	7.5°	3/16	2	997828	55.60	997828-C8	63.20
	.047 (3/64)	.038	I	.375	<b>.481</b>	8.7°	3/16	2	997835	55.30	997835-C8	62.90
	.047 (3/64)	.038	I	.750	<b>.839</b>	5.0°	3/16	2	997842	55.30	997842-C8	62.90
	.062 (1/16)	.050	I	.500	<b>.588</b>	6.4°	3/16	2	997849	54.00	997849-C8	61.60
	.062 (1/16)	.050	I	1.000	<b>1.066</b>	3.5°	3/16	2-1/2	997856	54.00	997856-C8	61.60
	.078 (5/64)	.062	I	.625	<b>.694</b>	4.8°	3/16	2	997863	52.70	997863-C8	60.30
	.093 (3/32)	.074	I	.750	<b>.801</b>	3.6°	3/16	2	997870	51.70	997870-C8	59.30
	.125 (1/8)	.100	II	1.293	<b>1.293</b>	1.5°	3/16	2-1/2	997877	65.40	997877-C8	73.00
	.187 (3/16)	.150	II	1.343	<b>1.343</b>	1.5°	1/4	2-1/2	997887	66.20	997887-C8	74.40
	.250 (1/4)	.200	II	1.393	<b>1.393</b>	1.5°	5/16	2-1/2	997892	71.50	997892-C8	88.90

continued on next page



# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

Ball – Tapered Reach (Mold Cutters) (cont.)

continued from previous page

NECK ANGLE	CUTTER DIA.	LENGTH OF CUT	TAPERED REACH TYPE	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		
								2 FL	PRICE	2 FL	PRICE	
A <sub>1</sub> <sup>+0°00'</sup> / <sub>-0°30'</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>					
3°	.031 (1/32)	.025	I	.750	<b>.820</b>	5.6°	3/16	2-1/2	996607	57.50	996607-C8	65.10
	.031 (1/32)	.025	II	1.518	<b>1.518</b>	3.0°	3/16	2-1/2	996614	57.50	996614-C8	65.10
	.047 (3/64)	.038	I	.875	<b>.921</b>	4.5°	3/16	2-1/2	996621	53.80	996621-C8	61.40
	.047 (3/64)	.038	II	1.378	<b>1.378</b>	3.0°	3/16	2-1/2	996628	54.30	996628-C8	61.90
	.062 (1/16)	.050	I	.625	<b>.681</b>	5.5°	3/16	2-1/2	996635	54.30	996635-C8	61.90
	.062 (1/16)	.050	II	1.247	<b>1.247</b>	3.0°	3/16	2-1/2	996642	54.30	996642-C8	61.90
	.078 (5/64)	.062	II	1.107	<b>1.107</b>	3.0°	3/16	2-1/2	996649	52.70	996649-C8	60.30
	.093 (3/32)	.074	II	.976	<b>.976</b>	3.0°	3/16	2	996656	47.70	996656-C8	55.30
	.125 (1/8)	.100	II	1.293	<b>1.293</b>	2.9°	1/4	2-1/2	996663	65.40	996663-C8	73.60
	.187 (3/16)	.150	II	.746	<b>.746</b>	2.8°	1/4	2-1/2	996670	70.80	996670-C8	79.00
	.187 (3/16)	.150	II	1.939	<b>1.939</b>	2.9°	3/8	4	996674	73.70	996674-C8	98.50
	.250 (1/4)	.200	II	1.393	<b>1.393</b>	2.9°	3/8	2-1/2	996692	72.10	996692-C8	93.20
5°	.031 (1/32)	.025	II	.919	<b>.919</b>	5.0°	3/16	2	996007	52.40	996007-C8	60.00
	.047 (3/64)	.038	II	.841	<b>.841</b>	5.0°	3/16	2	996014	51.90	996014-C8	59.50
	.062 (1/16)	.050	II	.767	<b>.767</b>	4.9°	3/16	2	996021	48.80	996021-C8	56.40
	.078 (5/64)	.062	II	1.045	<b>1.045</b>	4.9°	1/4	2-1/2	996028	67.60	996028-C8	75.80
	.093 (3/32)	.074	II	.971	<b>.971</b>	4.9°	1/4	2-1/2	996035	68.20	996035-C8	76.40
	.125 (1/8)	.100	II	.814	<b>.814</b>	4.8°	1/4	2-1/2	996042	70.30	996042-C8	78.50
	.187 (3/16)	.150	II	1.222	<b>1.222</b>	4.8°	3/8	2-1/2	996087	72.80	996087-C8	93.90
	.250 (1/4)	.200	II	.914	<b>.914</b>	4.5°	3/8	2-1/2	996092	72.80	996092-C8	93.90
7°	.031 (1/32)	.025	II	.662	<b>.662</b>	6.9°	3/16	2	995607	51.90	995607-C8	59.50
	.047 (3/64)	.038	II	.610	<b>.610</b>	6.9°	3/16	2	995614	52.40	995614-C8	60.00
	.062 (1/16)	.050	II	.816	<b>.816</b>	6.9°	1/4	2-1/2	995621	67.60	995621-C8	75.80
	.078 (5/64)	.062	II	.762	<b>.762</b>	6.8°	1/4	2-1/2	995628	68.20	995628-C8	76.40
	.093 (3/32)	.074	II	.713	<b>.713</b>	6.7°	1/4	2-1/2	995635	64.20	995635-C8	72.40
	.125 (1/8)	.100	II	.609	<b>.609</b>	6.5°	1/4	2-1/2	995642	61.70	995642-C8	69.90
	.187 (3/16)	.150	II	.914	<b>.914</b>	6.5°	3/8	2-1/2	995687	72.80	995687-C8	93.90

ALUMINUM ALLOYS

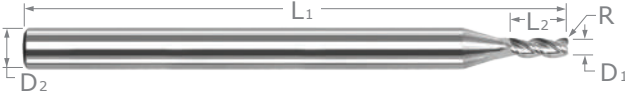


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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Corner Radius



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 42°) reduces chatter and harmonics, and increases material removal rates
- h6 shank tolerance for high precision tool holders
- 3 flutes • Center cutting
- Solid carbide • CNC ground in the USA

<b>TiB<sub>2</sub></b> Titanium Diboride	<b>Best used in Non-Abrasive Aluminum Alloys and Magnesium Alloys!</b> Extremely low affinity to aluminum. Prevents build-up on cutting edge and chip packing, extending tool life.
<b>Amorphous Diamond</b>	<b>Outstanding performance in Copper, Brass, Bronze and High Silicon Aluminum!</b> Improves wear resistance and lubricity. Thin film coating maintains sharp edge, improving performance and finish.

ALUMINUM ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA. OAL		UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+ .0005"	+ .00mm	decimal	+ .001"	+ .010"									
- .0005"	- .02mm	equivalent	- .001"	- .000"									
			+ .025mm	+ .25mm									
			- .025mm	- .00mm									
.2 mm	.0078		<b>.03 mm</b>	.30 mm (1.5x)	3	4 mm	50 mm	986204	54.70	986204-C8	62.70		
.2 mm	.0078		<b>.03 mm</b>	.60 mm (3x)	3	4 mm	50 mm	973504	54.70	973504-C8	62.70		
.010	.0100		<b>.002</b>	.030 (3x)	3	1/8	1-1/2	50010	44.80	50010-C8	52.40		
.3 mm	.0118		<b>.05 mm</b>	.90 mm (3x)	3	4 mm	50 mm	973506	53.20	973506-C8	61.20		
.015 (1/64)	.0150		<b>.002</b>	.022 (1.5x)	3	1/8	1-1/2	61715	42.70	61715-C8	50.30		
.015 (1/64)	.0150		<b>.002</b>	.045 (3x)	3	1/8	1-1/2	50015	41.90	50015-C8	49.50	50015-C4	55.00
.015 (1/64)	.0150		<b>.002</b>	.078 (5x)	3	1/8	2-1/2	53015	50.70	53015-C8	58.30	53015-C4	63.80
.4 mm	.0157		<b>.05 mm</b>	.60 mm (1.5x)	3	4 mm	50 mm	986209	45.00	986209-C8	53.00		
.4 mm	.0157		<b>.05 mm</b>	1.20 mm (3x)	3	4 mm	50 mm	973509	45.00	973509-C8	53.00		
.5 mm	.0196		<b>.05 mm</b>	.75 mm (1.5x)	3	4 mm	50 mm	986211	39.70	986211-C8	47.70		
.5 mm	.0196		<b>.05 mm</b>	1.50 mm (3x)	3	4 mm	50 mm	973511	39.70	973511-C8	47.70		
.020	.0200		<b>.002</b>	.030 (1.5x)	3	1/8	1-1/2	61720	35.90	61720-C8	43.50		
.020	.0200		<b>.002</b>	.060 (3x)	3	1/8	1-1/2	50020	35.90	50020-C8	43.50	50020-C4	49.00
.020	.0200		<b>.002</b>	.100 (5x)	3	1/8	2-1/2	53020	44.40	53020-C8	52.00	53020-C4	57.50
.6 mm	.0236		<b>.05 mm</b>	.90 mm (1.5x)	3	4 mm	50 mm	986213	38.20	986213-C8	46.20		
.6 mm	.0236		<b>.05 mm</b>	1.80 mm (3x)	3	4 mm	50 mm	973513	37.90	973513-C8	45.90		
.025	.0250		<b>.002</b>	.038 (1.5x)	3	1/8	1-1/2	61725	34.60	61725-C8	42.20		
.025	.0250		<b>.002</b>	.075 (3x)	3	1/8	1-1/2	50025	34.60	50025-C8	42.20	50025-C4	47.70
.025	.0250		<b>.002</b>	.125 (5x)	3	1/8	2-1/2	53025	43.00	53025-C8	50.60	53025-C4	56.10
.7 mm	.0275		<b>.08 mm</b>	2.10 mm (3x)	3	4 mm	50 mm	973515	37.90	973515-C8	45.90		
.031 (1/32)	.0310		<b>.003</b>	.047 (1.5x)	3	1/8	1-1/2	61731	28.80	61731-C8	36.40		
.031 (1/32)	.0310		<b>.003</b>	.093 (3x)	3	1/8	1-1/2	50031	28.80	50031-C8	36.40	50031-C4	41.90
.031 (1/32)	.0310		<b>.003</b>	.156 (5x)	3	1/8	2-1/2	53031	36.60	53031-C8	44.20	53031-C4	49.70
.031 (1/32)	.0310		<b>.005</b>	.093 (3x)	3	1/8	1-1/2	901531	28.30	901531-C8	35.90		
.031 (1/32)	.0310		<b>.010</b>	.093 (3x)	3	1/8	1-1/2	904631	28.30	904631-C8	35.90		
.8 mm	.0314		<b>.08 mm</b>	1.20 mm (1.5x)	3	4 mm	50 mm	986218	32.20	986218-C8	40.20		
.8 mm	.0314		<b>.08 mm</b>	2.40 mm (3x)	3	4 mm	50 mm	973518	32.20	973518-C8	40.20		
.035	.0350		<b>.003</b>	.053 (1.5x)	3	1/8	1-1/2	61735	28.80	61735-C8	36.40		
.035	.0350		<b>.003</b>	.105 (3x)	3	1/8	1-1/2	50035	28.60	50035-C8	36.20		
.9 mm	.0354		<b>.08 mm</b>	2.7 mm (3x)	3	4 mm	50 mm	973520	32.20	973520-C8	40.20		
1.0 mm	.0393		<b>.08 mm</b>	1.50 mm (1.5x)	3	4 mm	50 mm	986222	32.20	986222-C8	40.20		
1.0 mm	.0393		<b>.08 mm</b>	3.00 mm (3x)	3	4 mm	50 mm	973522	31.90	973522-C8	39.90		

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Corner Radius (cont.)

continued from previous page

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>		decimal equivalent	R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .001" - .001" + .025mm - .025mm	+ .010" - .000" + .25mm - .00mm									
.040		.0400	.003	.060 (1.5x)	3	1/8	1-1/2	61740	28.80	61740-C8	36.40		
.040		.0400	.003	.120 (3x)	3	1/8	1-1/2	50040	28.80	50040-C8	36.40		
.040		.0400	.003	.203 (5x)	3	1/8	2-1/2	53040	36.60	53040-C8	44.20		
	1.1 mm	.0433	.08 mm	3.00 mm (3x)	3	4 mm	50 mm	973524	32.20	973524-C8	40.20		
.045		.0450	.003	.135 (3x)	3	1/8	1-1/2	50045	28.80	50045-C8	36.40		
.047 (3/64)		.0470	.003	.070 (1.5x)	3	1/8	1-1/2	61747	28.80	61747-C8	36.40		
.047 (3/64)		.0470	.003	.141 (3x)	3	1/8	1-1/2	50047	28.60	50047-C8	36.20	50047-C4	41.70
.047 (3/64)		.0470	.003	.250 (5x)	3	1/8	2-1/2	53047	36.60	53047-C8	44.20	53047-C4	49.70
.047 (3/64)		.0470	.005	.141 (3x)	3	1/8	1-1/2	901547	28.30	901547-C8	35.90		
.047 (3/64)		.0470	.010	.141 (3x)	3	1/8	1-1/2	904647	28.30	904647-C8	35.90	904647-C4	41.40
.047 (3/64)		.0470	.010	.250 (5x)	3	1/8	2-1/2	840747	36.70	840747-C8	44.30		
.047 (3/64)		.0470	.015	.141 (3x)	3	1/8	1-1/2	912347	28.30	912347-C8	35.90		
	1.2 mm	.0472	.08 mm	1.80 mm (1.5x)	3	4 mm	50 mm	986227	32.20	986227-C8	40.20		
	1.2 mm	.0472	.08 mm	3.50 mm (3x)	3	4 mm	50 mm	973527	32.20	973527-C8	40.20		
.050		.0500	.003	.075 (1.5x)	3	1/8	1-1/2	61750	28.60	61750-C8	36.20		
.050		.0500	.003	.150 (3x)	3	1/8	1-1/2	50050	28.60	50050-C8	36.20		
.050		.0500	.003	.250 (5x)	3	1/8	2-1/2	53050	36.60	53050-C8	44.20		
	1.3 mm	.0511	.08 mm	4.00 mm (3x)	3	4 mm	50 mm	973529	32.20	973529-C8	40.20		
.055		.0550	.003	.083 (1.5x)	3	1/8	1-1/2	61755	28.60	61755-C8	36.20		
.055		.0550	.003	.165 (3x)	3	1/8	1-1/2	50055	28.60	50055-C8	36.20		
.055		.0550	.003	.275 (5x)	3	1/8	2-1/2	53055	36.60	53055-C8	44.20		
	1.4 mm	.0551	.08 mm	2.10 mm (1.5x)	3	4 mm	50 mm	986231	31.90	986231-C8	39.90		
	1.4 mm	.0551	.08 mm	4.00 mm (3x)	3	4 mm	50 mm	973531	32.20	973531-C8	40.20		
	1.5 mm	.0590	.10 mm	2.20 mm (1.5x)	3	4 mm	50 mm	986233	29.80	986233-C8	37.80		
	1.5 mm	.0590	.10 mm	4.50 mm (3x)	3	4 mm	50 mm	973533	29.80	973533-C8	37.80		
.060		.0600	.005	.090 (1.5x)	3	1/8	1-1/2	61760	28.60	61760-C8	36.20		
.060		.0600	.005	.180 (3x)	3	1/8	1-1/2	50060	28.60	50060-C8	36.20		
.060		.0600	.005	.312 (5x)	3	1/8	2-1/2	53060	36.90	53060-C8	44.50		
.060		.0600	.010	.180 (3x)	3	1/8	1-1/2	904660	36.20	904660-C8	43.80		
.062 (1/16)		.0620	.005	.093 (1.5x)	3	1/8	1-1/2	61762	26.50	61762-C8	34.10	61762-C4	39.60
.062 (1/16)		.0620	.005	.186 (3x)	3	1/8	1-1/2	50062	26.40	50062-C8	34.00	50062-C4	39.50
.062 (1/16)		.0620	.005	.312 (5x)	3	1/8	2-1/2	53062	34.70	53062-C8	42.30	53062-C4	47.80
.062 (1/16)		.0620	.010	.093 (1.5x)	3	1/8	1-1/2	878562	26.50	878562-C8	34.10		
.062 (1/16)		.0620	.010	.186 (3x)	3	1/8	1-1/2	904662	26.40	904662-C8	34.00		
.062 (1/16)		.0620	.010	.312 (5x)	3	1/8	2-1/2	840762	34.70	840762-C8	42.30		
.062 (1/16)		.0620	.015	.186 (3x)	3	1/8	1-1/2	912362	26.40	912362-C8	34.00		
.062 (1/16)		.0620	.020	.186 (3x)	3	1/8	1-1/2	925862	26.40	925862-C8	34.00		
	1.6 mm	.0629	.10 mm	2.40 mm (1.5x)	3	4 mm	50 mm	986236	29.60	986236-C8	37.60		
	1.6 mm	.0629	.10 mm	5.00 mm (3x)	3	4 mm	50 mm	973536	29.80	973536-C8	37.80		
	1.7 mm	.0669	.10 mm	5.00 mm (3x)	3	4 mm	50 mm	973538	29.80	973538-C8	37.80		
.070		.0700	.005	.210 (3x)	3	1/8	1-1/2	50070	27.50	50070-C8	35.10		
	1.8 mm	.0708	.10 mm	2.70 mm (1.5x)	3	4 mm	50 mm	986240	29.60	986240-C8	37.60		
	1.8 mm	.0708	.10 mm	5.50 mm (3x)	3	4 mm	50 mm	973540	29.80	973540-C8	37.80		
	1.9 mm	.0748	.10 mm	5.50 mm (3x)	3	4 mm	50 mm	973542	29.60	973542-C8	37.60		

ALUMINUM ALLOYS

continued on next page

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Corner Radius (cont.)

continued from previous page

ALUMINUM ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.		UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+ .0005"	+ .00mm	decimal	+ .001"	+ .010"									
- .0005"	- .02mm	equivalent	- .001"	- .000"									
			+ .025mm	+ .25mm									
			- .025mm	- .00mm									
.078 (5/64)		.0780	<b>.005</b>	.118 (1.5x)	3	1/8	1-1/2	61778	26.50	61778-C8	34.10	61778-C4	39.60
.078 (5/64)		.0780	<b>.005</b>	.234 (3x)	3	1/8	1-1/2	50078	26.40	50078-C8	34.00	50078-C4	39.50
.078 (5/64)		.0780	<b>.005</b>	.406 (5x)	3	1/8	2-1/2	53078	34.70	53078-C8	42.30	53078-C4	47.80
.078 (5/64)		.0780	<b>.010</b>	.118 (1.5x)	3	1/8	1-1/2	878578	26.50	878578-C8	34.10		
.078 (5/64)		.0780	<b>.010</b>	.234 (3x)	3	1/8	1-1/2	904678	26.40	904678-C8	34.00		
.078 (5/64)		.0780	<b>.015</b>	.117 (1.5x)	3	1/8	1-1/2	831178	26.40	831178-C8	34.00		
.078 (5/64)		.0780	<b>.015</b>	.234 (3x)	3	1/8	1-1/2	912378	26.40	912378-C8	34.00	912378-C4	39.50
.078 (5/64)		.0780	<b>.020</b>	.234 (3x)	3	1/8	1-1/2	925878	26.40	925878-C8	34.00		
.078 (5/64)		.0780	<b>.020</b>	.406 (5x)	3	1/8	2-1/2	838278	35.00	838278-C8	42.60		
	2.0 mm	.0787	<b>.10 mm</b>	3.00 mm (1.5x)	3	4 mm	50 mm	986245	29.60	986245-C8	37.60		
	2.0 mm	.0787	<b>.10 mm</b>	6.00 mm (3x)	3	4 mm	50 mm	973545	29.80	973545-C8	37.80		
.080		.0800	<b>.005</b>	.240 (3x)	3	1/8	1-1/2	50080	27.50	50080-C8	35.10		
.090		.0900	<b>.005</b>	.270 (3x)	3	1/8	1-1/2	50090	27.50	50090-C8	35.10		
.093 (3/32)		.0930	<b>.005</b>	.139 (1.5x)	3	1/8	1-1/2	61793	26.50	61793-C8	34.10	61793-C4	39.60
.093 (3/32)		.0930	<b>.005</b>	.279 (3x)	3	1/8	1-1/2	50093	26.40	50093-C8	34.00	50093-C4	39.50
.093 (3/32)		.0930	<b>.005</b>	.500 (5x)	3	1/8	2-1/2	53093	34.70	53093-C8	42.30	53093-C4	47.80
.093 (3/32)		.0930	<b>.010</b>	.139 (1.5x)	3	1/8	1-1/2	878593	26.50	878593-C8	34.10		
.093 (3/32)		.0930	<b>.010</b>	.279 (3x)	3	1/8	1-1/2	904693	26.40	904693-C8	34.00	904693-C4	39.50
.093 (3/32)		.0930	<b>.010</b>	.500 (5x)	3	1/8	2-1/2	840793	34.70	840793-C8	42.30		
.093 (3/32)		.0930	<b>.015</b>	.279 (3x)	3	1/8	1-1/2	912393	26.40	912393-C8	34.00		
.093 (3/32)		.0930	<b>.020</b>	.139 (1.5x)	3	1/8	1-1/2	889493	27.00	889493-C8	34.60		
.093 (3/32)		.0930	<b>.020</b>	.279 (3x)	3	1/8	1-1/2	925893	26.40	925893-C8	34.00		
.093 (3/32)		.0930	<b>.030</b>	.139 (1.5x)	3	1/8	1-1/2	893893	26.50	893893-C8	34.10		
.093 (3/32)		.0930	<b>.030</b>	.279 (3x)	3	1/8	1-1/2	904193	26.40	904193-C8	34.00		
	2.5 mm	.0984	<b>.10 mm</b>	7.50 mm (3x)	3	4 mm	50 mm	973551	29.80	973551-C8	37.80		
.100		.1000	<b>.005</b>	.150 (1.5x)	3	1/8	1-1/2	61800	26.50	61800-C8	34.10		
.100		.1000	<b>.005</b>	.300 (3x)	3	1/8	1-1/2	50100	26.50	50100-C8	34.10		
	3.0 mm	.1181	<b>.10 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	973557	29.60	973557-C8	37.60		

NEW  
NEW

D <sub>1</sub>	decimal	R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+ .000"	equivalent	+ .001"	+ .030"									
- .002"		- .001"	- .000"									
.125 (1/8)	.1250	<b>.005</b>	.187 (1.5x)	3	1/8	1-1/2	61808	26.40	61808-C8	34.00	61808-C4	39.50
.125 (1/8)	.1250	<b>.005</b>	.375 (3x)	3	1/8	1-1/2	50108	26.40	50108-C8	34.00	50108-C4	39.50
.125 (1/8)	.1250	<b>.005</b>	.625 (5x)	3	1/8	2-1/2	53108	34.70	53108-C8	42.30	53108-C4	47.80
.125 (1/8)	.1250	<b>.010</b>	.187 (1.5x)	3	1/8	1-1/2	878608	25.40	878608-C8	33.00		
.125 (1/8)	.1250	<b>.010</b>	.375 (3x)	3	1/8	1-1/2	904708	24.70	904708-C8	32.30	904708-C4	37.80
.125 (1/8)	.1250	<b>.010</b>	.625 (5x)	3	1/8	2-1/2	840808	34.20	840808-C8	41.80		
.125 (1/8)	.1250	<b>.015</b>	.187 (1.5x)	3	1/8	1-1/2	831208	24.90	831208-C8	32.50		
.125 (1/8)	.1250	<b>.015</b>	.375 (3x)	3	1/8	1-1/2	912408	24.70	912408-C8	32.30	912408-C4	37.80
.125 (1/8)	.1250	<b>.015</b>	.625 (5x)	3	1/8	2-1/2	852408	34.20	852408-C8	41.80		
.125 (1/8)	.1250	<b>.020</b>	.187 (1.5x)	3	1/8	1-1/2	889508	28.00	889508-C8	35.60		
.125 (1/8)	.1250	<b>.020</b>	.375 (3x)	3	1/8	1-1/2	925908	24.70	925908-C8	32.30	925908-C4	37.80
.125 (1/8)	.1250	<b>.020</b>	.625 (5x)	3	1/8	2-1/2	838308	33.90	838308-C8	41.50		
.125 (1/8)	.1250	<b>.030</b>	.187 (1.5x)	3	1/8	1-1/2	893908	28.00	893908-C8	35.60		
.125 (1/8)	.1250	<b>.030</b>	.375 (3x)	3	1/8	1-1/2	904208	24.70	904208-C8	32.30	904208-C4	37.80
.125 (1/8)	.1250	<b>.030</b>	.625 (5x)	3	1/8	2-1/2	829708	33.90	829708-C8	41.50		
.125 (1/8)	.1250	<b>.040</b>	.375 (3x)	3	1/8	1-1/2	892808	29.80	892808-C8	37.40		

continued on next page

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Corner Radius (cont.)

continued from previous page

CUTTER DIAMETER		CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub> <sup>+ .000"</sup> <sub>- .002"</sub>	decimal equivalent	R <sup>+ .001"</sup> <sub>- .001"</sub>	L <sub>2</sub> <sup>+ .030"</sup> <sub>- .000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.140 (9/64)	.1406	.015	.425 (3x)	3	3/16	2	912409	27.40	912409-C8	35.00		
.156 (5/32)	.1562	.005	.235 (1.5x)	3	3/16	2	61810	27.40	61810-C8	35.00		
.156 (5/32)	.1562	.005	.470 (3x)	3	3/16	2	50110	27.40	50110-C8	35.00	50110-C4	45.50
.156 (5/32)	.1562	.005	.750 (5x)	3	3/16	3	53110	38.60	53110-C8	46.20		
.156 (5/32)	.1562	.020	.470 (3x)	3	3/16	2	925910	27.40	925910-C8	35.00		
.156 (5/32)	.1562	.030	.470 (3x)	3	3/16	2	904210	27.40	904210-C8	35.00		
.187 (3/16)	.1875	.005	.285 (1.5x)	3	3/16	2	61812	27.40	61812-C8	35.00	61812-C4	45.50
.187 (3/16)	.1875	.005	.562 (3x)	3	3/16	2	50112	27.40	50112-C8	35.00	50112-C4	45.50
.187 (3/16)	.1875	.005	1.000 (5x)	3	3/16	3	53112	38.60	53112-C8	46.20	53112-C4	54.10
.187 (3/16)	.1875	.010	.562 (3x)	3	3/16	2	904712	38.30	904712-C8	45.90		
.187 (3/16)	.1875	.015	.285 (1.5x)	3	3/16	2	831212	39.40	831212-C8	47.00		
.187 (3/16)	.1875	.015	.562 (3x)	3	3/16	2	912412	38.30	912412-C8	45.90		
.187 (3/16)	.1875	.020	.285 (1.5x)	3	3/16	2	889512	38.30	889512-C8	45.90		
.187 (3/16)	.1875	.020	.562 (3x)	3	3/16	2	925912	38.30	925912-C8	45.90		
.187 (3/16)	.1875	.030	.285 (1.5x)	3	3/16	2	893912	38.30	893912-C8	45.90		
.187 (3/16)	.1875	.030	.562 (3x)	3	3/16	2	904212	38.30	904212-C8	45.90	904212-C4	56.40
.187 (3/16)	.1875	.030	1.000 (5x)	3	3/16	3	829712	41.50	829712-C8	49.10		
.187 (3/16)	.1875	.060	.562 (3x)	3	3/16	2	834812	38.30	834812-C8	45.90		
.250 (1/4)	.2500	.005	.750 (3x)	3	1/4	2-1/2	901616	36.10	901616-C8	44.30		
.250 (1/4)	.2500	.010	.375 (1.5x)	3	1/4	2-1/2	61816	32.30	61816-C8	40.50	61816-C4	52.90
.250 (1/4)	.2500	.010	.750 (3x)	3	1/4	2-1/2	50116	32.30	50116-C8	40.50	50116-C4	52.90
.250 (1/4)	.2500	.010	1.250 (5x)	3	1/4	4	53116	47.20	53116-C8	56.40	53116-C4	67.80
.250 (1/4)	.2500	.015	.750 (3x)	3	1/4	2-1/2	912416	34.30	912416-C8	42.50		
.250 (1/4)	.2500	.020	.375 (1.5x)	3	1/4	2-1/2	889516	34.30	889516-C8	42.50		
.250 (1/4)	.2500	.020	.750 (3x)	3	1/4	2-1/2	925916	34.30	925916-C8	42.50	925916-C4	54.90
.250 (1/4)	.2500	.030	.375 (1.5x)	3	1/4	2-1/2	893916	34.30	893916-C8	42.50		
.250 (1/4)	.2500	.030	.750 (3x)	3	1/4	2-1/2	904216	34.30	904216-C8	42.50		
.250 (1/4)	.2500	.060	.750 (3x)	3	1/4	2-1/2	834816	34.30	834816-C8	42.50		
.375 (3/8)	.3750	.015	1.125 (3x)	3	3/8	2-1/2	912424	55.90	912424-C8	77.00		
.375 (3/8)	.3750	.030	1.125 (3x)	3	3/8	2-1/2	904224	55.90	904224-C8	77.00		
NEW .375 (3/8)	.3750	.060	.570 (1.5x)	3	3/8	2-1/2	744960	55.90	744960-C8	77.00		
NEW .500 (1/2)	.5000	.015	.750 (1.5x)	3	1/2	3	831232	81.60	831232-C8	106.40		
NEW .500 (1/2)	.5000	.030	.750 (1.5x)	3	1/2	3	893932	81.60	893932-C8	106.40		

ALUMINUM ALLOYS

PLEASE SEE SPEEDS & FEEDS ON PAGE 208



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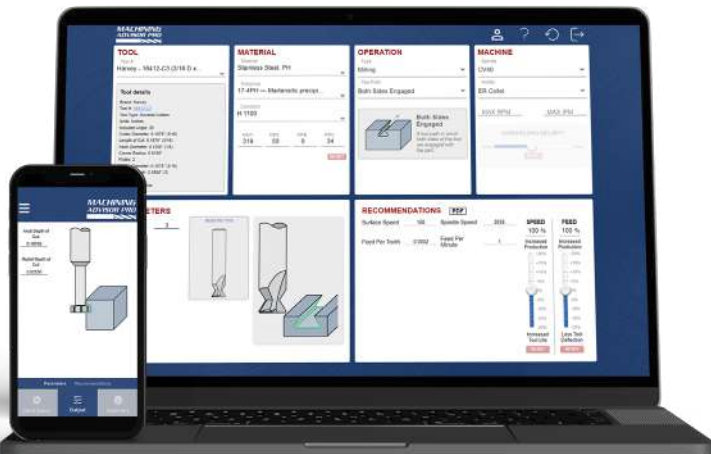
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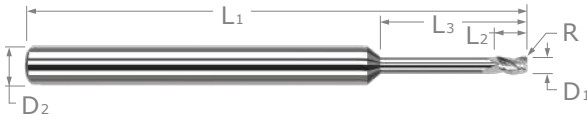
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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Corner Radius – Long Reach, Stub Flute



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Long reach design for deep cavities • Reduced neck diameter to avoid heeling
- Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- Small corner radius for improved strength • 3 flutes • h6 shank tolerance for high precision tool holders
- Center cutting • Solid carbide • CNC ground in the USA

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED			
D <sub>1</sub>		decimal equivalent	R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE		
+ .0005" - .0005"	+ .00mm - .02mm		+ .001" - .001" + .025mm - .025mm	+ .010" - .000" + .25mm - .00mm	+ .010" - .000" + .25mm - .00mm									
.015 (1/64)		.0150	.002	.023	.078 (5x)	3	1/8	2-1/2	956515	55.10	956515-C8	62.70		
.015 (1/64)		.0150	.002	.023	.125 (8x)	3	1/8	2-1/2	961315	56.90	961315-C8	64.50		
.020		.0200	.002	.030	.100 (5x)	3	1/8	2-1/2	956520	52.20	956520-C8	59.80		
.025		.0250	.002	.038	.125 (5x)	3	1/8	2-1/2	956525	51.40	956525-C8	59.00		
.031 (1/32)		.0310	.003	.047	.156 (5x)	3	1/8	2-1/2	956531	47.50	956531-C8	55.10		
.031 (1/32)		.0310	.003	.047	.250 (8x)	3	1/8	2-1/2	961331	48.80	961331-C8	56.40		
.031 (1/32)		.0310	.003	.047	.312 (10x)	3	1/8	2-1/2	861031	53.00	861031-C8	60.60		
.031 (1/32)		.0310	.003	.047	.375 (12x)	3	1/8	2-1/2	949631	53.80	949631-C8	61.40		
.031 (1/32)		.0310	.010	.047	.250 (8x)	3	1/8	2-1/2	876231	49.20	876231-C8	56.80		
1.0 mm		.0393	.08 mm	1.50 mm	5.0 mm (5x)	3	4 mm	50 mm	907622	52.50	907622-C8	60.50		
.040		.0400	.003	.060	.203 (5x)	3	1/8	2-1/2	956540	47.80	956540-C8	55.40		
.040		.0400	.003	.060	.325 (8x)	3	1/8	2-1/2	961340	48.80	961340-C8	56.40		
.047 (3/64)		.0470	.003	.071	.250 (5x)	3	1/8	2-1/2	956547	47.50	956547-C8	55.10		
.047 (3/64)		.0470	.003	.071	.375 (8x)	3	1/8	2-1/2	961347	48.80	961347-C8	56.40		
.047 (3/64)		.0470	.003	.071	.570 (12x)	3	1/8	2-1/2	949647	53.80	949647-C8	61.40		
.047 (3/64)		.0470	.010	.071	.375 (8x)	3	1/8	2-1/2	876247	49.20	876247-C8	56.80		
.062 (1/16)		.0620	.005	.093	.312 (5x)	3	1/8	2-1/2	956562	47.50	956562-C8	55.10		
.062 (1/16)		.0620	.005	.093	.500 (8x)	3	1/8	2-1/2	961362	48.80	961362-C8	56.40		
.062 (1/16)		.0620	.005	.093	.625 (10x)	3	1/8	2-1/2	861062	52.50	861062-C8	60.10		
.062 (1/16)		.0620	.005	.093	.750 (12x)	3	1/8	2-1/2	949662	53.80	949662-C8	61.40		
.062 (1/16)		.0620	.005	.093	.950 (15x)	3	1/8	2-1/2	886862	53.80	886862-C8	61.40		
.062 (1/16)		.0620	.010	.093	.500 (8x)	3	1/8	2-1/2	876262	48.80	876262-C8	56.40		
.078 (5/64)		.0780	.005	.118	.406 (5x)	3	1/8	2-1/2	956578	47.50	956578-C8	55.10		
.078 (5/64)		.0780	.005	.118	.625 (8x)	3	1/8	2-1/2	961378	48.80	961378-C8	56.40		
.078 (5/64)		.0780	.005	.118	.940 (12x)	3	1/8	2-1/2	949678	53.80	949678-C8	61.40		
.078 (5/64)		.0780	.010	.118	.625 (8x)	3	1/8	2-1/2	876278	48.80	876278-C8	56.40		
2.0 mm		.0787	.10 mm	3.00 mm	10.0 mm (5x)	3	4 mm	50 mm	907645	52.50	907645-C8	60.50		
.093 (3/32)		.0930	.005	.140	.500 (5x)	3	1/8	2-1/2	956593	47.50	956593-C8	55.10		
.093 (3/32)		.0930	.005	.140	.750 (8x)	3	1/8	2-1/2	961393	48.80	961393-C8	56.40		
.093 (3/32)		.0930	.005	.140	.950 (10x)	3	1/8	2-1/2	861093	52.50	861093-C8	60.10		
.093 (3/32)		.0930	.005	.140	1.125 (12x)	3	1/8	2-1/2	949693	53.80	949693-C8	61.40		
.093 (3/32)		.0930	.005	.140	1.400 (15x)	3	1/8	3	886893	56.50	886893-C8	64.10		
.093 (3/32)		.0930	.010	.140	.750 (8x)	3	1/8	2-1/2	876293	48.80	876293-C8	56.40		
.093 (3/32)		.0930	.030	.140	.500 (5x)	3	1/8	2-1/2	761093	47.50	761093-C8	55.10		
.093 (3/32)		.0930	.030	.140	.750 (8x)	3	1/8	2-1/2	891893	48.80	891893-C8	56.40		
3.0 mm		.1181	.10 mm	4.50 mm	15.0 mm (5x)	3	4 mm	50 mm	907657	49.40	907657-C8	57.40		
D <sub>1</sub>	+ .000" - .002"	decimal equivalent	R	+ .001" - .001"	L <sub>2</sub>	+ .030" - .000"	L <sub>3</sub>	+ .030" - .000"	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
.125 (1/8)		.1250	.005	.187	.625 (5x)	3	1/8	2-1/2	956608	46.30	956608-C8	53.90		
.125 (1/8)		.1250	.005	.187	1.000 (8x)	3	1/8	2-1/2	961408	47.40	961408-C8	55.00		

ALUMINUM ALLOYS

continued on next page

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Corner Radius – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		
							3 FL	PRICE	3 FL	PRICE	
D <sub>1</sub> <sup>+ .000"</sup> <sub>-.002"</sub>	decimal equivalent	R <sup>+ .001"</sup> <sub>-.001"</sub>	L <sub>2</sub> <sup>+ .030"</sup> <sub>-.000"</sub>	L <sub>3</sub> <sup>+ .030"</sup> <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>					
.125 (1/8)	.1250	.005	.187	1.250 (10x)	3	1/8	2-1/2	861108	50.50	861108-C8	58.10
.125 (1/8)	.1250	.005	.187	1.500 (12x)	3	1/8	3	949708	51.70	949708-C8	59.30
.125 (1/8)	.1250	.005	.187	1.875 (15x)	3	1/8	3	886908	55.00	886908-C8	62.60
.125 (1/8)	.1250	.010	.187	1.000 (8x)	3	1/8	2-1/2	876308	47.40	876308-C8	55.00
.125 (1/8)	.1250	.030	.187	1.000 (8x)	3	1/8	2-1/2	891908	47.40	891908-C8	55.00
.156 (5/32)	.1562	.005	.235	.750 (5x)	3	3/16	3	956610	52.10	956610-C8	59.70
.156 (5/32)	.1562	.005	.235	1.250 (8x)	3	3/16	3	961410	53.50	961410-C8	61.10
.187 (3/16)	.1875	.005	.285	1.000 (5x)	3	3/16	3	956612	52.10	956612-C8	59.70
.187 (3/16)	.1875	.005	.285	1.500 (8x)	3	3/16	3	961412	53.50	961412-C8	61.10
.187 (3/16)	.1875	.005	.285	2.250 (12x)	3	3/16	4	949712	67.40	949712-C8	75.60
.187 (3/16)	.1875	.030	.285	1.000 (5x)	3	3/16	3	761112	52.10	761112-C8	59.70
.187 (3/16)	.1875	.030	.285	1.500 (8x)	3	3/16	3	891912	53.50	891912-C8	61.10
.250 (1/4)	.2500	.010	.375	1.250 (5x)	3	1/4	4	956616	55.60	956616-C8	64.80
.250 (1/4)	.2500	.010	.375	2.000 (8x)	3	1/4	4	961416	56.70	961416-C8	65.90
.250 (1/4)	.2500	.010	.375	3.000 (12x)	3	1/4	6	949716	71.50	949716-C8	84.60
.250 (1/4)	.2500	.030	.375	1.250 (5x)	3	1/4	4	761116	55.60	761116-C8	64.80
.250 (1/4)	.2500	.030	.375	2.000 (8x)	3	1/4	4	891916	56.70	891916-C8	65.90

ALUMINIUM ALLOYS

### SPEEDS & FEEDS (Variable Helix – Long Reach, Stub Flute for Aluminum Alloys)

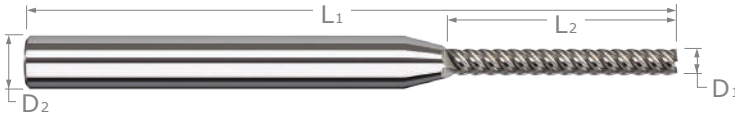
**Important Note:** Values in table are in inches and are based on reached (8x Dia) end mills. For shorter reaches, table values of IPT must be increased (for 3x, increase to 135%; for 5x, increase to 125%). For longer reaches, table values of IPT and DOC must be reduced (for 10x, reduce to 90%; for 12x, reduce to 80%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Cutter Series	Material	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter										
			.015	.031	.047	.062	.078	.093	.125	.187	.250		
Uncoated	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	750	Slotting	.00016	.00033	.00050	.00065	.00082	.00098	.00132	.00197	.00264	
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000	Roughing	.00018	.00038	.00058	.00076	.00096	.00115	.00154	.00230	.00308	
	<b>Magnesium Alloys:</b> All alloys	1500	Finishing	.00020	.00041	.00062	.00082	.00103	.00123	.00165	.00247	.00330	
	<b>Zinc Alloys:</b> All alloys	800	Max	.00021	.00044	.00066	.00087	.00110	.00131	.00176	.00263	.00352	
	<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)	225	Slotting	.00013	.00026	.00040	.00052	.00066	.00079	.00106	.00158	.00211	
	Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	500	Roughing	.00015	.00031	.00046	.00061	.00077	.00092	.00123	.00184	.00246	
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225	Finishing	.00016	.00033	.00050	.00065	.00082	.00098	.00132	.00197	.00264	
	Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500	Max	.00017	.00035	.00053	.00070	.00088	.00105	.00141	.00211	.00282	
	Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	500	<b>Radial Depth of Cut*:</b>		Slotting: 1x Dia Roughing: 4x Dia Finishing: .1x Dia				<b>Axial Depth of Cut*:</b>				
	Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225			Slotting: 1x Dia Roughing: .5x - 1x Dia Finishing: .5x - 1x Dia								
	Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	550											
	TiB <sub>2</sub>	<b>Aluminum:</b> Casting (2xx, 5xx, 7xx, 8xx)	1000	Slotting	.00021	.00043	.00065	.00085	.00107	.00128	.00172	.00257	.00343
		Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1400	Roughing	.00024	.00050	.00075	.00099	.00125	.00149	.00200	.00299	.00400
<b>Magnesium Alloys:</b> All alloys		2000	Finishing	.00026	.00053	.00081	.00106	.00134	.00160	.00215	.00321	.00429	
<b>Zinc Alloys:</b> All alloys		1100	Max	.00027	.00057	.00086	.00113	.00143	.00170	.00229	.00342	.00458	
		<b>Radial Depth of Cut*:</b>		Slotting: 1x Dia Roughing: 4x Dia Finishing: .1x Dia				<b>Axial Depth of Cut*:</b>					
				Slotting: 1x Dia Roughing: .5x - 1x Dia Finishing: .5x - 1x Dia									
Amorphous Diamond		<b>Aluminum (High Silicon):</b> Casting - 3% - 5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	2500	Slotting	.00017	.00036	.00055	.00072	.00091	.00108	.00145	.00217	.00290
		Casting - 5% - 8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	2000	Roughing	.00020	.00042	.00064	.00084	.00106	.00126	.00169	.00253	.00339
		Casting - 8% - 12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	1500	Finishing	.00022	.00045	.00068	.00090	.00113	.00135	.00182	.00272	.00363
		Casting - 12% - 16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	1000	Max	.00023	.00048	.00073	.00096	.00121	.00144	.00194	.00290	.00387
		Wrought - 5% - 8% Si (4xxx)	2200										
		Wrought - 8% - 12% Si (4xxx)	1700										
		<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)	800	Slotting	.00014	.00029	.00044	.00058	.00072	.00086	.00116	.00174	.00232
	Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	1500	Roughing	.00016	.00034	.00051	.00067	.00085	.00101	.00136	.00203	.00271	
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	800	Finishing	.00017	.00036	.00055	.00072	.00091	.00108	.00145	.00217	.00290	
	Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	1000	Max	.00019	.00038	.00058	.00077	.00097	.00115	.00155	.00232	.00310	
	Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	1000	<b>Radial Depth of Cut*:</b>		Slotting: 1x Dia Roughing: .3x Dia Finishing: .1x Dia				<b>Axial Depth of Cut*:</b>				
	Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	800			Slotting: 1x Dia Roughing: .3x Dia Finishing: .3x - .8x Dia Finishing: .5x - 1x Dia								
	Cast Copper Alloys (C80100-C82800, C86300, C90200-C91700, C96200-C96600, C99300)	150											
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	750												

\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Finishers - Square



- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 50°) reduces chatter and harmonics, improving finish
- High helix for effective chip evacuation • h6 shank tolerance for high precision tool holders
- End cutting (not center cutting) • Solid carbide • CNC ground in the USA

CUTTER DIAMETER  D <sub>1</sub> +.0005" - .0005"    +.00mm - .02mm    decimal equivalent	LENGTH OF CUT  L <sub>2</sub> +.010" - .000"    +.25mm - .00mm	FLUTES	SHANK DIAMETER  D <sub>2</sub> (h6)	OVERALL LENGTH  L <sub>1</sub>	UNCOATED		TiB <sub>2</sub> COATED		
					TOOL #	PRICE	TOOL #	PRICE	
.015 (1/64)	.0150	<b>.078</b> (5x)	4	1/8	2-1/2	66715	50.10	66715-C8	57.70
.015 (1/64)	.0150	<b>.125</b> (8x)	4	1/8	2-1/2	67115	49.80	67115-C8	57.40
.020	.0200	<b>.100</b> (5x)	4	1/8	2-1/2	66720	47.80	66720-C8	55.40
.020	.0200	<b>.160</b> (8x)	4	1/8	2-1/2	67120	50.40	67120-C8	58.00
.025	.0250	<b>.125</b> (5x)	4	1/8	2-1/2	66725	46.50	66725-C8	54.10
.025	.0250	<b>.203</b> (8x)	4	1/8	2-1/2	67125	47.60	67125-C8	55.20
.031 (1/32)	.0310	<b>.093</b> (3x)	5	1/8	1-1/2	948831	31.70	948831-C8	39.30
.031 (1/32)	.0310	<b>.156</b> (5x)	5	1/8	2-1/2	66731	44.40	66731-C8	52.00
.031 (1/32)	.0310	<b>.250</b> (8x)	5	1/8	2-1/2	67131	45.60	67131-C8	53.20
.031 (1/32)	.0310	<b>.312</b> (10x)	5	1/8	2-1/2	917631	58.20	917631-C8	65.80
1.0 mm	.0393	<b>5.00 mm</b> (5x)	5	4 mm	50 mm	915522	46.00	915522-C8	54.00
1.0 mm	.0393	<b>8.00 mm</b> (8x)	5	4 mm	50 mm	907122	48.00	907122-C8	56.00
.040	.0400	<b>.203</b> (5x)	5	1/8	2-1/2	66740	44.40	66740-C8	52.00
.040	.0400	<b>.325</b> (8x)	5	1/8	2-1/2	67140	45.60	67140-C8	53.20
.047 (3/64)	.0470	<b>.141</b> (3x)	5	1/8	1-1/2	948847	31.70	948847-C8	39.30
.047 (3/64)	.0470	<b>.250</b> (5x)	5	1/8	2-1/2	66747	44.40	66747-C8	52.00
.047 (3/64)	.0470	<b>.375</b> (8x)	5	1/8	2-1/2	67147	45.60	67147-C8	53.20
.050	.0500	<b>.250</b> (5x)	5	1/8	2-1/2	66750	44.40	66750-C8	52.00
.050	.0500	<b>.400</b> (8x)	5	1/8	2-1/2	67150	45.60	67150-C8	53.20
.060	.0600	<b>.312</b> (5x)	5	1/8	2-1/2	66760	41.20	66760-C8	48.80
.060	.0600	<b>.500</b> (8x)	5	1/8	2-1/2	67160	42.50	67160-C8	50.10
.062 (1/16)	.0620	<b>.186</b> (3x)	5	1/8	1-1/2	948862	29.60	948862-C8	37.20
.062 (1/16)	.0620	<b>.312</b> (5x)	5	1/8	2-1/2	66762	41.20	66762-C8	48.80
.062 (1/16)	.0620	<b>.500</b> (8x)	5	1/8	2-1/2	67162	42.50	67162-C8	50.10
.062 (1/16)	.0620	<b>.625</b> (10x)	5	1/8	2-1/2	917662	62.50	917662-C8	70.10
.078 (5/64)	.0780	<b>.234</b> (3x)	5	1/8	1-1/2	948878	29.60	948878-C8	37.20
.078 (5/64)	.0780	<b>.406</b> (5x)	5	1/8	2-1/2	66778	41.20	66778-C8	48.80
.078 (5/64)	.0780	<b>.625</b> (8x)	5	1/8	2-1/2	67178	42.50	67178-C8	50.10
2.0 mm	.0787	<b>10.00 mm</b> (5x)	5	4 mm	50 mm	915545	45.00	915545-C8	53.00
2.0 mm	.0787	<b>16.00 mm</b> (8x)	5	4 mm	50 mm	907145	46.00	907145-C8	54.00
.093 (3/32)	.0930	<b>.279</b> (3x)	5	1/8	1-1/2	948893	29.60	948893-C8	37.20
.093 (3/32)	.0930	<b>.375</b> (4x)	5	1/8	2-1/2	829493	40.70	829493-C8	48.30
.093 (3/32)	.0930	<b>.500</b> (5x)	5	1/8	2-1/2	66793	41.20	66793-C8	48.80
.093 (3/32)	.0930	<b>.750</b> (8x)	5	1/8	2-1/2	67193	42.50	67193-C8	50.10
.093 (3/32)	.0930	<b>.950</b> (10x)	5	1/8	2-1/2	917693	63.70	917693-C8	71.30

ALUMINUM ALLOYS

continued on next page

# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Finishers – Square (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
D <sub>1</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
+ .0005"	+ .00mm	decimal	+ .010"							
- .0005"	- .02mm	equivalent	- .000"							
			+ .25mm							
			- .00mm							
.100		.1000	<b>.500</b> (5x)	5	1/8	2-1/2	66800	41.20	66800-C8	48.80
.100		.1000	<b>.800</b> (8x)	5	1/8	2-1/2	67200	42.50	67200-C8	50.10
.109 (7/64)		.1090	<b>.570</b> (5x)	5	1/8	2-1/2	66802	41.20	66802-C8	48.80
.109 (7/64)		.1090	<b>.900</b> (8x)	5	1/8	2-1/2	67202	42.50	67202-C8	50.10
	3.0 mm	.1181	<b>15.00 mm</b> (5x)	5	4 mm	50 mm	915557	44.60	915557-C8	52.60
	3.0 mm	.1181	<b>24.00 mm</b> (8x)	5	4 mm	50 mm	907157	46.00	907157-C8	54.00

D <sub>1</sub>	decimal	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	
+ .000"	equivalent	+ .030"							
- .002"		- .000"							
.125 (1/8)	.1250	<b>.187</b> (1.5x)	5	1/8	1-1/2	856908	27.40	856908-C8	35.00
.125 (1/8)	.1250	<b>.375</b> (3x)	5	1/8	1-1/2	948908	27.40	948908-C8	35.00
.125 (1/8)	.1250	<b>.500</b> (4x)	5	1/8	2-1/2	829508	39.70	829508-C8	47.30
.125 (1/8)	.1250	<b>.625</b> (5x)	5	1/8	2-1/2	66808	40.20	66808-C8	47.80
.125 (1/8)	.1250	<b>1.000</b> (8x)	5	1/8	2-1/2	67208	41.70	67208-C8	49.30
.125 (1/8)	.1250	<b>1.125</b> (10x)	5	1/8	2-1/2	917708	62.30	917708-C8	69.90
.156 (5/32)	.1562	<b>.750</b> (5x)	5	3/16	3	66810	43.00	66810-C8	50.60
.156 (5/32)	.1562	<b>1.250</b> (8x)	5	3/16	3	67210	45.60	67210-C8	53.20
.187 (3/16)	.1875	<b>.285</b> (1.5x)	5	3/16	2	856912	32.30	856912-C8	39.90
.187 (3/16)	.1875	<b>.570</b> (3x)	5	3/16	2	948912	32.30	948912-C8	39.90
.187 (3/16)	.1875	<b>1.000</b> (5x)	5	3/16	3	66812	43.00	66812-C8	50.60
.187 (3/16)	.1875	<b>1.500</b> (8x)	5	3/16	3	67212	45.60	67212-C8	53.20
.187 (3/16)	.1875	<b>1.875</b> (10x)	5	3/16	4	917712	63.30	917712-C8	71.50
.250 (1/4)	.2500	<b>.375</b> (1.5x)	5	1/4	2-1/2	856916	42.60	856916-C8	50.80
.250 (1/4)	.2500	<b>.750</b> (3x)	5	1/4	2-1/2	948916	42.60	948916-C8	50.80
.250 (1/4)	.2500	<b>1.250</b> (5x)	5	1/4	4	66816	52.50	66816-C8	61.70
.250 (1/4)	.2500	<b>2.000</b> (8x)	5	1/4	4	67216	54.90	67216-C8	64.10
.375 (3/8)	.3750	<b>1.125</b> (3x)	5	3/8	2-1/2	948924	59.50	948924-C8	80.60
.500 (1/2)	.5000	<b>1.500</b> (3x)	5	1/2	3	948932	80.10	948932-C8	104.90

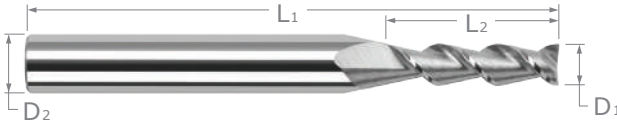
ALUMINUM ALLOYS

### SPEEDS & FEEDS (High Helix Finishers for Aluminum & Non-Ferrous Alloys)

Cutter Series	Material	SFM	Chip Load Per Tooth (IPT)										Depth of Cut			
			.015	.031	.047	.062	.078	.093	.125	.187	.250	Radial	Axial			
Uncoated	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	750														
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000	Finishing (3x LOC)	.00027	.00056	.00085	.00112	.00140	.00167	.00225	.00337	.00450	.12x Dia	.5x - 3x Dia		
	<b>Magnesium Alloys:</b> All alloys	1500														
	<b>Zinc Alloys:</b> All alloys	800														
	<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)	225	Finishing (4x LOC)	.00024	.00049	.00074	.00098	.00123	.00146	.00197	.00295	.00394	.10x Dia	.5x - 4x Dia		
	Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	500														
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225	Finishing (5x LOC)	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	.09x Dia	.5x - 5x Dia		
	Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500														
	Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	500	Finishing (8x LOC)	.00015	.00031	.00047	.00061	.00077	.00092	.00124	.00185	.00248	.07x Dia	.5x - 8x Dia		
	Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225														
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	550	Finishing (10x LOC)	.00014	.00029	.00044	.00058	.00073	.00087	.00117	.00175	.00234	.05x Dia	.5x - 10x Dia			
TiB <sub>2</sub>	<b>Aluminum:</b> Casting (2xx, 5xx, 7xx, 8xx)	1000	Finishing (3x LOC)	.00035	.00073	.00110	.00145	.00183	.00218	.00293	.00438	.00585	.12x Dia	.5x - 3x Dia		
			Finishing (4x LOC)	.00031	.00063	.00096	.00127	.00160	.00190	.00256	.00383	.00512	.10x Dia	.5x - 4x Dia		
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1400	Finishing (5x LOC)	.00026	.00054	.00082	.00109	.00137	.00163	.00219	.00328	.00439	.09x Dia	.5x - 5x Dia		
	<b>Magnesium Alloys:</b> All alloys	2000	Finishing (8x LOC)	.00019	.00040	.00060	.00080	.00100	.00120	.00161	.00241	.00322	.07x Dia	.5x - 8x Dia		
	<b>Zinc Alloys:</b> All alloys	1100	Finishing (10x LOC)	.00018	.00038	.00057	.00075	.00095	.00113	.00152	.00228	.00304	.05x Dia	.5x - 10x Dia		

# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

45° Helix – Square



◀ Down to .010"!

Outstanding in Aluminum!



- 2 flute and 3 flute, high helix design improves results in aluminum and other non-ferrous applications
- 45° helix for faster chip removal and better finish
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIA.	OVERALL LENGTH	UNCOATED			ZrN COATED		TiB <sub>2</sub> COATED		
				2 FL	3 FL	PRICE	2 FL	PRICE	2 FL	3 FL	PRICE
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>								
.010	<b>.030</b> (3x)	1/8	1-1/2	24110		32.00			24110-C8		39.60
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	24115		31.20			24115-C8		38.80
.020	<b>.060</b> (3x)	1/8	1-1/2	24120		29.30			24120-C8		36.90
.025	<b>.075</b> (3x)	1/8	1-1/2	24125		27.20			24125-C8		34.80
.030	<b>.090</b> (3x)	1/8	1-1/2	24130		23.60			24130-C8		31.20
.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2	935531		23.60			935531-C8		31.20
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	24131	747431	23.60	24131-C7	29.50	24131-C8	747431-C8	31.20
.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2	932031		30.30			932031-C8		37.90
.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2	24139		23.60			24139-C8		31.20
.040	<b>.120</b> (3x)	1/8	1-1/2	24140		23.60	24140-C7	29.50	24140-C8		31.20
.040	<b>.203</b> (5x)	1/8	2-1/2	932040		30.30			932040-C8		37.90
.047 (3/64)	<b>.071</b> (1.5x)	1/8	1-1/2	935547		23.60			935547-C8		31.20
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	24147	747447	23.60	24147-C7	29.50	24147-C8	747447-C8	31.20
.047 (3/64)	<b>.250</b> (5x)	1/8	2-1/2	932047		30.30			932047-C8		37.90
.050	<b>.150</b> (3x)	1/8	1-1/2	24150		23.60	24150-C7	29.50	24150-C8		31.20
.050	<b>.250</b> (5x)	1/8	2-1/2	932050		30.30			932050-C8		37.90
.060	<b>.180</b> (3x)	1/8	1-1/2	24160		23.60	24160-C7	29.50	24160-C8		31.20
.060	<b>.312</b> (5x)	1/8	2-1/2	932060		32.00			932060-C8		39.60
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	935562		20.60			935562-C8		28.20
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	24162	747462	20.60	24162-C7	26.50	24162-C8	747462-C8	28.20
.062 (1/16)	<b>.250</b> (4x)	1/8	2-1/2	789662		31.40			789662-C8		39.00
.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2	932062		31.40	932062-C7	37.00	932062-C8		39.00
.070	<b>.210</b> (3x)	1/8	1-1/2	24170		20.60	24170-C7	26.50	24170-C8		28.20
.078 (5/64)	<b>.117</b> (1.5x)	1/8	1-1/2	935578		20.60			935578-C8		28.20
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	24178	747478	20.60	24178-C7	26.50	24178-C8	747478-C8	28.20
.078 (5/64)	<b>.406</b> (5x)	1/8	2-1/2	932078		31.40			932078-C8		39.00
.080	<b>.240</b> (3x)	1/8	1-1/2	24180		20.60	24180-C7	26.50	24180-C8		28.20
.090	<b>.270</b> (3x)	1/8	1-1/2	24190		20.60	24190-C7	26.50	24190-C8		28.20
.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2	935593		20.60			935593-C8		28.20
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	24193	747493	20.60	24193-C7	26.50	24193-C8	747493-C8	28.20
.093 (3/32)	<b>.375</b> (4x)	1/8	2-1/2	789693		31.40			789693-C8		39.00
.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2	932093		31.40			932093-C8		39.00
.100	<b>.300</b> (3x)	1/8	1-1/2	24199		20.60	24199-C7	26.50	24199-C8		28.20
.109 (7/64)	<b>.327</b> (3x)	1/8	1-1/2	24202		31.20			24202-C8		38.80
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	24205		30.90			24205-C8		38.50

ALUMINUM ALLOYS

continued on next page

# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

## 45° Helix – Square (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIA.	OVERALL LENGTH	UNCOATED			ZrN COATED		TiB <sub>2</sub> COATED		
				2 FL	3 FL	PRICE	2 FL	PRICE	2 FL	3 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>								
.125 (1/8)	.187 (1.5x)	1/8	1-1/2	935608		18.60			935608-C8		26.20
.125 (1/8)	.375 (3x)	1/8	1-1/2	752708	747508	18.80			752708-C8	747508-C8	26.40
.125 (1/8)	.500 (4x)	1/8	1-1/2	24208		18.60	24208-C7	24.50	24208-C8		26.20
.125 (1/8)	.625 (5x)	1/8	2-1/2	932108		25.70			932108-C8		33.30
.140 (9/64)	.500 (3x)	3/16	2	24209		25.60			24209-C8		33.20
.156 (5/32)	.235 (1.5x)	3/16	2	935610		21.20			935610-C8		28.80
.156 (5/32)	.562 (3x)	3/16	2	24210		21.20	24210-C7	27.60	24210-C8		28.80
.156 (5/32)	.750 (5x)	3/16	3	932110		25.70			932110-C8		33.30
.187 (3/16)	.285 (1.5x)	3/16	2	935612		21.20			935612-C8		28.80
.187 (3/16)	.625 (3x)	3/16	2	24212		21.00	24212-C7	27.40	24212-C8		28.60
.187 (3/16)	1.000 (5x)	3/16	3	932112		25.70			932112-C8		33.30
.250 (1/4)	.375 (1.5x)	1/4	2-1/2	935616		26.20			935616-C8		34.40
.250 (1/4)	.750 (3x)	1/4	2-1/2	24216		26.20	24216-C7	35.30	24216-C8		34.40
.250 (1/4)	1.250 (5x)	1/4	4	932116		32.20			932116-C8		41.40
.375 (3/8)	1.125 (3x)	3/8	2-1/2	752724		35.70			752724-C8		56.80

ALUMINUM ALLOYS

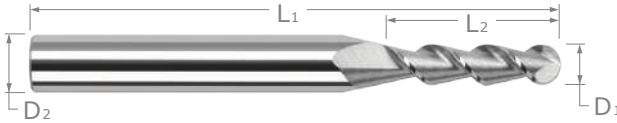
### SPEEDS & FEEDS (45° Helix )

**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 1.5x, increase to 110%). For longer lengths of cut, table values of IPT must be reduced (for 4x, reduce to 90%; for 5x, reduce to 80%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

SERIES	MATERIAL	SFM	CHIP LOAD PER TOOTH (IPT) BY CUTTER DIAMETER								
Uncoated	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx) Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	750 1000	.031	.047	.062	.078	.093	.125	.187	.250	
	<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxx) Brass (Copper Zinc alloys, C2xxx, C3xxx, C4xxx, C66400-C69800) Phosphor Bronzes (Copper Tin alloys, C5xxx) Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200) Silicon Bronzes (Copper Silicon alloys, C64700-C66100) Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxx) Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	225 500 225 500 500 225 550	Slotting .00031 .00047 .00062 .00078 .00093 .00125 .00187 .00250 Roughing .00037 .00056 .00074 .00094 .00112 .00150 .00224 .00300 Finishing .00025 .00038 .00050 .00062 .00074 .00100 .00150 .00200								
	<b>Magnesium Alloys</b>	1500									
	<b>Zinc Alloys</b>	800									
				<b>Radial Depth of Cut*:</b> Slotting: 1x Dia Roughing: .5x Dia Finishing: .1x Dia				<b>Axial Depth of Cut*:</b> Slotting: .5x Dia Roughing: .5x - 1x Dia Finishing: 1x - 3x Dia			
	ZrN	<b>Aluminum Alloys (High Silicon):</b> Casting - 3% - 5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) Casting - 5% - 8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) Casting - 8% - 12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) Casting - 12% - 16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) Wrought - 5% - 8% Si (4xxx) Wrought - 8% - 12% Si (4xxx)	2500 2000 1500 1000 2200 1700	.031	.047	.062	.078	.093	.125	.187	.250
		<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxx) Brass (Copper Zinc alloys, C2xxx, C3xxx, C4xxx, C66400-C69800) Phosphor Bronzes (Copper Tin alloys, C5xxx) Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200) Silicon Bronzes (Copper Silicon alloys, C64700-C66100) Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxx) Cast Copper Alloys (C80100-C82800, C86300, C90200-C91700, C96200-C96600, C99300) Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	800 1500 800 1000 1000 800 150 750	Slotting .00039 .00059 .00078 .00098 .00116 .00156 .00234 .00313 Roughing .00042 .00063 .00084 .00105 .00126 .00169 .00252 .00338 Finishing .00031 .00047 .00062 .00078 .00093 .00125 .00187 .00250							
		<b>Magnesium Alloys</b>	2000								
		<b>Zinc Alloys</b>	1100								
					<b>Radial Depth of Cut*:</b> Slotting: 1x Dia Roughing: .5x Dia Finishing: .1x Dia				<b>Axial Depth of Cut*:</b> Slotting: .5x Dia Roughing: .5x - 1x Dia Finishing: 1x - 3x Dia		
TiB <sub>2</sub>		<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx) Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000 1400								
		<b>Magnesium Alloys</b>	2000								
		<b>Zinc Alloys</b>	1100								

# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

45° Helix – Ball



- 2 flute, high helix design improves results in aluminum and other non-ferrous applications
- 45° helix for faster chip removal and better finish
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

Outstanding in Aluminum!

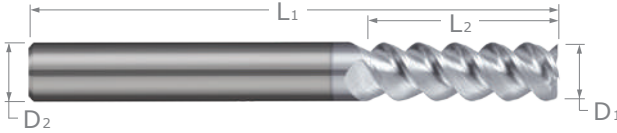
CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		ZrN COATED		TiB <sub>2</sub> COATED	
				2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	27815	35.90			27815-C8	43.50
.020	<b>.060</b> (3x)	1/8	1-1/2	27820	33.50			27820-C8	41.10
.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2	894831	27.20			894831-C8	34.80
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	27831	27.20	27831-C7	33.10	27831-C8	34.80
.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2	887631	33.60			887631-C8	41.20
.040	<b>.120</b> (3x)	1/8	1-1/2	27840	27.20	27840-C7	33.10	27840-C8	34.80
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	27847	27.20	27847-C7	33.10	27847-C8	34.80
.050	<b>.150</b> (3x)	1/8	1-1/2	27850	27.20	27850-C7	33.10	27850-C8	34.80
.060	<b>.180</b> (3x)	1/8	1-1/2	27860	27.20	27860-C7	33.10	27860-C8	34.80
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	894862	25.70			894862-C8	33.30
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	27862	25.70	27862-C7	31.60	27862-C8	33.30
.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2	887662	33.60			887662-C8	41.20
.070	<b>.210</b> (3x)	1/8	1-1/2	27870	26.20	27870-C7	32.10	27870-C8	33.80
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	27878	25.70	27878-C7	31.60	27878-C8	33.30
.080	<b>.240</b> (3x)	1/8	1-1/2	27880	25.70	27880-C7	31.60	27880-C8	33.30
.090	<b>.270</b> (3x)	1/8	1-1/2	27890	26.20	27890-C7	32.10	27890-C8	33.80
.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2	894893	25.70			894893-C8	33.30
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	27893	25.70	27893-C7	31.60	27893-C8	33.30
.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2	887693	34.30			887693-C8	41.90
.100	<b>.300</b> (3x)	1/8	1-1/2	27899	25.70	27899-C7	31.60	27899-C8	33.30
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	27905	35.00			27905-C8	42.60
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	894908	23.90			894908-C8	31.50
.125 (1/8)	<b>.500</b> (4x)	1/8	1-1/2	27908	23.20	27908-C7	29.10	27908-C8	30.80
.125 (1/8)	<b>.625</b> (5x)	1/8	2-1/2	887708	29.20			887708-C8	36.80
.156 (5/32)	<b>.562</b> (3x)	3/16	2	27910	25.20			27910-C8	32.80
.187 (3/16)	<b>.625</b> (3x)	3/16	2	27912	25.20	27912-C7	31.60	27912-C8	32.80
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	27916	28.80	27916-C7	37.90	27916-C8	37.00

ALUMINUM ALLOYS

PLEASE SEE SPEEDS & FEEDS ON PAGE 214

# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

## 60° Helix – Square



- 60° helix for excellent finishing operations in aluminum and other non-ferrous materials
- High helix design for faster chip removal
- h6 tolerance for high precision holders
- Center cutting
- Solid carbide
- CNC ground in the USA

Outstanding in Aluminum!



ALUMINUM ALLOYS

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
				3 FL	PRICE	3 FL	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.0005'' \\ - .0005'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.010'' \\ - .000'' \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>	<b>3 FL</b>	<b>PRICE</b>	<b>3 FL</b>	<b>PRICE</b>
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	745231	24.80	745231-C8	32.40
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	745262	21.80	745262-C8	29.40
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	745293	21.80	745293-C8	29.40
D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ - .002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ - .000'' \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>	<b>3 FL</b>	<b>PRICE</b>	<b>3 FL</b>	<b>PRICE</b>
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	745308	19.80	745308-C8	27.40
.187 (3/16)	<b>.563</b> (3x)	3/16	2	745312	22.30	745312-C8	29.90
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	745316	27.60	745316-C8	35.80
.375 (3/8)	<b>1.125</b> (3x)	3/8	2-1/2	745324	37.60	745324-C8	58.70

NEW  
NEW  
NEW

NEW  
NEW  
NEW  
NEW

### SPEEDS & FEEDS (High Helix for Aluminum & Non-Ferrous Alloys)

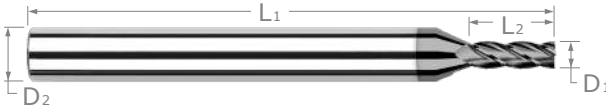
**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased. For longer lengths of cut, table values of IPT must be reduced (for 4x, reduce to 90%; for 5x, reduce to 80%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Cutter Series	Material	SFM	Chip Load Per Tooth (IPT)										Depth of Cut	
			.015	.031	.047	.062	.078	.093	.125	.187	.250	Radial	Axial	
Uncoated	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	750	Slotting	.00014	.00028	.00043	.00049	.00062	.00074	.00099	.00148	.00198	1x Dia	.5x Dia
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000												
	<b>Magnesium Alloys</b>	1500												
	<b>Zinc Alloys</b>	800	Roughing	.00014	.00028	.00043	.00049	.00062	.00074	.00099	.00148	.00198	.5x Dia	.5x - 1x Dia
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225												
	Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500												
	Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	225												
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	550	Finishing	.00017	.00036	.00054	.00062	.00078	.00093	.00125	.00187	.00250	.1x Dia	1x - 3x Dia	
TiB <sub>2</sub>	<b>Aluminum:</b> Casting (2xx, 5xx, 7xx, 8xx)	1000	Slotting	.00018	.00037	.00056	.00064	.00080	.00096	.00129	.00193	.00257	.12x Dia	.5x Dia
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1400												
	<b>Magnesium Alloys</b>	2000	Roughing	.00018	.00037	.00056	.00064	.00080	.00096	.00129	.001993	.00257	.05x Dia	.5x - 1x Dia
	<b>Zinc Alloys</b>	1100	Finishing	.00022	.00046	.00070	.00081	.00102	.00121	.00163	.00243	.00325	1x Dia	1x - 3x Dia



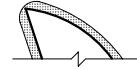
# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Square

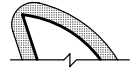


◀ **Outstanding in Graphite!**

- True crystalline CVD diamond on solid carbide substrate
- 4 µm CVD diamond coating yields a sharper cutting edge and therefore leaves a smoother finish on non-ferrous alloys and composites
- 9 µm CVD diamond coating offers increased tool life for non-ferrous alloys and composites, especially higher abrasive materials such as graphite, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- 4 flutes • h6 shank tolerance for high precision tool holders
- Center cutting • CNC ground in the USA



CVD diamond (4 µm) layer for a balance between wear resistance and edge sharpness.



CVD diamond (9 µm) layer for increased tool life, especially in abrasive materials.

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (4 µm)		CVD DIAMOND (9 µm)	
				4 FL	PRICE	4 FL	PRICE
D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>	D2 (h6)	L1				
.015 (1/64)	<b>.023</b> (1.5x)	1/8	1-1/2			962715	91.80
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	799715	78.80	995715	91.80
.015 (1/64)	<b>.078</b> (5x)	1/8	2-1/2			936615	103.90
.020	<b>.030</b> (1.5x)	1/8	1-1/2			962720	92.70
.020	<b>.060</b> (3x)	1/8	1-1/2	799720	78.80	995720	91.80
.020	<b>.100</b> (5x)	1/8	2-1/2			936620	103.90
.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2			962731	91.80
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	799731	78.80	995731	91.80
.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2			936631	103.90
.031 (1/32)	<b>.250</b> (8x)	1/8	2-1/2			891531	92.70
.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2			995739	91.80
.040	<b>.120</b> (3x)	1/8	1-1/2			995740	91.80
.040	<b>.203</b> (5x)	1/8	2-1/2			936640	103.90
.047 (3/64)	<b>.071</b> (1.5x)	1/8	1-1/2			962747	91.80
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	799747	78.80	995747	91.80
.047 (3/64)	<b>.250</b> (5x)	1/8	2-1/2			936647	103.90
.050	<b>.150</b> (3x)	1/8	1-1/2			995750	91.80
.050	<b>.250</b> (5x)	1/8	2-1/2			936650	103.90
.060	<b>.090</b> (1.5x)	1/8	1-1/2			962760	92.70
.060	<b>.180</b> (3x)	1/8	1-1/2			995760	91.80
.060	<b>.312</b> (5x)	1/8	2-1/2			936660	103.90
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2			962762	91.00
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	799762	77.30	995762	91.00
.062 (1/16)	<b>.250</b> (4x)	1/8	2-1/2			871262	102.40
.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2			936662	103.40
.062 (1/16)	<b>.500</b> (8x)	1/8	2-1/2			891562	106.40
.078 (5/64)	<b>.118</b> (1.5x)	1/8	1-1/2			962778	91.90
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2			995778	91.00
.078 (5/64)	<b>.406</b> (5x)	1/8	2-1/2			936678	103.40
.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2			962793	91.00
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	799793	78.10	995793	91.00
.093 (3/32)	<b>.375</b> (4x)	1/8	2-1/2			871293	102.40
.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2			936693	103.40
.093 (3/32)	<b>.750</b> (8x)	1/8	2-1/2			891593	106.40

DIAMOND TOOLING

continued on next page

# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Square (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (4 µm)		CVD DIAMOND (9 µm)	
				4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>				
.100	<b>.300</b> (3x)	1/8	1-1/2			995800	91.90
.109 (7/64)	<b>.327</b> (3x)	1/8	1-1/2			995802	91.00
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2			995805	91.00

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (4 µm)		CVD DIAMOND (9 µm)	
				4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>				
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2			962808	92.70
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	799808	78.70	995808	92.70
.125 (1/8)	<b>.500</b> (4x)	1/8	2-1/2			871308	102.70
.125 (1/8)	<b>.625</b> (5x)	1/8	2-1/2			936708	103.90
.125 (1/8)	<b>1.000</b> (8x)	1/8	2-1/2			891608	106.80
.140 (9/64)	<b>.425</b> (3x)	3/16	2			995809	117.50
.156 (5/32)	<b>.235</b> (1.5x)	3/16	2			962810	116.40
.156 (5/32)	<b>.470</b> (3x)	3/16	2			995810	116.40
.187 (3/16)	<b>.285</b> (1.5x)	3/16	2			962812	116.40
.187 (3/16)	<b>.570</b> (3x)	3/16	2	799812	98.90	995812	116.40
.187 (3/16)	<b>.750</b> (4x)	3/16	3			871312	133.50
.187 (3/16)	<b>1.000</b> (5x)	3/16	3	<b>741912</b>	125.50	936712	148.10
.187 (3/16)	<b>1.500</b> (8x)	3/16	3			891612	164.80
.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2			962816	155.10
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	799816	131.80	995816	155.10
.250 (1/4)	<b>1.000</b> (4x)	1/4	4			871316	164.30
.250 (1/4)	<b>1.250</b> (5x)	1/4	4			936716	166.80
.312 (5/16)	<b>.470</b> (1.5x)	5/16	2-1/2			962820	174.10
.312 (5/16)	<b>1.000</b> (3x)	5/16	2-1/2			995820	174.10
.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2			962824	186.30
.375 (3/8)	<b>1.125</b> (3x)	3/8	2-1/2	<b>741924</b>	166.50	995824	196.50
.375 (3/8)	<b>2.000</b> (5x)	3/8	4			936724	205.30
.500 (1/2)	<b>.750</b> (1.5x)	1/2	3			962832	300.30
.500 (1/2)	<b>1.500</b> (3x)	1/2	3	<b>741932</b>	261.80	995832	309.20
.500 (1/2)	<b>2.625</b> (5x)	1/2	6			936732	319.40

DIAMOND TOOLING

NEW

NEW

NEW

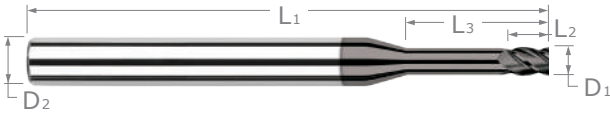


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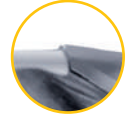
On [harveytool.com](http://harveytool.com)

# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Square – Long Reach, Stub Flute



◀ Outstanding in Graphite!



Reduced Neck Diameter to Avoid Heeling

- True crystalline CVD diamond on solid carbide substrate
- Ideal for machining graphite and composites, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- Reduced neck for clearance and maximum rigidity
- 4 flutes
- h6 shank tolerance for high precision tool holders
- Center cutting
- CNC ground in the USA

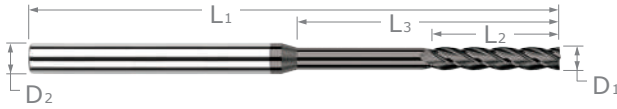
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 μm)	
					4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.015 (1/64)	.023	<b>.078</b> (5x)	1/8	2-1/2	943015	137.60
.015 (1/64)	.023	<b>.125</b> (8x)	1/8	2-1/2	960215	137.60
.015 (1/64)	.023	<b>.187</b> (12x)	1/8	2-1/2	974615	141.00
.020	.030	<b>.100</b> (5x)	1/8	2-1/2	943020	137.60
.020	.030	<b>.160</b> (8x)	1/8	2-1/2	960220	137.60
.020	.030	<b>.250</b> (12x)	1/8	2-1/2	974620	141.00
.025	.038	<b>.125</b> (5x)	1/8	2-1/2	943025	137.60
.025	.038	<b>.203</b> (8x)	1/8	2-1/2	960225	137.60
.025	.038	<b>.312</b> (12x)	1/8	2-1/2	974625	141.00
.031 (1/32)	.047	<b>.156</b> (5x)	1/8	2-1/2	943031	137.60
.031 (1/32)	.047	<b>.250</b> (8x)	1/8	2-1/2	960231	137.60
.031 (1/32)	.047	<b>.375</b> (12x)	1/8	2-1/2	974631	141.00
.039 (1 mm)	.059	<b>.203</b> (5x)	1/8	2-1/2	943039	137.60
.039 (1 mm)	.059	<b>.325</b> (8x)	1/8	2-1/2	960239	137.60
.047 (3/64)	.071	<b>.250</b> (5x)	1/8	2-1/2	943047	137.60
.047 (3/64)	.071	<b>.375</b> (8x)	1/8	2-1/2	960247	137.60
.047 (3/64)	.071	<b>.570</b> (12x)	1/8	2-1/2	974647	141.00
.062 (1/16)	.093	<b>.312</b> (5x)	1/8	2-1/2	943062	125.50
.062 (1/16)	.093	<b>.500</b> (8x)	1/8	2-1/2	960262	125.50
.062 (1/16)	.093	<b>.750</b> (12x)	1/8	2-1/2	974662	129.20
.078 (5/64)	.117	<b>.406</b> (5x)	1/8	2-1/2	943078	125.50
.078 (5/64)	.117	<b>.625</b> (8x)	1/8	2-1/2	960278	125.50
.078 (5/64)	.117	<b>.940</b> (12x)	1/8	2-1/2	974678	129.20
.093 (3/32)	.140	<b>.500</b> (5x)	1/8	2-1/2	943093	125.50
.093 (3/32)	.140	<b>.750</b> (8x)	1/8	2-1/2	960293	125.50
.093 (3/32)	.140	<b>1.125</b> (12x)	1/8	2-1/2	974693	129.20
.118 (3 mm)	.177	<b>.625</b> (5x)	1/8	2-1/2	943105	125.50
.118 (3 mm)	.177	<b>.950</b> (8x)	1/8	2-1/2	960305	125.50

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.125 (1/8)	.187	<b>.625</b> (5x)	1/8	2-1/2	943108	128.00
.125 (1/8)	.187	<b>1.000</b> (8x)	1/8	2-1/2	960308	128.00
.125 (1/8)	.187	<b>1.500</b> (12x)	1/8	3	974708	131.60
.187 (3/16)	.285	<b>1.000</b> (5x)	3/16	3	943112	175.40
.187 (3/16)	.285	<b>1.500</b> (8x)	3/16	3	960312	175.40
.250 (1/4)	.375	<b>1.250</b> (5x)	1/4	4	943116	195.10
.250 (1/4)	.375	<b>2.000</b> (8x)	1/4	4	960316	195.10
.375 (3/8)	.570	<b>1.250</b> (3x)	3/8	2-1/2	977924	239.80
.375 (3/8)	.570	<b>2.000</b> (5x)	3/8	4	943124	264.70
.500 (1/2)	.750	<b>1.500</b> (3x)	1/2	3	977932	359.50
.500 (1/2)	.750	<b>2.625</b> (5x)	1/2	4	943132	376.00

DIAMOND TOOLING

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### CVD Diamond – Square – Long Reach, Long Flute



◀ Outstanding in Graphite!

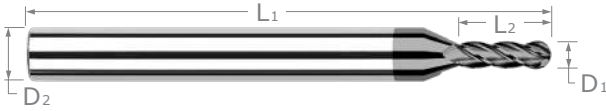
- True crystalline CVD diamond on solid carbide substrate
- Ideal for machining graphite and composites, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- Reduced neck for clearance and maximum rigidity
- h6 shank tolerance for high precision tool holders
- 4 flutes
- Center cutting
- CNC ground in the USA

DIAMOND TOOLING

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 μm)	
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$	4 FL	PRICE
.015 (1/64)	.078	<b>.156</b> (10x)	1/8	2-1/2	36315	157.80
.020	.100	<b>.200</b> (10x)	1/8	2-1/2	36320	157.80
.025	.125	<b>.250</b> (10x)	1/8	2-1/2	36325	157.80
.031 (1/32)	.156	<b>.312</b> (10x)	1/8	2-1/2	746231	154.20
.031 (1/32)	.156	<b>.312</b> (10x)	1/8	2-1/2	36331	157.80
.047 (3/64)	.250	<b>.480</b> (10x)	1/8	2-1/2	36347	157.80
.062 (1/16)	.312	<b>.500</b> (8x)	1/8	2-1/2	746262	140.80
.062 (1/16)	.312	<b>.625</b> (10x)	1/8	2-1/2	36362	144.40
.078 (5/64)	.406	<b>.800</b> (10x)	1/8	2-1/2	36378	144.40
.093 (3/32)	.500	<b>.750</b> (8x)	1/8	2-1/2	746293	140.80
.093 (3/32)	.500	<b>.950</b> (10x)	1/8	2-1/2	36393	144.40
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$	4 FL	PRICE
.125 (1/8)	.625	<b>1.00</b> (8x)	1/8	2-1/2	746308	150.40
.125 (1/8)	.625	<b>1.250</b> (10x)	1/8	2-1/2	36408	154.20
.187 (3/16)	1.000	<b>1.875</b> (10x)	3/16	3	36412	203.40
.250 (1/4)	1.250	<b>2.500</b> (10x)	1/4	4	36416	225.90

# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond – Ball



◀ Outstanding in Graphite!

- True crystalline CVD diamond on solid carbide substrate
- 4 μm CVD diamond coating yields a sharper cutting edge and therefore leaves a smoother finish on non-ferrous alloys and composites
- 9 μm CVD diamond coating offers increased tool life for non-ferrous alloys and composites, especially higher abrasive materials such as graphite, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- 4 flutes • h6 shank tolerance for high precision tool holders
- Center cutting • CNC ground in the USA



CVD diamond (4 μm) layer for a balance between wear resistance and edge sharpness.



CVD diamond (9 μm) layer for increased tool life, especially in abrasive materials.

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (4 μm)		CVD DIAMOND (9 μm)	
				4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>				
.015 (1/64)	<b>.023</b> (1.5x)	1/8	1-1/2			914415	100.00
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	799515	85.80	999315	100.00
.015 (1/64)	<b>.078</b> (5x)	1/8	2-1/2			940915	111.90
.020	<b>.030</b> (1.5x)	1/8	1-1/2			914420	100.00
.020	<b>.060</b> (3x)	1/8	1-1/2	799520	85.80	999320	100.00
.020	<b>.100</b> (5x)	1/8	2-1/2			940920	111.90
.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2			914431	100.00
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	799531	85.80	999331	100.00
.031 (1/32)	<b>.125</b> (4x)	1/8	2-1/2			818631	110.90
.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2			940931	111.90
.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2			999339	100.00
.040	<b>.120</b> (3x)	1/8	1-1/2			999340	101.00
.047 (3/64)	<b>.071</b> (1.5x)	1/8	1-1/2			914447	101.00
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	799547	85.80	999347	100.00
.047 (3/64)	<b>.250</b> (5x)	1/8	2-1/2			940947	111.90
.050	<b>.150</b> (3x)	1/8	1-1/2			999350	101.00
.060	<b>.180</b> (3x)	1/8	1-1/2			999360	100.00
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2			914462	96.80
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	799562	82.30	999362	96.80
.062 (1/16)	<b>.250</b> (4x)	1/8	2-1/2			818662	108.10
.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2			940962	109.00
.078 (5/64)	<b>.118</b> (1.5x)	1/8	1-1/2			914478	96.80
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2			999378	96.80
.078 (5/64)	<b>.406</b> (5x)	1/8	2-1/2			940978	109.00
.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2			914493	97.70
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	799593	83.10	999393	96.80
.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2			940993	109.00
.100	<b>.300</b> (3x)	1/8	1-1/2			999400	97.70
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2			999405	96.80

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DIAMOND TOOLING

# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Ball (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (4 µm)		CVD DIAMOND (9 µm)	
				4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>				
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2			914508	98.30
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	799608	83.50	999408	98.30
.125 (1/8)	<b>.500</b> (4x)	1/8	2-1/2			818708	110.60
.125 (1/8)	<b>.625</b> (5x)	1/8	2-1/2			941008	111.70
.156 (5/32)	<b>.235</b> (1.5x)	3/16	2			914510	123.10
.156 (5/32)	<b>.470</b> (3x)	3/16	2			999410	122.00
.187 (3/16)	<b>.285</b> (1.5x)	3/16	2			914512	123.10
.187 (3/16)	<b>.570</b> (3x)	3/16	2	799612	104.70	999412	122.00
.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2			914516	161.30
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	799616	137.10	999416	161.30
.250 (1/4)	<b>1.250</b> (5x)	1/4	4			941016	173.00
.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2			914524	201.20
.500 (1/2)	<b>.750</b> (1.5x)	1/2	3			914532	316.00
.500 (1/2)	<b>1.500</b> (3x)	1/2	3			999432	319.00

DIAMOND TOOLING



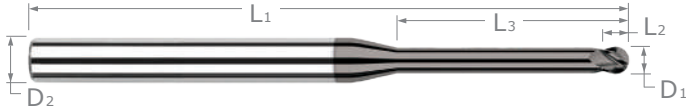
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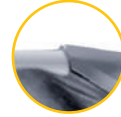


# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Ball – Long Reach, Stub Flute



Outstanding in Graphite!



Reduced Neck Diameter to Avoid Heeling

- True crystalline CVD diamond on solid carbide substrate
- Ideal for machining graphite and composites, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- Reduced neck for clearance and maximum rigidity
- 4 flutes
- h6 shank tolerance for high precision tool holders
- Center cutting
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 μm)	
					4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>		
.015 (1/64)	.023	<b>.078</b> (5x)	1/8	2-1/2	61015	143.90
.015 (1/64)	.023	<b>.125</b> (8x)	1/8	2-1/2	62015	143.90
.015 (1/64)	.023	<b>.156</b> (10x)	1/8	2-1/2	939515	147.60
.015 (1/64)	.023	<b>.187</b> (12x)	1/8	2-1/2	65215	147.60
.015 (1/64)	.023	<b>.225</b> (15x)	1/8	2-1/2	76015	155.10
.015 (1/64)	.023	<b>.270</b> (18x)	1/8	2-1/2	841815	162.40
.020	.030	<b>.100</b> (5x)	1/8	2-1/2	61020	143.90
.020	.030	<b>.160</b> (8x)	1/8	2-1/2	62020	143.90
.020	.030	<b>.200</b> (10x)	1/8	2-1/2	939520	147.60
.020	.030	<b>.250</b> (12x)	1/8	2-1/2	65220	147.60
.020	.030	<b>.300</b> (15x)	1/8	2-1/2	76020	155.10
.020	.030	<b>.360</b> (18x)	1/8	2-1/2	841820	162.40
.025	.038	<b>.125</b> (5x)	1/8	2-1/2	61025	143.90
.025	.038	<b>.203</b> (8x)	1/8	2-1/2	62025	143.90
.025	.038	<b>.312</b> (12x)	1/8	2-1/2	65225	147.60
.025	.038	<b>.375</b> (15x)	1/8	2-1/2	76025	155.10
.030	.045	<b>.250</b> (8x)	1/8	2-1/2	62030	143.90
.031 (1/32)	.047	<b>.093</b> (3x)	1/8	1-1/2	922231	129.50
.031 (1/32)	.047	<b>.156</b> (5x)	1/8	2-1/2	61031	143.90
.031 (1/32)	.047	<b>.187</b> (6x)	1/8	2-1/2	795131	143.90
.031 (1/32)	.047	<b>.218</b> (7x)	1/8	2-1/2	794931	143.90
.031 (1/32)	.047	<b>.250</b> (8x)	1/8	2-1/2	62031	143.90
.031 (1/32)	.047	<b>.312</b> (10x)	1/8	2-1/2	939531	147.60
.031 (1/32)	.047	<b>.375</b> (12x)	1/8	2-1/2	65231	147.60
.031 (1/32)	.047	<b>.470</b> (15x)	1/8	2-1/2	76031	155.10
.031 (1/32)	.047	<b>.565</b> (18x)	1/8	2-1/2	841831	162.40
.039 (1 mm)	.059	<b>.203</b> (5x)	1/8	2-1/2	61039	143.90
.039 (1 mm)	.059	<b>.325</b> (8x)	1/8	2-1/2	62039	143.90
.040	.060	<b>.203</b> (5x)	1/8	2-1/2	61040	143.90
.040	.060	<b>.325</b> (8x)	1/8	2-1/2	62040	143.90
.047 (3/64)	.071	<b>.250</b> (5x)	1/8	2-1/2	61047	143.90
.047 (3/64)	.071	<b>.375</b> (8x)	1/8	2-1/2	62047	143.90
.047 (3/64)	.071	<b>.480</b> (10x)	1/8	2-1/2	939547	147.60
.047 (3/64)	.071	<b>.570</b> (12x)	1/8	2-1/2	65247	147.60
.047 (3/64)	.071	<b>.710</b> (15x)	1/8	2-1/2	76047	155.10
.047 (3/64)	.071	<b>.850</b> (18x)	1/8	2-1/2	841847	162.40
.050	.075	<b>.250</b> (5x)	1/8	2-1/2	61050	143.90
.050	.075	<b>.400</b> (8x)	1/8	2-1/2	62050	143.90
.060	.090	<b>.312</b> (5x)	1/8	2-1/2	61060	143.90
.060	.090	<b>.500</b> (8x)	1/8	2-1/2	62060	143.90

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DIAMOND TOOLING

# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Ball – Long Reach, Stub Flute (cont.)

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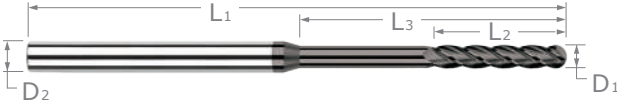
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 µm)	
					4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.062 (1/16)	.093	<b>.186</b> (3x)	1/8	1-1/2	922262	114.30
.062 (1/16)	.093	<b>.312</b> (5x)	1/8	2-1/2	61062	129.20
.062 (1/16)	.093	<b>.375</b> (6x)	1/8	2-1/2	795162	129.20
.062 (1/16)	.093	<b>.437</b> (7x)	1/8	2-1/2	794962	129.20
.062 (1/16)	.093	<b>.500</b> (8x)	1/8	2-1/2	62062	129.20
.062 (1/16)	.093	<b>.625</b> (10x)	1/8	2-1/2	939562	133.00
.062 (1/16)	.093	<b>.750</b> (12x)	1/8	2-1/2	65262	133.00
.062 (1/16)	.093	<b>.950</b> (15x)	1/8	2-1/2	76062	139.90
.062 (1/16)	.093	<b>1.125</b> (18x)	1/8	2-1/2	841862	146.80
.078 (5/64)	.117	<b>.406</b> (5x)	1/8	2-1/2	61078	129.20
.078 (5/64)	.117	<b>.625</b> (8x)	1/8	2-1/2	62078	129.20
.078 (5/64)	.117	<b>.800</b> (10x)	1/8	2-1/2	939578	133.00
.078 (5/64)	.117	<b>.940</b> (12x)	1/8	2-1/2	65278	133.00
.078 (5/64)	.117	<b>1.187</b> (15x)	1/8	2-1/2	76078	139.90
.078 (5/64)	.117	<b>1.400</b> (18x)	1/8	2-1/2	841878	146.80
.093 (3/32)	.140	<b>.279</b> (3x)	1/8	1-1/2	922293	114.30
.093 (3/32)	.140	<b>.500</b> (5x)	1/8	2-1/2	61093	129.20
.093 (3/32)	.140	<b>.585</b> (6x)	1/8	2-1/2	795193	129.20
.093 (3/32)	.140	<b>.670</b> (7x)	1/8	2-1/2	794993	129.20
.093 (3/32)	.140	<b>.750</b> (8x)	1/8	2-1/2	62093	129.20
.093 (3/32)	.140	<b>.950</b> (10x)	1/8	2-1/2	939593	133.00
.093 (3/32)	.140	<b>1.125</b> (12x)	1/8	2-1/2	65293	133.00
.093 (3/32)	.140	<b>1.400</b> (15x)	1/8	2-1/2	76093	139.90
.093 (3/32)	.140	<b>1.675</b> (18x)	1/8	3	841893	146.80
.100	.150	<b>.800</b> (8x)	1/8	2-1/2	62100	129.20
.109 (7/64)	.164	<b>.900</b> (8x)	1/8	2-1/2	62102	129.20
.118 (3 mm)	.177	<b>.625</b> (5x)	1/8	2-1/2	61105	129.20
.118 (3 mm)	.177	<b>.950</b> (8x)	1/8	2-1/2	62105	129.20
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.125 (1/8)	.187	<b>.375</b> (3x)	1/8	1-1/2	64008	126.30
.125 (1/8)	.187	<b>.625</b> (5x)	1/8	2-1/2	61108	140.80
.125 (1/8)	.187	<b>.750</b> (6x)	1/8	2-1/2	795208	140.80
.125 (1/8)	.187	<b>.875</b> (7x)	1/8	2-1/2	795008	140.80
.125 (1/8)	.187	<b>1.000</b> (8x)	1/8	2-1/2	62108	140.80
.125 (1/8)	.187	<b>1.250</b> (10x)	1/8	2-1/2	939608	144.90
.125 (1/8)	.187	<b>1.500</b> (12x)	1/8	3	65308	144.90
.125 (1/8)	.187	<b>1.875</b> (15x)	1/8	3	944108	152.50
.125 (1/8)	.187	<b>2.250</b> (18x)	1/8	4	841908	161.60
.140 (9/64)	.220	<b>1.125</b> (8x)	3/16	3	62109	181.80
.156 (5/32)	.235	<b>.750</b> (5x)	3/16	3	61110	181.80
.156 (5/32)	.235	<b>1.250</b> (8x)	3/16	3	62110	181.80
.187 (3/16)	.285	<b>1.000</b> (5x)	3/16	3	61112	181.80
.187 (3/16)	.285	<b>1.500</b> (8x)	3/16	3	62112	181.80
.187 (3/16)	.285	<b>2.250</b> (12x)	3/16	4	65312	191.40
.250 (1/4)	.375	<b>1.250</b> (5x)	1/4	4	61116	201.90
.250 (1/4)	.375	<b>2.000</b> (8x)	1/4	4	62116	201.90
.250 (1/4)	.375	<b>3.000</b> (12x)	1/4	6	65316	210.80
.312 (5/16)	.470	<b>2.500</b> (8x)	5/16	4	62120	220.10
.375 (3/8)	.570	<b>1.250</b> (3x)	3/8	2-1/2	64024	253.70
.500 (1/2)	.750	<b>1.500</b> (3x)	1/2	3	64032	376.90

DIAMOND TOOLING



# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Ball – Long Reach, Long Flute



◀ Outstanding in Graphite!

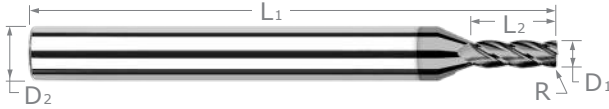
- True crystalline CVD diamond on solid carbide substrate
- Ideal for machining graphite and composites, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- Reduced neck for clearance and maximum rigidity
- h6 shank tolerance for high precision tool holders
- 4 flutes
- Center cutting
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 μm)	
D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	L <sub>3</sub> $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.015 (1/64)	<b>.078</b>	<b>.156</b> (10x)	1/8	2-1/2	36515	168.70
.020	<b>.100</b>	<b>.200</b> (10x)	1/8	2-1/2	36520	168.70
.025	<b>.125</b>	<b>.250</b> (10x)	1/8	2-1/2	36525	168.70
.031 (1/32)	<b>.156</b>	<b>.250</b> (8x)	1/8	2-1/2	745831	165.10
.031 (1/32)	<b>.156</b>	<b>.312</b> (10x)	1/8	2-1/2	36531	168.70
.047 (3/64)	<b>.250</b>	<b>.480</b> (10x)	1/8	2-1/2	36547	168.70
.062 (1/16)	<b>.312</b>	<b>.500</b> (8x)	1/8	2-1/2	745862	147.80
.062 (1/16)	<b>.312</b>	<b>.625</b> (10x)	1/8	2-1/2	36562	151.40
.078 (5/64)	<b>.406</b>	<b>.800</b> (10x)	1/8	2-1/2	36578	151.40
.093 (3/32)	<b>.500</b>	<b>.750</b> (8x)	1/8	2-1/2	745893	147.80
.093 (3/32)	<b>.500</b>	<b>.950</b> (10x)	1/8	2-1/2	36593	151.40
D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	L <sub>3</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.125 (1/8)	<b>.625</b>	<b>1.000</b> (8x)	1/8	2-1/2	745908	157.30
.125 (1/8)	<b>.625</b>	<b>1.250</b> (10x)	1/8	2-1/2	36608	161.10
.187 (3/16)	<b>1.000</b>	<b>1.875</b> (10x)	3/16	3	36612	212.80
.250 (1/4)	<b>1.250</b>	<b>2.500</b> (10x)	1/4	4	36616	236.20

DIAMOND TOOLING

# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Corner Radius



◀ Outstanding in Graphite!

- True crystalline CVD diamond on solid carbide substrate
- Ideal for machining graphite and composites, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- Corner radius for improved strength
- 4 flutes
- h6 shank tolerance for high precision tool holders
- Center cutting
- CNC ground in the USA

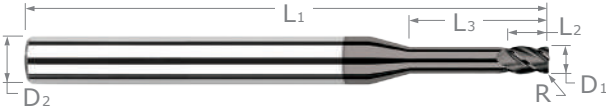
DIAMOND TOOLING

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 μm)	
					4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.015 (1/64)	<b>.003</b>	<b>.045</b> (3x)	1/8	1-1/2	942015	100.00
.020	<b>.005</b>	<b>.060</b> (3x)	1/8	1-1/2	955420	101.00
.031 (1/32)	<b>.005</b>	<b>.047</b> (1.5x)	1/8	1-1/2	746831	101.00
.031 (1/32)	<b>.005</b>	<b>.093</b> (3x)	1/8	1-1/2	955431	100.00
.031 (1/32)	<b>.005</b>	<b>.156</b> (5x)	1/8	2-1/2	819331	111.90
.031 (1/32)	<b>.010</b>	<b>.093</b> (3x)	1/8	1-1/2	977131	101.00
.047 (3/64)	<b>.005</b>	<b>.141</b> (3x)	1/8	1-1/2	955447	100.00
.062 (1/16)	<b>.005</b>	<b>.186</b> (3x)	1/8	1-1/2	955462	96.80
.062 (1/16)	<b>.010</b>	<b>.093</b> (1.5x)	1/8	1-1/2	745062	97.70
.062 (1/16)	<b>.010</b>	<b>.186</b> (3x)	1/8	1-1/2	977162	96.80
.062 (1/16)	<b>.010</b>	<b>.312</b> (5x)	1/8	2-1/2	820462	109.00
.062 (1/16)	<b>.020</b>	<b>.186</b> (3x)	1/8	1-1/2	768262	97.70
.078 (5/64)	<b>.010</b>	<b>.234</b> (3x)	1/8	1-1/2	977178	97.70
.093 (3/32)	<b>.005</b>	<b>.140</b> (1.5x)	1/8	1-1/2	746893	97.70
.093 (3/32)	<b>.005</b>	<b>.279</b> (3x)	1/8	1-1/2	955493	96.80
.093 (3/32)	<b>.010</b>	<b>.279</b> (3x)	1/8	1-1/2	977193	96.80
.093 (3/32)	<b>.015</b>	<b>.279</b> (3x)	1/8	1-1/2	938593	96.80
.093 (3/32)	<b>.030</b>	<b>.279</b> (3x)	1/8	1-1/2	906293	97.70

$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$	4 FL	PRICE
.125 (1/8)	<b>.005</b>	<b>.375</b> (3x)	1/8	1-1/2	955508	98.30
.125 (1/8)	<b>.010</b>	<b>.375</b> (3x)	1/8	1-1/2	977208	98.30
.125 (1/8)	<b>.015</b>	<b>.187</b> (1.5x)	1/8	1-1/2	748408	99.30
.125 (1/8)	<b>.015</b>	<b>.375</b> (3x)	1/8	1-1/2	938608	98.30
.125 (1/8)	<b>.015</b>	<b>.625</b> (5x)	1/8	2-1/2	855208	109.70
.125 (1/8)	<b>.030</b>	<b>.375</b> (3x)	1/8	1-1/2	906308	98.30
.156 (5/32)	<b>.015</b>	<b>.470</b> (3x)	3/16	2	938610	123.10
.187 (3/16)	<b>.015</b>	<b>.570</b> (3x)	3/16	2	938612	122.00
.187 (3/16)	<b>.030</b>	<b>.570</b> (3x)	3/16	2	906312	122.00
.250 (1/4)	<b>.010</b>	<b>.750</b> (3x)	1/4	2-1/2	977216	161.30
.250 (1/4)	<b>.030</b>	<b>.375</b> (1.5x)	1/4	2-1/2	747716	162.90
.250 (1/4)	<b>.030</b>	<b>.750</b> (3x)	1/4	2-1/2	906316	161.30
.250 (1/4)	<b>.030</b>	<b>1.250</b> (5x)	1/4	4	862116	174.60
.375 (3/8)	<b>.030</b>	<b>1.125</b> (3x)	3/8	2-1/2	906324	192.00

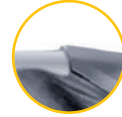
# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Corner Radius – Long Reach, Stub Flute



◀ Outstanding in Graphite!

- True crystalline CVD diamond on solid carbide substrate
- Ideal for machining graphite and composites, green carbide, and green ceramics
- Maximum abrasion resistance increases tool life
- Reduced neck for clearance and maximum rigidity
- Corner radius for improved strength
- 4 flutes
- h6 shank tolerance for high precision tool holders
- Center cutting • CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 μm)	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.0000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.0000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.015 (1/64)	.003	.023	.078 (5x)	1/8	2-1/2	61615	143.90
.015 (1/64)	.003	.023	.125 (8x)	1/8	2-1/2	61915	143.90
.015 (1/64)	.003	.023	.187 (12x)	1/8	2-1/2	62215	147.60
.020	.005	.030	.100 (5x)	1/8	2-1/2	62920	143.90
.020	.005	.030	.160 (8x)	1/8	2-1/2	63220	143.90
.020	.005	.030	.250 (12x)	1/8	2-1/2	64120	147.60
.025	.005	.038	.125 (5x)	1/8	2-1/2	62925	143.90
.025	.005	.038	.203 (8x)	1/8	2-1/2	63225	143.90
.025	.005	.038	.312 (12x)	1/8	2-1/2	64125	147.60
.031 (1/32)	.005	.047	.156 (5x)	1/8	2-1/2	62931	143.90
.031 (1/32)	.005	.047	.250 (8x)	1/8	2-1/2	63231	143.90
.031 (1/32)	.005	.047	.375 (12x)	1/8	2-1/2	64131	147.60
.039 (1 mm)	.005	.059	.203 (5x)	1/8	2-1/2	62939	143.90
.039 (1 mm)	.005	.059	.325 (8x)	1/8	2-1/2	63239	143.90
.047 (3/64)	.005	.071	.250 (5x)	1/8	2-1/2	62947	143.90
.047 (3/64)	.005	.071	.375 (8x)	1/8	2-1/2	63247	143.90
.047 (3/64)	.005	.071	.570 (12x)	1/8	2-1/2	64147	147.60
.062 (1/16)	.005	.093	.312 (5x)	1/8	2-1/2	62962	129.20
.062 (1/16)	.005	.093	.500 (8x)	1/8	2-1/2	63262	129.20
.062 (1/16)	.010	.093	.312 (5x)	1/8	2-1/2	65062	129.20
.062 (1/16)	.010	.093	.500 (8x)	1/8	2-1/2	66562	129.20
.062 (1/16)	.010	.093	.750 (12x)	1/8	2-1/2	65962	133.00
.078 (5/64)	.010	.117	.406 (5x)	1/8	2-1/2	65078	129.20
.078 (5/64)	.010	.117	.625 (8x)	1/8	2-1/2	66578	129.20
.078 (5/64)	.010	.117	.940 (12x)	1/8	2-1/2	65978	133.00
.093 (3/32)	.010	.140	.500 (5x)	1/8	2-1/2	65093	129.20
.093 (3/32)	.010	.140	.750 (8x)	1/8	2-1/2	66593	129.20
.093 (3/32)	.010	.140	1.125 (12x)	1/8	2-1/2	65993	133.00
.118 (3 mm)	.010	.177	.625 (5x)	1/8	2-1/2	916305	129.20
.118 (3 mm)	.010	.177	.950 (8x)	1/8	2-1/2	914705	129.20

continued on next page

DIAMOND TOOLING

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### CVD Diamond – Corner Radius – Long Reach, Stub Flute (cont.)

continued from previous page

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND (9 µm)	
						4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>		
.125 (1/8)	<b>.010</b>	.187	<b>.625</b> (5x)	1/8	2-1/2	916308	140.80
.125 (1/8)	<b>.010</b>	.187	<b>1.000</b> (8x)	1/8	2-1/2	914708	140.80
.125 (1/8)	<b>.015</b>	.187	<b>.625</b> (5x)	1/8	2-1/2	66208	140.80
.125 (1/8)	<b>.015</b>	.187	<b>1.000</b> (8x)	1/8	2-1/2	64708	140.80
.125 (1/8)	<b>.015</b>	.187	<b>1.500</b> (12x)	1/8	3	66408	144.90
.187 (3/16)	<b>.030</b>	.285	<b>1.000</b> (5x)	3/16	3	63312	181.80
.187 (3/16)	<b>.030</b>	.285	<b>1.500</b> (8x)	3/16	3	65612	181.80
.250 (1/4)	<b>.030</b>	.375	<b>1.250</b> (5x)	1/4	4	63316	201.90
.250 (1/4)	<b>.030</b>	.375	<b>2.000</b> (8x)	1/4	4	65616	201.90

DIAMOND TOOLING

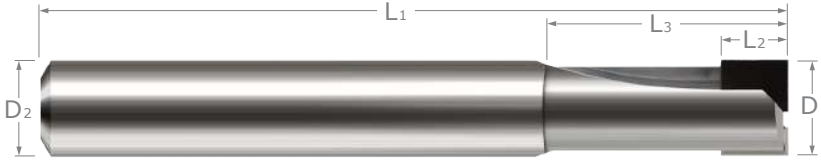


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# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## PCD Diamond – Square



- PCD diamond brazed on solid carbide body allows for significant tool life improvement over carbide
- Recommended work piece material: aluminum, copper, brass, bronze, plastics, graphite, carbon, carbon fiber materials, green carbide, gold, silver, magnesium, zinc, green ceramics
- Center cutting for 1 and 2 flutes
- End cutting (not center cutting) for 4 flutes

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	PCD DIAMOND	
						TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>		
3/32	3/16	<b>3/8</b>	1	1/8	1-1/2	12106	267.10
3 mm	1/4	<b>1/2</b>	1	1/8	1-1/2	1213M	267.10
1/8	1/8	<b>5/16</b>	1	1/8	1-1/2	760008	242.70
1/8	1/4	<b>1/2</b>	1	1/8	1-1/2	12108	267.10
5/32	1/4	<b>1/2</b>	1	3/16	2	12110	298.40
3/16	1/4	<b>5/8</b>	2	3/16	2	12112	298.40
1/4	1/4	<b>3/4</b>	2	1/4	2-1/2	12116	324.00
<b>NEW</b> 1/4	1/2	<b>1</b>	2	1/4	2-1/2	<b>739216</b>	393.80
1/4	1/2	<b>1</b>	4	1/4	2-1/2	914116	521.70
5/16	1/4	<b>13/16</b>	2	5/16	2-1/2	12120	354.50
5/16	1/2	<b>1-1/16</b>	4	5/16	2-1/2	914120	576.60
3/8	1/4	<b>15/16</b>	2	3/8	2-1/2	12124	380.20
3/8	3/4	<b>1-7/16</b>	4	3/8	3	914124	659.40
1/2	1/4	<b>1</b>	2	1/2	3	12132	484.70
<b>NEW</b> 1/2	1	<b>1-3/4</b>	2	1/2	3	<b>739232</b>	594.10
1/2	1	<b>1-3/4</b>	4	1/2	3	914132	777.70
5/8	3/8	<b>1</b>	2	5/8	3-1/2	12140	598.60
5/8	1	<b>1-3/4</b>	4	5/8	3-1/2	914140	911.30
3/4	3/8	<b>1-1/8</b>	2	3/4	4	12148	729.10
3/4	1-1/4	<b>2</b>	4	3/4	4	914148	1065.10

\* End cutting (not center cutting) for 4 flutes

**Single Flute** designed for smaller diameters



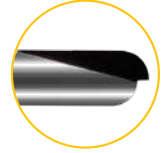
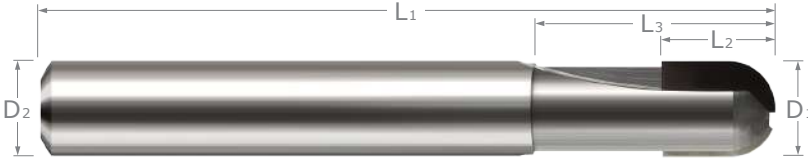
**4 Flute** ideal for finishing operations



For PCD High Performance Drills, see page 451.

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### PCD Diamond – Ball



Also Stocked in Single Flute Style

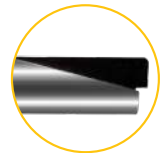
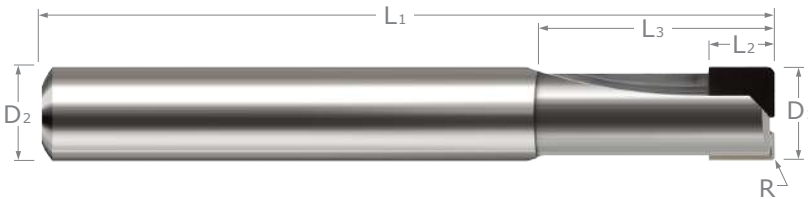
- PCD diamond brazed on solid carbide body allows for significant tool life improvement over carbide.
- Recommended work piece material: aluminum, copper, brass, bronze, plastics, graphite, carbon, carbon fiber materials, green carbide, gold, silver, magnesium, zinc, green ceramics
- Center cutting

DIAMOND TOOLING

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	PCD DIAMOND	
						TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$		
3/32	3/16	<b>3/8</b>	1	1/8	1-1/2	12006	324.00
1/8	1/4	<b>1/2</b>	1	1/8	1-1/2	12008	324.00
3/16	1/4	<b>5/8</b>	2	3/16	2	12012	346.90
1/4	5/16	<b>3/4</b>	2	1/4	2-1/2	12016	364.00
3/8	7/16	<b>15/16</b>	2	3/8	2-1/2	12024	449.70
1/2	1/2	<b>1</b>	2	1/2	3	12032	521.50
5/8	1/2	<b>1</b>	2	5/8	3-1/2	12040	635.00
3/4	5/8	<b>1-1/8</b>	2	3/4	4	12048	765.30

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### PCD Diamond – Corner Radius



Also Stocked in Single Flute Style

- PCD diamond brazed on solid carbide body allows for significant tool life improvement over carbide.
- Recommended work piece material: aluminum, copper, brass, bronze, plastics, graphite, carbon, carbon fiber materials, green carbide, gold, silver, magnesium, zinc, green ceramics
- Center cutting

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	CORNER RADIUS	FLUTES	SHANK DIAMETER	OVERALL LENGTH	PCD DIAMOND	
							TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$		$D_2$	$L_1$		
3/32	3/16	<b>3/8</b>	<b>.010</b>	1	1/8	1-1/2	12206	324.00
1/8	1/4	<b>1/2</b>	<b>.015</b>	1	1/8	1-1/2	12208	324.00
3/16	1/4	<b>5/8</b>	<b>.015</b>	2	3/16	2	12212	346.90
1/4	1/4	<b>3/4</b>	<b>.010</b>	2	1/4	2-1/2	858916	364.00
1/4	1/4	<b>3/4</b>	<b>.030</b>	2	1/4	2-1/2	12216	364.00
1/4	1/4	<b>3/4</b>	<b>.060</b>	2	1/4	2-1/2	847316	364.00
3/8	1/4	<b>15/16</b>	<b>.030</b>	2	3/8	2-1/2	12224	449.70
1/2	1/4	<b>1</b>	<b>.030</b>	2	1/2	3	12232	521.50

For PCD High Performance Drills, see page 451.

## END MILLS FOR PLASTICS

### Rougher – Square Upcut – 3 Flute (Slow Helix)



- Optimized for roughing applications in plastics
- Engineered with irregular edge geometry for chip control and minimized cutting forces
- 3 flute design strengthens rigidity of tool
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				3 FL	PRICE	3 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$				
1/16	<b>.186</b> (3x)	1/8	1-1/2	798662	33.30	798662-C4	46.40
1/16	<b>5/16</b> (5x)	1/8	2	770662	39.10	770662-C4	58.40
3/32	<b>.279</b> (3x)	1/8	1-1/2	798693	33.30	798693-C4	46.40
3/32	<b>1/2</b> (5x)	1/8	2	770693	39.10	770693-C4	58.40
1/8	<b>3/8</b> (3x)	1/8	1-1/2	798708	33.30	798708-C4	46.40
1/8	<b>5/8</b> (5x)	1/8	2	770708	39.10	770708-C4	58.40
3/16	<b>.570</b> (3x)	3/16	2	798712	51.70	798712-C4	69.80
3/16	<b>1</b> (5x)	3/16	3	770712	54.00	770712-C4	72.10
1/4	<b>3/4</b> (3x)	1/4	2-1/2	798716	54.00	798716-C4	74.60
1/4	<b>1-1/4</b> (5x)	1/4	3	770716	61.10	770716-C4	81.70

PLASTICS

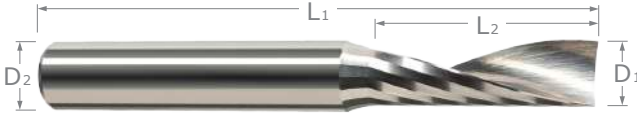


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# END MILLS FOR PLASTICS

## Square Upcut – Single Flute



2x the Material Removal with Improved Finish Over Standard End Mills!



Single Spiral Upcut Flute

- Design allows for maximum stock removal while maintaining excellent finish
- High rake, high relief design produces sharper edge for improved shearing action while transferring heat into the chip
- Large flute valley creates room for the chip and aids in chip evacuation
- Slower helix reduces lifting forces, making design preferable for fiber-reinforced applications and vacuum table setups
- Select sizes available with oversized, router-style shanks
- High flute finish resists chip welding
- Will ramp or plunge if required
- Right hand spiral, right hand cut
- Solid carbide
- CNC ground in the USA

PLASTICS

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	SOFT PLASTICS		HARD PLASTICS		HARD PLASTICS AMORPHOUS DIAMOND	
				1 FL	PRICE	1 FL	PRICE	1 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>						
.020	<b>.060</b> (3x)	1/8	1-1/2			51420	36.40		
1/32	<b>3/32</b> (3x)	1/8	1-1/2			51431	36.40	51431-C4	49.50
1/32	<b>5/32</b> (5x)	1/8	1-1/2			52431	44.70		
.039	<b>.117</b> (3x)	1/8	1-1/2			51439	35.20		
3/64	<b>9/64</b> (3x)	1/8	1-1/2			51447	32.50	51447-C4	45.60
3/64	<b>1/4</b> (5x)	1/8	1-1/2			52447	37.70		

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	SOFT PLASTICS		HARD PLASTICS		HARD PLASTICS AMORPHOUS DIAMOND	
				1 FL	PRICE	1 FL	PRICE	1 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>						
1/16	<b>3/16</b> (3x)	1/8	1-1/2	51162	26.60	51462	26.60	51462-C4	39.70
1/16	<b>1/4</b> (4x)	1/8	1-1/2	878262	26.60	897362	26.60		
1/16*	<b>1/4</b> (4x)	1/4*	2	14104-20	37.90	14204-20	37.90		
1/16	<b>5/16</b> (5x)	1/8	2	51862	31.40	52462	31.40	52462-C4	50.70
5/64	<b>15/64</b> (3x)	1/8	1-1/2	51178	27.10	51478	26.60	51478-C4	39.70
5/64*	<b>5/16</b> (4x)	1/4*	2	14105-20	38.60	14205-20	38.60		
5/64	<b>13/32</b> (5x)	1/8	2	51878	31.40	52478	32.00	52478-C4	51.30
3/32	<b>9/32</b> (3x)	1/8	1-1/2	51193	26.60	51493	26.60	51493-C4	39.70
3/32	<b>3/8</b> (4x)	1/8	1-1/2	878293	26.60	897393	26.60		
3/32*	<b>3/8</b> (4x)	1/4*	2	14106-20	37.90	14206-20	37.90		
3/32	<b>1/2</b> (5x)	1/8	2	51893	31.40	52493	31.40	52493-C4	50.70
.118	<b>.354</b> (3x)	1/4	2	<b>51205</b>	36.00	<b>51505</b>	36.00		NEW
1/8*	<b>1/4</b> (2x)	1/4*	2	14108-10	36.00	14208-10	36.00	892026-C4	51.40
1/8	<b>3/8</b> (3x)	1/8	1-1/2	51208	26.60	51508	26.60	51508-C4	39.70
1/8	<b>1/2</b> (4x)	1/8	2	878308	26.60	897408	26.60		
1/8*	<b>1/2</b> (4x)	1/4*	2	14108-20	36.00	14208-20	36.00	892028-C4	51.40
1/8	<b>5/8</b> (5x)	1/8	2	51908	31.40	52508	31.40	52508-C4	45.60
9/64	<b>.425</b> (3x)	1/4	2	<b>51209</b>	36.00	<b>51509</b>	36.00		NEW
5/32*	<b>5/8</b> (4x)	1/4*	2	14110-20	36.00	14210-20	36.00		
5/32	<b>3/4</b> (5x)	3/16	3	<b>51910</b>	42.00	52510	42.00		NEW
3/16*	<b>3/8</b> (2x)	1/4*	2	14112-10	36.00	14212-10	36.00		
3/16	<b>9/16</b> (3x)	3/16	2	51212	34.10	51512	34.10	51512-C4	52.20

\*Cutter diameter tolerance is +.000"/-.004". Tools are ground on oversized, router-style shank.

continued on next page

PLEASE SEE SPEEDS & FEEDS ON PAGE 235



## END MILLS FOR PLASTICS

### Square Upcut – Single Flute (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	SOFT PLASTICS		HARD PLASTICS		HARD PLASTICS AMORPHOUS DIAMOND	
				1 FL	PRICE	1 FL	PRICE	1 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	1 FL	PRICE	1 FL	PRICE	1 FL	PRICE
3/16*	<b>5/8</b> (3x)	1/4*	2	14112-20	36.00	14212-20	36.00	892012-C4	56.60
3/16	<b>1</b> (5x)	3/16	3	51912	42.00	52512	42.00	52512-C4	60.10
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	883116	36.00	883816	36.00		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	51216	36.00	51516	36.00	51516-C4	56.60
1/4	<b>1</b> (4x)	1/4	3	878316	46.60	897416	46.60		
1/4	<b>1-1/4</b> (5x)	1/4	3	51916	46.60	52516	46.60	52516-C4	67.20
3/8	<b>9/16</b> (1.5x)	3/8	2-1/2	883124	73.30	883824	73.30		
3/8	<b>1-1/8</b> (3x)	3/8	2-1/2	51224	73.30	51524	73.30	51524-C4	98.10
3/8	<b>1-1/2</b> (4x)	3/8	4	878324	82.80	897424	82.80		
3/8	<b>2</b> (5x)	3/8	4	51924	81.30	52524	81.30		
1/2	<b>3/4</b> (1.5x)	1/2	3	883132	124.90	883832	124.90		
1/2	<b>1-1/2</b> (3x)	1/2	3	51232	124.90	51532	124.90	51532-C4	154.80
1/2	<b>2-5/8</b> (5x)	1/2	5	51932	206.30	52532	206.30		

\*Cutter diameter tolerance is +.000"/-.004". Tools are ground on oversized, router-style shank.

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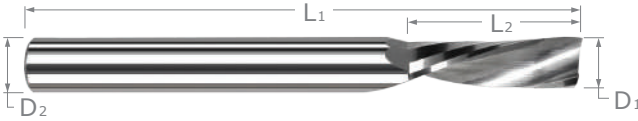


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## END MILLS FOR PLASTICS

### Square Downcut – Single Flute



Prevents Fraying, Chip-Out, and Lifting

- Prevents fraying and chip-out of top edge of work piece
- Prevents lifting on vacuum tables
- Left hand spiral, right hand cut
- High rake, high relief design produces sharper edge for improved shearing action while transferring heat into the chip
- Resists chip welding • Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	SOFT PLASTICS		HARD PLASTICS		HARD PLASTICS AMORPHOUS DIAMOND	
				1 FL	PRICE	1 FL	PRICE	1 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>						
1/32	<b>3/32</b> (3x)	1/8	1-1/2			929731	39.40		
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	1 FL	PRICE	1 FL	PRICE	1 FL	PRICE
1/16	<b>3/16</b> (3x)	1/8	1-1/2			929762	39.40		
1/16	<b>1/4</b> (4x)	1/4	2	855862	42.20	44862	41.40		
1/16	<b>5/16</b> (5x)	1/8	2			935362	40.40		
5/64	<b>5/16</b> (4x)	1/4	2			44878	41.40		
3/32	<b>9/32</b> (3x)	1/8	1/2			929793	42.20		
3/32	<b>3/8</b> (4x)	1/4	2	855893	42.20	44893	41.40	44893-C4	62.00
3/32	<b>1/2</b> (5x)	1/8	2			935393	42.20		
1/8	<b>3/8</b> (3x)	1/8	1-1/2			929808	37.70		
1/8	<b>1/2</b> (4x)	1/4	2	855908	39.60	44908	39.60	44908-C4	60.20
1/8	<b>5/8</b> (5x)	1/8	2			935408	38.80		
5/32	<b>5/8</b> (4x)	1/4	2			44910	39.60		
3/16	<b>9/16</b> (3x)	3/16	2			929812	37.70		
3/16	<b>5/8</b> (3x)	1/4	2			44912	39.60	44912-C4	60.20
3/16	<b>3/4</b> (4x)	1/4	2	855912	39.60				
3/16	<b>1</b> (5x)	3/16	3			935412	39.60		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	855916	39.60	44916	39.60	44916-C4	60.20
1/4	<b>1-1/4</b> (5x)	1/4	3			935416	72.60		
3/8	<b>1-1/8</b> (3x)	3/8	3			44924	68.00		
3/8	<b>1-1/8</b> (4x)	3/8	4	855924	81.10				
3/8	<b>2</b> (5x)	3/8	4			935424	118.70		
1/2	<b>1-1/2</b> (3x)	1/2	4			44932	159.90		
1/2	<b>2-5/8</b> (5x)	1/2	5			935432	250.30		

PLEASE SEE SPEEDS & FEEDS ON PAGE 235



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# END MILLS FOR PLASTICS

## Ball Upcut - Single Flute



- Design allows for maximum stock removal while maintaining excellent finish
- High rake, high relief design produces sharper edge for improved shearing action while transferring heat into the chip
- Large flute valley creates room for the chip and aids in chip evacuation
- Slower helix reduces lifting forces, making design preferable for fiber-reinforced applications and vacuum table setups
- High flute finish resists chip welding
- Will ramp or plunge if required
- Right hand spiral, right hand cut
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
				1 FL	PRICE
D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>	D2	L1		
1/16	<b>.186</b> (3x)	1/8	1-1/2	869562	31.40
1/16	<b>5/16</b> (5x)	1/8	2	842262	38.30
3/32	<b>.279</b> (3x)	1/8	1-1/2	869593	31.40
3/32	<b>1/2</b> (5x)	1/8	2	842293	38.30
1/8	<b>3/8</b> (3x)	1/8	1-1/2	869608	31.40
1/8	<b>5/8</b> (5x)	1/8	2	842308	38.30
3/16	<b>.570</b> (3x)	3/16	2	869612	40.40
1/4	<b>3/4</b> (3x)	1/4	2-1/2	869616	44.30
3/8	<b>1-1/8</b> (3x)	3/8	2-1/2	869624	83.90

PLASTICS

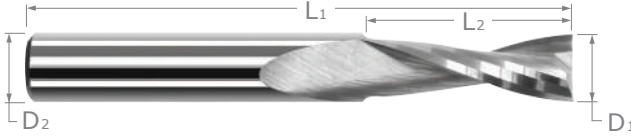
### SPEEDS & FEEDS (Single Flute Plastic Cutting End Mills)

**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 1.5x, increase to 115%). For longer lengths of cut, table values of IPT must be reduced (for 4x, reduce 95%, for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Material Type	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter														Depth of Cut	
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	Radial	Axial
Unfilled	800-1200	Slot - Rough	.0006	.0013	.0020	.0027	.0033	.0040	.0054	.0080	.0107	.0114	.0137	.0182	.0228	.0273	1 x Dia	1 x Dia
		Profile	.0007	.0015	.0023	.0031	.0038	.0046	.0062	.0092	.0123	.0131	.0157	.0210	.0262	.0315	.35 x Dia	1 x Dia
Filled Plastics	600-800	Slot - Rough	.0006	.0013	.0020	.0027	.0033	.0040	.0054	.0080	.0107	.0114	.0137	.0182	.0228	.0273	1 x Dia	1 x Dia
		Profile	.0007	.0015	.0023	.0031	.0038	.0046	.0062	.0092	.0123	.0131	.0157	.0210	.0262	.0315	.35 x Dia	1 x Dia
Filled Plastics	500-700	Slot - Rough	.0005	.0011	.0016	.0022	.0027	.0033	.0044	.0066	.0088	.0093	.0112	.0149	.0186	.0224	1 x Dia	1 x Dia
		Profile	.0006	.0013	.0019	.0025	.0031	.0038	.0050	.0075	.0101	.0107	.0129	.0172	.0214	.0257	.35 x Dia	1 x Dia
Fiber Reinforced	500-700	Slot - Rough	.0006	.0013	.0020	.0027	.0033	.0040	.0054	.0080	.0107	.0114	.0137	.0182	.0228	.0273	1 x Dia	1 x Dia
		Profile	.0007	.0015	.0023	.0031	.0038	.0046	.0062	.0092	.0123	.0131	.0157	.0210	.0262	.0315	.35 x Dia	1 x Dia
Fiber Reinforced	300-400	Slot - Rough	.0005	.0011	.0016	.0022	.0027	.0033	.0044	.0066	.0088	.0093	.0112	.0149	.0186	.0224	1 x Dia	1 x Dia
		Profile	.0006	.0013	.0019	.0025	.0031	.0038	.0050	.0075	.0101	.0107	.0129	.0172	.0214	.0257	.35 x Dia	1 x Dia

# END MILLS FOR PLASTICS

## Square Upcut – 2 Flute (Slow Helix)



2 Flute Design Improves Bottom Finish and Accuracy

- High rake, high relief design with large flute valley maximizes chip removal and performance
- 2 flute design improves rigidity for better accuracy, less deflection, and longer tool life
- Slower helix reduces lifting forces, making design preferable for fiber-reinforced applications and vacuum table setups
- Center cutting design improves plunging and ramping
- Solid carbide
- CNC ground in the USA

PLASTICS

CUTTER DIAMETER		LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
D <sub>1</sub> <sup>+0.000"</sup> <sub>-.001"</sub>	decimal equivalent	L <sub>2</sub> <sup>+0.010"</sup> <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.008	.0080	<b>.024</b> (3x)	1/8	1-1/2	48608	65.00		
.008	.0080	<b>.040</b> (5x)	1/8	1-1/2	49808	66.80		
.010	.0010	<b>.030</b> (3x)	1/8	1-1/2	48610	61.90		
.010	.0010	<b>.050</b> (5x)	1/8	1-1/2	49810	70.50		
1/64	.0156	<b>.023</b> (1.5x)	1/8	1-1/2	957615	53.00		
1/64	.0156	<b>3/64</b> (3x)	1/8	1-1/2	48615	53.00		
1/64	.0156	<b>5/64</b> (5x)	1/8	1-1/2	49815	62.70		
1/64	.0156	<b>1/8</b> (8x)	1/8	1-1/2	60215	69.10		
.020	.0200	<b>.030</b> (1.5x)	1/8	1-1/2	957620	40.40		
.020	.0200	<b>.060</b> (3x)	1/8	1-1/2	48620	40.40	48620-C4	53.50
.020	.0200	<b>.100</b> (5x)	1/8	1-1/2	49820	49.10		
.020	.0200	<b>.160</b> (8x)	1/8	1-1/2	60220	57.80		
.020	.0200	<b>.200</b> (10x)	1/8	1-1/2	938920	57.80		
.025	.0250	<b>.038</b> (1.5x)	1/8	1-1/2	957625	41.20		
.025	.0250	<b>.075</b> (3x)	1/8	1-1/2	48625	40.40		
.025	.0250	<b>1/8</b> (5x)	1/8	1-1/2	49825	48.90	49825-C4	62.00
.025	.0250	<b>13/64</b> (8x)	1/8	1-1/2	60225	56.70		
.030	.0300	<b>.090</b> (3x)	1/8	1-1/2	48630	40.40		
.030	.0300	<b>.156</b> (5x)	1/8	1-1/2	49830	50.10		
1/32	.0312	<b>3/64</b> (1.5x)	1/8	1-1/2	957631	40.10		
1/32	.0312	<b>3/32</b> (3x)	1/8	1-1/2	48631	40.10	48631-C4	53.20
1/32	.0312	<b>3/32</b> (3x)	1/4	2	878731	49.70		
1/32	.0312	<b>5/32</b> (5x)	1/8	1-1/2	49831	48.90	49831-C4	62.00
1/32	.0312	<b>1/4</b> (8x)	1/8	1-1/2	60231	56.00	60231-C4	69.10
1/32	.0312	<b>5/16</b> (10x)	1/8	1-1/2	938931	56.00		
.035	.0350	<b>.105</b> (3x)	1/8	1-1/2	48635	40.40		
.039 (1 mm)	.0394	<b>.118</b> (3x)	1/8	1-1/2	48639	40.60		
.039 (1 mm)	.0394	<b>13/64</b> (5x)	1/8	1-1/2	49839	40.60		
.040	.0400	<b>.060</b> (1.5x)	1/8	1-1/2	957640	41.20		
.040	.0400	<b>.120</b> (3x)	1/8	1-1/2	48640	40.40		
.040	.0400	<b>13/64</b> (5x)	1/8	1-1/2	49840	49.10		
.040	.0400	<b>.325</b> (8x)	1/8	2	60240	56.70		
.045	.0450	<b>.135</b> (3x)	1/8	1-1/2	48645	40.40		
3/64	.0469	<b>.071</b> (1.5x)	1/8	1-1/2	957647	34.00		
3/64	.0469	<b>9/64</b> (3x)	1/8	1-1/2	48647	34.00	48647-C4	47.10
3/64	.0469	<b>1/4</b> (5x)	1/8	1-1/2	49847	39.50	49847-C4	52.60
3/64	.0469	<b>3/8</b> (8x)	1/8	2	60247	47.40		
.050	.0500	<b>.150</b> (3x)	1/8	1-1/2	48650	34.30		
.050	.0500	<b>.250</b> (5x)	1/8	1-1/2	49850	39.80		
.055	.0550	<b>.165</b> (3x)	1/8	1-1/2	48655	34.90		
.060	.0600	<b>.180</b> (3x)	1/8	1-1/2	48660	34.30		
.060	.0600	<b>5/16</b> (5x)	1/8	1-1/2	49860	39.80		

continued on next page

**END MILLS FOR PLASTICS**

**Square Upcut – 2 Flute (Slow Helix) (cont.)**

continued from previous page

NEW

PLASTICS

CUTTER DIAMETER			LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	
									+ .030" - .000"
1/16	.0625	<b>3/32</b> (1.5x)	1/8	1-1/2	957662	29.80			
1/16	.0625	<b>3/16</b> (3x)	1/8	1-1/2	48662	29.80	48662-C4	42.90	
1/16	.0625	<b>3/16</b> (3x)	1/4	2	878762	39.40			
1/16	.0625	<b>1/4</b> (4x)	1/8	2	874862	35.20			
1/16	.0625	<b>5/16</b> (5x)	1/8	2	49862	35.20	49862-C4	49.40	
1/16	.0625	<b>3/8</b> (6x)	1/8	2	745662	38.60			
1/16	.0625	<b>1/2</b> (8x)	1/8	2	60262	43.40	60262-C4	58.00	
1/16	.0625	<b>5/8</b> (10x)	1/8	2	938962	43.40	938962-C4	62.70	
5/64	.0781	<b>.117</b> (1.5x)	1/8	1-1/2	957678	29.80			
5/64	.0781	<b>15/64</b> (3x)	1/8	1-1/2	48678	29.80	48678-C4	42.90	
5/64	.0781	<b>13/32</b> (5x)	1/8	2	49878	35.20	49878-C4	49.40	
5/64	.0781	<b>5/8</b> (8x)	1/8	2	60278	43.40			
5/64	.0781	<b>.800</b> (10x)	1/8	2	938978	43.40			
3/32	.0937	<b>9/64</b> (1.5x)	1/8	1-1/2	957693	29.80	957693-C4	42.90	
3/32	.0937	<b>9/32</b> (3x)	1/8	1-1/2	48693	29.80	48693-C4	42.90	
3/32	.0937	<b>9/32</b> (3x)	1/4	2	878793	39.40			
3/32	.0937	<b>3/8</b> (4x)	1/8	2	874893	35.20			
3/32	.0937	<b>1/2</b> (5x)	1/8	2	49893	35.20	49893-C4	49.40	
3/32	.0937	<b>9/16</b> (6x)	1/8	2	745693	38.60			
3/32	.0937	<b>3/4</b> (8x)	1/8	2	60293	43.40	60293-C4	58.00	
3/32	.0937	<b>.950</b> (10x)	1/8	2	938993	43.40			
.100	.1000	<b>.150</b> (1.5x)	1/8	1-1/2	957700	29.90			
.100	.1000	<b>.300</b> (3x)	1/8	1-1/2	48700	30.50			
.100	.1000	<b>1/2</b> (5x)	1/8	2	49900	35.70			
.100	.1000	<b>.800</b> (8x)	1/8	2-1/2	60300	44.80			
7/64	.1090	<b>21/64</b> (3x)	1/8	1-1/2	48707	29.90			
.118 (3 mm)	.1181	<b>.177</b> (1.5x)	1/8	1-1/2	957706	30.50			
.118 (3 mm)	.1181	<b>.354</b> (3x)	1/8	1-1/2	48706	29.90			
.118 (3 mm)	.1181	<b>.625</b> (5x)	1/8	2	49906	36.40			
.118 (3 mm)	.1181	<b>.950</b> (8x)	1/8	2-1/2	60306	44.80			
1/8	.1250	<b>.100</b> (0.8x)	1/8	1-1/2	793208	30.40			
1/8	.1250	<b>3/16</b> (1.5x)	1/8	1-1/2	957708	29.80	957708-C4	42.90	
1/8	.1250	<b>3/8</b> (3x)	1/8	1-1/2	48708	29.80	48708-C4	42.90	
1/8	.1250	<b>3/8</b> (3x)	1/4	2	878808	39.40			
1/8	.1250	<b>1/2</b> (4x)	1/8	2	874908	35.20			
1/8	.1250	<b>5/8</b> (5x)	1/8	2	49908	35.20	49908-C4	49.40	
1/8	.1250	<b>3/4</b> (6x)	1/8	2-1/2	745708	38.60			
1/8	.1250	<b>1</b> (8x)	1/8	2-1/2	60308	43.40	60308-C4	56.50	
1/8	.1250	<b>1-1/4</b> (10x)	1/8	2-1/2	939008	43.40	939008-C4	56.50	
9/64	.1406	<b>27/64</b> (3x)	3/16	2	48709	39.50			
9/64	.1406	<b>3/4</b> (5x)	3/16	3	49909	39.40			
5/32	.1562	<b>15/64</b> (1.5x)	3/16	2	957710	39.40			
5/32	.1562	<b>15/32</b> (3x)	3/16	2	48710	39.40	48710-C4	57.50	
5/32	.1562	<b>3/4</b> (5x)	3/16	3	49910	48.50	49910-C4	66.60	
5/32	.1562	<b>1-1/4</b> (8x)	3/16	3	60310	53.30			
3/16	.1875	<b>9/32</b> (1.5x)	3/16	2	957712	39.40	957712-C4	57.50	
3/16	.1875	<b>9/16</b> (3x)	3/16	2	48712	39.40	48712-C4	57.50	
3/16	.1875	<b>9/16</b> (3x)	1/4	2	878812	48.90			

continued on next page

# END MILLS FOR PLASTICS

## Square Upcut – 2 Flute (Slow Helix) (cont.)

continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
+ .000" - .002"	+ .00mm - .05mm		+ .030" - .000" + .75mm - .00mm						
3/16		.1875	<b>3/4</b> (4x)	3/16	3	874912	48.50		
3/16		.1875	<b>1</b> (5x)	3/16	3	49912	48.50	49912-C4	66.60
3/16		.1875	<b>1-1/2</b> (8x)	3/16	3	60312	53.30		
3/16		.1875	<b>1-7/8</b> (10x)	3/16	3	939012	53.30		
	6.0 mm	.2362	<b>18 mm</b> (3x)	6 mm	63 mm	886566	79.00		
1/4		.2500	<b>.200</b> (0.8x)	1/4	2-1/2	793216	48.50		
1/4		.2500	<b>3/8</b> (1.5x)	1/4	2-1/2	957716	48.50	957716-C4	69.10
1/4		.2500	<b>3/4</b> (3x)	1/4	2-1/2	48716	48.50	48716-C4	69.10
1/4		.2500	<b>1</b> (4x)	1/4	3	874916	55.60		
1/4		.2500	<b>1-1/4</b> (5x)	1/4	3	49916	55.60	49916-C4	76.20
1/4		.2500	<b>2</b> (8x)	1/4	4	60316	69.50	60316-C4	90.10
1/4		.2500	<b>2-1/2</b> (10x)	1/4	4	939016	69.50		
5/16		.3125	<b>15/32</b> (1.5x)	5/16	2-1/2	957720	72.20		
5/16		.3125	<b>1</b> (3x)	5/16	2-1/2	48720	72.20		
5/16		.3125	<b>1-5/8</b> (5x)	5/16	4	49920	93.30		
	8.0 mm	.3149	<b>24 mm</b> (3x)	8 mm	63 mm	886570	105.80		
3/8		.3750	<b>9/16</b> (1.5x)	3/8	3	957724	83.40	957724-C4	108.20
3/8		.3750	<b>1-1/8</b> (3x)	3/8	3	48724	83.40	48724-C4	108.20
3/8		.3750	<b>1-1/2</b> (4x)	3/8	4	874924	96.20		
3/8		.3750	<b>2</b> (5x)	3/8	4	49924	96.20		
3/8		.3750	<b>3</b> (8x)	3/8	6	60324	108.50		
	10.0 mm	.3937	<b>30 mm</b> (3x)	10 mm	75 mm	886573	94.80		
	12.0 mm	.4724	<b>36 mm</b> (3x)	12 mm	100 mm	886576	98.50		
1/2		.5000	<b>3/4</b> (1.5x)	1/2	4	957732	146.80	957732-C4	176.60
1/2		.5000	<b>1-1/2</b> (3x)	1/2	4	48732	146.80	48732-C4	176.60
1/2		.5000	<b>2</b> (4x)	1/2	4	874932	158.80		
1/2		.5000	<b>2-5/8</b> (5x)	1/2	5	49932	174.80	49932-C4	205.00
1/2		.5000	<b>4</b> (8x)	1/2	7	60332	201.20		
5/8		.6250	<b>15/16</b> (1.5x)	5/8	4	957740	216.30		
3/4		.7500	<b>1-1/8</b> (1.5x)	3/4	4	957748	276.30	957748-C4	358.50
3/4		.7500	<b>2-1/4</b> (3x)	3/4	4	48748	276.30		

PLASTICS

NEW

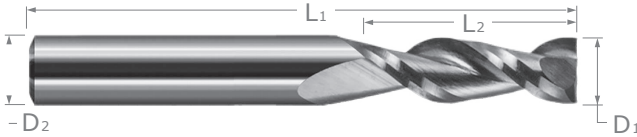
### SPEEDS & FEEDS (2 Flute Plastic Cutting End Mills - Slow Helix)

**Important Note:** Values are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cut, table values of IPT must be increased (for 0.8x, increase 120% for 1.5x, increase 115%). For longer lengths of cuts, table values of IPT must be reduced (for 4x, reduce to 95%; for 5x, reduce to 90%; for 6x, reduce to 80%; for 8x, reduce to 54%; for 10x, reduce to 40%).

Material Type	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter														Depth of Cut			
		.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	Radial	Axial		
Unfilled	Unfilled	800-1200	Slot - Rough	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0060	.0080	.0085	.0103	.0137	.0171	.0205	1 x Dia	1 x Dia
			Profile	.0006	.0011	.0017	.0023	.0029	.0034	.0046	.0069	.0093	.0098	.0118	.0157	.0197	.0236	.35 x Dia	1 x Dia
Filled Plastics	Carbon/Glass Filled 5% < 20%	600-800	Slot - Rough	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0060	.0080	.0085	.0103	.0137	.0171	.0205	1 x Dia	1 x Dia
			Profile	.0006	.0011	.0017	.0023	.0029	.0034	.0046	.0069	.0093	.0098	.0118	.0157	.0197	.0236	.35 x Dia	1 x Dia
Filled Plastics	Carbon/Glass Filled 21% < 40%	500-700	Slot - Rough	.0004	.0008	.0012	.0016	.0021	.0024	.0033	.0049	.0066	.0070	.0084	.0112	.0140	.0168	1 x Dia	1 x Dia
			Profile	.0005	.0009	.0014	.0019	.0024	.0028	.0038	.0057	.0076	.0080	.0096	.0129	.0161	.0193	.35 x Dia	1 x Dia
Fiber Reinforced	Carbon/Glass Fiber 5% < 20%	500-700	Slot - Rough	.0005	.0010	.0015	.0020	.0025	.0030	.0040	.0060	.0080	.0085	.0103	.0137	.0171	.0205	1 x Dia	1 x Dia
			Profile	.0006	.0011	.0017	.0023	.0029	.0034	.0046	.0069	.0093	.0098	.0118	.0157	.0197	.0236	.35 x Dia	1 x Dia
Fiber Reinforced	Carbon/Glass Fiber 21% < 40%	300-400	Slot - Rough	.0004	.0008	.0012	.0016	.0021	.0024	.0033	.0049	.0066	.0070	.0084	.0112	.0140	.0168	1 x Dia	1 x Dia
			Profile	.0005	.0009	.0014	.0019	.0024	.0028	.0038	.0057	.0076	.0080	.0096	.0129	.0161	.0193	.35 x Dia	1 x Dia

# END MILLS FOR PLASTICS

## Square Upcut – 2 Flute (High Helix)



2 Flute Design Improves Bottom Finish and Accuracy

- High rake, high relief design with large flute valley maximizes chip removal performance
- 2 flute design improves rigidity for better accuracy, less deflection, and longer tool life
- Higher helix (approx. 40°) for faster chip removal and better finish
- Center cutting design improves plunging and ramping
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>				
1/32	<b>3/32</b> (3x)	1/8	1-1/2	898131	52.10		
3/64	<b>9/64</b> (3x)	1/8	1-1/2	898147	38.00		

NEW	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
					2 FL	PRICE	2 FL	PRICE
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>				
	1/16	<b>3/32</b> (1.5x)	1/8	1-1/2	827662	38.30		
	1/16	<b>3/16</b> (3x)	1/8	1-1/2	898162	38.00	898162-C4	51.10
	1/16	<b>5/16</b> (5x)	1/8	2	866262	40.40		
	5/64	<b>15/64</b> (3x)	1/8	1-1/2	898178	38.30		
	3/32	<b>9/32</b> (3x)	1/8	1-1/2	898193	38.00		
NEW	1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	827708	38.30		
	1/8	<b>3/8</b> (3x)	1/8	1-1/2	898208	38.00	898208-C4	51.10
	1/8	<b>5/8</b> (5x)	1/8	2	866308	40.40		
NEW	5/32	<b>15/32</b> (3x)	3/16	2	898210	54.30		
	3/16	<b>9/16</b> (3x)	3/16	2	898212	52.20	898212-C4	70.30
	3/16	<b>1</b> (5x)	3/16	3	866312	55.90		
NEW	1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	827716	58.80		
	1/4	<b>3/4</b> (3x)	1/4	2-1/2	898216	58.80	898216-C4	79.40
	1/4	<b>1-1/4</b> (5x)	1/4	3	866316	62.70		
NEW	3/8	<b>9/16</b> (1.5x)	3/8	3	827724	89.90		
	3/8	<b>1-1/8</b> (3x)	3/8	3	898224	89.10	898224-C4	113.90
	3/8	<b>2</b> (5x)	3/8	4	866324	95.30		
NEW	1/2	<b>3/4</b> (1.5x)	1/2	4	827732	155.10		
	1/2	<b>1-1/2</b> (3x)	1/2	4	898232	153.70	898232-C4	183.50
	1/2	<b>2-5/8</b> (5x)	1/2	5	866332	165.80		

PLASTICS

### SPEEDS & FEEDS (2 Flute Plastic Cutting End Mills - High Helix)

**Important Note:** Values are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cut, table values of IPT must be increased (for 1.5x, increase 115%). For longer lengths of cuts, table values of IPT must be reduced (for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Material Type	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter															Depth of Cut		
		.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	Radial	Axial		
Unfilled	Unfilled	800-1200	Slot - Rough	.0006	.0013	.0020	.0027	.0033	.0040	.0054	.0080	.0107	.0114	.0137	.0182	.0228	.0273	1 x Dia	1 x Dia
			Profile	.0007	.0015	.0023	.0031	.0038	.0046	.0062	.0092	.0123	.0131	.0157	.0210	.0262	.0315	.35 x Dia	1 x Dia
Filled Plastics	Carbon/Glass Filled 5% < 20%	600-800	Slot - Rough	.0006	.0013	.0020	.0027	.0033	.0040	.0054	.0080	.0107	.0114	.0137	.0182	.0228	.0273	1 x Dia	1 x Dia
			Profile	.0007	.0015	.0023	.0031	.0038	.0046	.0062	.0092	.0123	.0131	.0157	.0210	.0262	.0315	.35 x Dia	1 x Dia
	Carbon/Glass Filled 21% < 40%	500-700	Slot - Rough	.0005	.0011	.0016	.0022	.0027	.0033	.0044	.0066	.0088	.0093	.0112	.0149	.0186	.0224	1 x Dia	1 x Dia
			Profile	.0006	.0013	.0019	.0025	.0031	.0038	.0050	.0075	.0101	.0107	.0129	.0172	.0214	.0257	.35 x Dia	1 x Dia
Fiber Reinforced	Carbon/Glass Fiber 5% < 20%	500-700	Slot - Rough	.0006	.0013	.0020	.0027	.0033	.0040	.0054	.0080	.0107	.0114	.0137	.0182	.0228	.0273	1 x Dia	1 x Dia
			Profile	.0007	.0015	.0023	.0031	.0038	.0046	.0062	.0092	.0123	.0131	.0157	.0210	.0262	.0315	.35 x Dia	1 x Dia
	Carbon/Glass Fiber 21% < 40%	300-400	Slot - Rough	.0005	.0011	.0016	.0022	.0027	.0033	.0044	.0066	.0088	.0093	.0112	.0149	.0186	.0224	1 x Dia	1 x Dia
			Profile	.0006	.0013	.0019	.0025	.0031	.0038	.0050	.0075	.0101	.0107	.0129	.0172	.0214	.0257	.35 x Dia	1 x Dia

# END MILLS FOR PLASTICS

## Square Downcut – 2 Flute (Slow Helix)



- Prevents fraying and chip-out on the top of the workpiece
- Prevents lifting on vacuum tables
- 2 left hand spiral, right hand cut flutes
- High rake, high relief design with large flute valley maximizes chip removal and performance
- 2 flute design improves rigidity for better accuracy, less deflection, and longer tool life
- Solid carbide • CNC ground in the USA

PLASTICS

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	2 FL	PRICE	2 FL	PRICE
.010	<b>.030</b> (3x)	1/8	1-1/2	998510	64.60		
1/64	<b>.023</b> (1.5x)	1/8	1-1/2	966215	59.00		
1/64	<b>3/64</b> (3x)	1/8	1-1/2	998515	59.00	998515-C4	72.10
1/64	<b>5/64</b> (5x)	1/8	1-1/2	999815	68.30		
.020	<b>.030</b> (1.5x)	1/8	1-1/2	966220	46.50		
.020	<b>.060</b> (3x)	1/8	1-1/2	998520	46.00	998520-C4	59.10
.025	<b>.075</b> (3x)	1/8	1-1/2	998525	46.00		
1/32	<b>3/64</b> (1.5x)	1/8	1-1/2	966231	46.00		
1/32	<b>3/32</b> (3x)	1/8	1-1/2	998531	46.00	998531-C4	59.10
1/32	<b>5/32</b> (5x)	1/8	1-1/2	999831	55.30		
.040	<b>.120</b> (3x)	1/8	1-1/2	998540	46.00	998540-C4	59.10
.040	<b>.203</b> (5x)	1/8	1-1/2	999840	55.30		
3/64	<b>.071</b> (1.5x)	1/8	1-1/2	966247	40.00		
3/64	<b>9/64</b> (3x)	1/8	1-1/2	998547	39.60		
3/64	<b>1/4</b> (5x)	1/8	1-1/2	999847	46.00		
.050	<b>.150</b> (3x)	1/8	1-1/2	998550	46.50		
.060	<b>.180</b> (3x)	1/8	1-1/2	998560	46.50		

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	2 FL	PRICE	2 FL	PRICE
1/16	<b>3/32</b> (1.5x)	1/8	1-1/2	966262	35.50		
1/16	<b>3/16</b> (3x)	1/8	1-1/2	998562	35.50	998562-C4	48.60
1/16	<b>1/4</b> (4x)	1/8	2	827462	47.50		
1/16	<b>5/16</b> (5x)	1/8	2	999862	47.50	999862-C4	66.80
1/16	<b>1/2</b> (8x)	1/8	2	978962	79.40		
5/64	<b>.117</b> (1.5x)	1/8	1-1/2	966278	35.50		
5/64	<b>15/64</b> (3x)	1/8	1-1/2	998578	35.50		
5/64	<b>13/32</b> (5x)	1/8	2	999878	47.50		
5/64	<b>5/8</b> (8x)	1/8	2	978978	79.40		

continued on next page



Check Out All of Our Plastic Cutting Solutions!



# END MILLS FOR PLASTICS

## Square Downcut – 2 Flute (Slow Helix) (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
3/32	<b>9/64</b> (1.5x)	1/8	1-1/2	966293	35.50		
3/32	<b>9/32</b> (3x)	1/8	1-1/2	998593	35.50	998593-C4	48.60
3/32	<b>3/8</b> (4x)	1/8	2	827493	48.00		
3/32	<b>1/2</b> (5x)	1/8	2	999893	47.50		
3/32	<b>3/4</b> (8x)	1/8	2	978993	80.20		
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	998606	35.50		
1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	966308	35.50	966308-C4	48.60
1/8	<b>3/8</b> (3x)	1/8	1-1/2	998608	35.50	998608-C4	48.60
1/8	<b>1/2</b> (4x)	1/8	2	827508	47.50		
1/8	<b>5/8</b> (5x)	1/8	2	999908	47.50		
1/8	<b>1</b> (8x)	1/8	2-1/2	979008	79.40		
9/64	<b>.425</b> (3x)	3/16	2	998609	48.70		
5/32	<b>15/64</b> (1.5x)	3/16	2	966310	48.70		
5/32	<b>15/32</b> (3x)	3/16	2	998610	48.30	998610-C4	66.40
5/32	<b>3/4</b> (5x)	3/16	3	999910	57.30		
3/16	<b>9/32</b> (1.5x)	3/16	2	966312	48.30		
3/16	<b>9/16</b> (3x)	3/16	2	998612	48.30	998612-C4	66.40
3/16	<b>1</b> (5x)	3/16	3	999912	57.30		
3/16	<b>1-1/2</b> (8x)	3/16	3	979012	85.10		
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	966316	57.30	966316-C4	77.90
1/4	<b>3/4</b> (3x)	1/4	2-1/2	998616	57.30	998616-C4	77.90
1/4	<b>1</b> (4x)	1/4	3	827516	62.50		
1/4	<b>1-1/4</b> (5x)	1/4	3	999916	62.50	999916-C4	83.10
1/4	<b>2</b> (8x)	1/4	4	979016	92.10		
5/16	<b>1</b> (3x)	5/16	2-1/2	998620	85.60		
3/8	<b>9/16</b> (1.5x)	3/8	3	966324	97.40		
3/8	<b>1-1/8</b> (3x)	3/8	3	998624	97.40	998624-C4	122.20
3/8	<b>2</b> (5x)	3/8	4	999924	114.20		
1/2	<b>3/4</b> (1.5x)	1/2	4	966332	175.50		
1/2	<b>1-1/2</b> (3x)	1/2	4	998632	175.50	998632-C4	205.30
1/2	<b>2-5/8</b> (5x)	1/2	5	999932	194.50		





PLASTICS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 238**

### Plastic Cutting End Mills vs. Metal Cutting End Mills

**Improved Finish** - Sharper edge provides for cleaner cut and less plowing action. Chips curl faster, transferring heat to the chip, not the part.

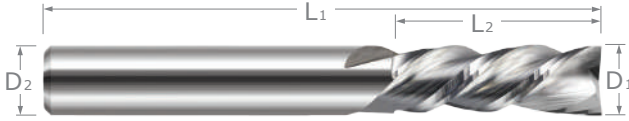
**Increased Stock Removal** - Large flute opening gives more chip clearance, avoids chip welding, and improves chip evacuation.

Feature	Typical Metal Working End Mills	Plastic Cutting End Mills
Flute Rake	8° – 12°	25° – 32°
Axial/End Gash Rake	2° – 4°	8° – 12°
OD Primary Relief	12° – 18°	18° – 26°
OD Secondary Relief	18° – 26°	35° – 45°
Core Diameter	56% – 60%	40% – 44%
Typical Cross Section	 2 FLUTE STANDARD	 SINGLE FLUTE  2 FLUTE  2 STRAIGHT FLUTE

Data presented is intended to be general guidelines for understanding how plastic end mill geometry compares to metal working tools. Actual values will change based on diameter, application and specific tool.

## END MILLS FOR PLASTICS

### Square Downcut – 2 Flute (High Helix)



- Prevents fraying and chip-out on the top of the workpiece
- Prevents lifing on vacuum tables
- 2 left hand spiral, right hand cut flutes
- High rake, high relief design with large flute valley maximizes chip removal and performance
- Higher helix (approx. 40°) for faster chip removal and better finish
- Solid carbide
- CNC ground in the USA

PLASTICS

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
				2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$		
1/32	<b>3/32</b> (3x)	1/8	1-1/2	775831	44.80
1/32	<b>5/32</b> (5x)	1/8	1-1/2	826331	45.80
3/64	<b>9/64</b> (3x)	1/8	1-1/2	775847	46.00
3/64	<b>1/4</b> (5x)	1/8	1-1/2	826347	46.90
1/16	<b>.186</b> (3x)	1/8	1-1/2	775862	42.50
1/16	<b>5/16</b> (5x)	1/8	2	826362	47.50
3/32	<b>.273</b> (3x)	1/8	1-1/2	775893	42.50
3/32	<b>1/2</b> (5x)	1/8	2	826393	47.50
1/8	<b>3/8</b> (3x)	1/8	1-1/2	775908	42.50
1/8	<b>5/8</b> (5x)	1/8	2	826408	47.50
3/16	<b>.570</b> (3x)	3/16	2	775912	51.30
3/16	<b>1</b> (5x)	3/16	3	826412	57.30
1/4	<b>3/4</b> (3x)	1/4	2-1/2	775916	56.50
1/4	<b>1-1/4</b> (5x)	1/4	3	826416	62.50
3/8	<b>1-1/8</b> (3x)	3/8	3	775924	104.00
3/8	<b>2</b> (5x)	3/8	4	826424	115.30
1/2	<b>1-1/2</b> (3x)	1/2	4	775932	177.00
1/2	<b>2-5/8</b> (5x)	1/2	5	826432	194.50

PLEASE SEE SPEEDS & FEEDS ON PAGE 239

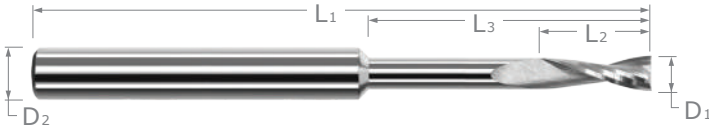


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## END MILLS FOR PLASTICS

### Square Upcut – Long Reach – 2 Flute



- High rake, high relief design with large flute valley maximizes chip removal and performance
- Center cutting design improves plunging and ramping
- Reduced neck diameter to avoid heeling
- Length of cut = 3x diameter
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
					2 FL	PRICE	2 FL	PRICE
D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>	L3 <sup>+0.010"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE	2 FL	PRICE
1/64	3/64	<b>1/8</b> (8x)	1/8	1-1/2	989015	68.50		
1/64	3/64	<b>3/16</b> (12x)	1/8	1-1/2	994115	72.00		
.020	.060	<b>.160</b> (8x)	1/8	1-1/2	989020	55.60		
.020	.060	<b>1/4</b> (12x)	1/8	1-1/2	994120	58.80		
1/32	3/32	<b>5/32</b> (5x)	1/8	1-1/2	961531	54.00		
1/32	3/32	<b>1/4</b> (8x)	1/8	1-1/2	989031	55.60		
1/32	3/32	<b>3/8</b> (12x)	1/8	1-1/2	994131	58.80		
1/32	3/32	<b>.470</b> (15x)	1/8	1-1/2	979731	62.30		
.040	.120	<b>.325</b> (8x)	1/8	1-1/2	989040	55.60		
.040	.120	<b>.480</b> (12x)	1/8	1-1/2	994140	58.80		
3/64	9/64	<b>3/8</b> (8x)	1/8	1-1/2	989047	49.40		
3/64	9/64	<b>.570</b> (12x)	1/8	1-1/2	994147	52.60		

D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>	L3 <sup>+0.030"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE	2 FL	PRICE
1/16	3/16	<b>5/16</b> (5x)	1/8	1-1/2	961562	44.20		
1/16	3/16	<b>1/2</b> (8x)	1/8	1-1/2	989062	45.30	989062-C4	58.40
1/16	3/16	<b>5/8</b> (10x)	1/8	2	748162	47.30		
1/16	3/16	<b>3/4</b> (12x)	1/8	2	994162	48.50		
1/16	3/16	<b>15/16</b> (15x)	1/8	2	979762	52.00		
5/64	15/64	<b>5/8</b> (8x)	1/8	2	989078	45.70		
5/64	15/64	<b>15/16</b> (12x)	1/8	2	994178	48.90		
3/32	9/32	<b>1/2</b> (5x)	1/8	1-1/2	961593	44.20		
3/32	9/32	<b>3/4</b> (8x)	1/8	2	989093	45.30		
3/32	9/32	<b>15/16</b> (10x)	1/8	2	748193	47.30		
3/32	9/32	<b>1-1/8</b> (12x)	1/8	2	994193	48.50		
3/32	9/32	<b>1-13/32</b> (15x)	1/8	2-1/2	979793	52.00		
1/8	3/8	<b>5/8</b> (5x)	1/8	1-1/2	961608	44.20		
1/8	3/8	<b>1</b> (8x)	1/8	2	989108	45.30	989108-C4	64.60
1/8	3/8	<b>1-1/4</b> (10x)	1/8	3	748108	47.30		
1/8	3/8	<b>1-1/2</b> (12x)	1/8	2-1/2	994208	48.50		
1/8	3/8	<b>1-7/8</b> (15x)	1/8	3	979808	52.00		
5/32	15/32	<b>1-1/4</b> (8x)	3/16	2-1/2	989110	54.70		
5/32	15/32	<b>1-7/8</b> (12x)	3/16	4	994210	63.70		
3/16	9/16	<b>1-1/2</b> (8x)	3/16	2-1/2	989112	54.70		
3/16	9/16	<b>2-1/4</b> (12x)	3/16	4	994212	63.70		
1/4	3/4	<b>2</b> (8x)	1/4	4	989116	64.90	989116-C4	85.50
1/4	3/4	<b>3</b> (12x)	1/4	6	994216	77.50		
3/8	1-1/8	<b>3</b> (8x)	3/8	6	989124	119.40		
1/2	1-1/2	<b>4</b> (8x)	1/2	7	989132	217.40		

PLASTICS

PLEASE SEE SPEEDS & FEEDS ON PAGE 246

# END MILLS FOR PLASTICS

## Ball Upcut – 2 Flute



- Ball end for profiling complex shapes
- Ball end has increased rake and relief for improved cutting action at tip of ball
- Slower helix reduces lifting forces, making design preferable for fiber-reinforced applications and vacuum table setups
- Center cutting • Solid carbide • CNC ground in the USA

PLASTICS

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$				
1/64	<b>3/64</b> (3x)	1/8	1-1/2	49515	59.70		
1/64	<b>5/64</b> (5x)	1/8	1-1/2	71315	70.30		
.020	<b>.060</b> (3x)	1/8	1-1/2	49520	46.80		
.020	<b>.100</b> (5x)	1/8	1-1/2	71320	57.30		
.025	<b>.075</b> (3x)	1/8	1-1/2	49525	47.20		
.025	<b>1/8</b> (5x)	1/8	1-1/2	71325	57.30		
1/32	<b>3/64</b> (1.5x)	1/8	1-1/2	962331	46.80		
1/32	<b>3/32</b> (3x)	1/8	1-1/2	49531	46.80	49531-C4	59.90
1/32	<b>5/32</b> (5x)	1/8	1-1/2	71331	56.50	71331-C4	69.60
1/32	<b>1/4</b> (8x)	1/8	1-1/2	955731	67.00		
.039 (1 mm)	<b>.118</b> (3x)	1/8	1-1/2	49539	47.30		
3/64	<b>9/64</b> (3x)	1/8	1-1/2	49547	40.00		
3/64	<b>1/4</b> (5x)	1/8	1-1/2	71347	49.20		

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$				
1/16	<b>3/32</b> (1.5x)	1/8	1-1/2	962362	34.60		
1/16	<b>3/16</b> (3x)	1/8	1-1/2	49562	34.60	49562-C4	47.70
1/16	<b>1/4</b> (4x)	1/8	1-1/2	784662	38.30		
1/16	<b>5/16</b> (5x)	1/8	2	71362	42.20	71362-C4	61.50
1/16	<b>1/2</b> (8x)	1/8	2	955762	63.10		
5/64	<b>15/64</b> (3x)	1/8	1-1/2	49578	34.60		
5/64	<b>13/32</b> (5x)	1/8	2	71378	42.20		
3/32	<b>9/32</b> (3x)	1/8	1-1/2	49593	34.60	49593-C4	47.70
3/32	<b>1/2</b> (5x)	1/8	2	71393	42.20		
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	49605	34.90		
1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	962408	34.60		
1/8	<b>3/8</b> (3x)	1/8	1-1/2	49608	34.60	49608-C4	47.70
1/8	<b>1/2</b> (4x)	1/8	2	784708	38.30		
1/8	<b>5/8</b> (5x)	1/8	2	71408	42.20	71408-C4	61.50
1/8	<b>1</b> (8x)	1/8	2-1/2	955808	63.10		
9/64	<b>.425</b> (3x)	3/16	2	49609	46.00		
5/32	<b>15/32</b> (3x)	3/16	2	49610	45.60		
5/32	<b>3/4</b> (5x)	3/16	3	71410	55.90		
3/16	<b>9/32</b> (1.5x)	3/16	2	962412	45.60		
3/16	<b>9/16</b> (3x)	3/16	2	49612	45.60	49612-C4	63.70
3/16	<b>1</b> (5x)	3/16	3	71412	56.40		

NEW

NEW

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## END MILLS FOR PLASTICS

Ball Upcut – 2 Flute (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	D <sub>2</sub>	L <sub>1</sub>				
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	962416	58.40		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	49616	58.40	49616-C4	79.00
1/4	<b>1-1/4</b> (5x)	1/4	3	71416	66.90	71416-C4	87.50
3/8	<b>9/16</b> (1.5x)	3/8	3	962424	93.60		
3/8	<b>1-1/8</b> (3x)	3/8	3	49624	93.60	49624-C4	118.40
3/8	<b>2</b> (5x)	3/8	4	71424	106.70		
1/2	<b>3/4</b> (1.5x)	1/2	4	962432	161.40		
1/2	<b>1-1/2</b> (3x)	1/2	4	49632	161.40	49632-C4	191.20
1/2	<b>2-5/8</b> (5x)	1/2	5	71432	195.20		

PLEASE SEE SPEEDS &amp; FEEDS ON PAGE 238

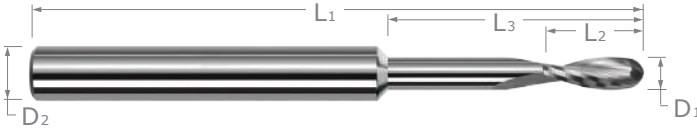


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# END MILLS FOR PLASTICS

## Ball Upcut – Long Reach – 2 Flute



- Ball end has increased rake and relief for improved cutting action at tip of ball
- Reduced neck diameter to avoid heeling
- Ball end for profiling complex shapes
- Length of cut = 3x diameter
- Slower helix reduces lifting forces, making design preferable for fiber-reinforced applications and vacuum table setups
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>	L3 <sup>+0.010"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE
1/32	3/32	<b>5/32</b> (5x)	1/8	1-1/2	964531	59.90
1/32	3/32	<b>1/4</b> (8x)	1/8	1-1/2	976231	61.80
3/64	9/64	<b>1/4</b> (5x)	1/8	1-1/2	964547	53.20
3/64	9/64	<b>3/8</b> (8x)	1/8	1-1/2	976247	54.40

D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>	L3 <sup>+0.030"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE
1/16	3/16	<b>5/16</b> (5x)	1/8	1-1/2	964562	48.30
1/16	3/16	<b>1/2</b> (8x)	1/8	1-1/2	976262	50.00
5/64	15/64	<b>13/32</b> (5x)	1/8	1-1/2	964578	48.70
5/64	15/64	<b>5/8</b> (8x)	1/8	2	976278	50.00
3/32	9/32	<b>1/2</b> (5x)	1/8	1-1/2	964593	48.70
3/32	9/32	<b>3/4</b> (8x)	1/8	2	976293	50.00
1/8	3/8	<b>5/8</b> (5x)	1/8	1-1/2	964608	48.30
1/8	3/8	<b>1</b> (8x)	1/8	2	976308	50.00
3/16	9/16	<b>1</b> (5x)	3/16	2	964612	59.60
1/4	3/4	<b>1-1/4</b> (5x)	1/4	2-1/2	964616	72.20

PLASTICS

### SPEEDS & FEEDS (Square & Ball – Long Reach Plastic Cutting End Mills)

**Important Note:** Values in table are in inches and are based on reached (8x Dia) end mills. For shorter reaches, table values of IPT must be increased (for 5x, increase to 130%). For longer reaches, table values of IPT and DOC must be reduced (for 10x, reduce to 89%; for 12x, reduce to 80%; for 15x, reduce to 67%). For complete speed and feed charts, please see [www.harveytool.com](http://www.harveytool.com)

Material Type	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter															Depth of Cut		
		.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	Radial	Axial		
Unfilled	Unfilled	800-1200	Slot - Rough	.0003	.0006	.0010	.0013	.0016	.0019	.0026	.0039	.0051	.0055	.0066	.0088	.0109	.0131	1 x Dia	1 x Dia
			Profile	.0004	.0007	.0011	.0015	.0018	.0022	.0030	.0044	.0059	.0063	.0075	.0101	.0126	.0151	.35 x Dia	1 x Dia
Filled Plastics	Carbon/Glass Filled 5% < 20%	600-800	Slot - Rough	.0003	.0006	.0010	.0013	.0016	.0019	.0026	.0039	.0051	.0055	.0066	.0088	.0109	.0131	1 x Dia	1 x Dia
			Profile	.0004	.0007	.0011	.0015	.0018	.0022	.0030	.0044	.0059	.0063	.0075	.0101	.0126	.0151	.35 x Dia	1 x Dia
Filled Plastics	Carbon/Glass Filled 21% < 40%	500-700	Slot - Rough	.0003	.0005	.0008	.0010	.0013	.0016	.0021	.0032	.0042	.0045	.0054	.0072	.0090	.0107	1 x Dia	1 x Dia
			Profile	.0003	.0006	.0009	.0012	.0015	.0018	.0024	.0036	.0048	.0051	.0062	.0082	.0103	.0124	.35 x Dia	1 x Dia
Fiber Reinforced	Carbon/Glass Fiber 5% < 20%	500-700	Slot - Rough	.0003	.0006	.0010	.0013	.0016	.0019	.0026	.0039	.0051	.0055	.0066	.0088	.0109	.0131	1 x Dia	1 x Dia
			Profile	.0004	.0007	.0011	.0015	.0018	.0022	.0030	.0044	.0059	.0063	.0075	.0101	.0126	.0151	.35 x Dia	1 x Dia
Fiber Reinforced	Carbon/Glass Fiber 21% < 40%	300-400	Slot - Rough	.0003	.0005	.0008	.0010	.0013	.0016	.0021	.0032	.0042	.0045	.0054	.0072	.0090	.0107	1 x Dia	1 x Dia
			Profile	.0003	.0006	.0009	.0012	.0015	.0018	.0024	.0036	.0048	.0051	.0062	.0082	.0103	.0124	.35 x Dia	1 x Dia

## END MILLS FOR PLASTICS

### Corner Radius Upcut – 2 Flute



- High rake, high relief design with large flute valley maximizes chip removal and performance
- Slower helix reduces lifting forces, making design preferable for fiber-reinforced applications and vacuum table setups
- Center cutting design improves plunging and ramping
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
					2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	2 FL	PRICE
1/32	.005	<b>3/32</b> (3x)	1/8	1-1/2	54031	35.20
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	2 FL	PRICE
1/16	.005	<b>3/16</b> (3x)	1/8	1-1/2	54062	34.60
1/16	.010	<b>3/16</b> (3x)	1/8	1-1/2	55462	34.60
1/16	.010	<b>5/16</b> (5x)	1/8	2	861862	43.00
1/16	.015	<b>3/16</b> (3x)	1/8	1-1/2	69362	34.60
1/16	.015	<b>5/16</b> (5x)	1/8	2	862462	43.00
3/32	.005	<b>9/32</b> (3x)	1/8	1-1/2	54093	34.60
3/32	.010	<b>9/32</b> (3x)	1/8	1-1/2	55493	34.60
3/32	.010	<b>1/2</b> (5x)	1/8	2	861893	43.00
3/32	.015	<b>9/32</b> (3x)	1/8	1-1/2	69393	35.20
3/32	.015	<b>1/2</b> (5x)	1/8	2	862493	43.40
3/32	.020	<b>9/32</b> (3x)	1/8	1-1/2	69893	34.60
3/32	.030	<b>9/32</b> (3x)	1/8	1-1/2	70693	34.60
1/8	.005	<b>3/16</b> (1.5x)	1/8	1-1/2	767508	35.20
1/8	.005	<b>3/8</b> (3x)	1/8	1-1/2	54108	34.60
1/8	.005	<b>5/8</b> (5x)	1/8	2	768908	43.40
1/8	.010	<b>3/8</b> (3x)	1/8	1-1/2	55508	34.60
1/8	.010	<b>5/8</b> (5x)	1/8	2	861908	43.40
1/8	.015	<b>3/8</b> (3x)	1/8	1-1/2	56408	34.60
1/8	.015	<b>5/8</b> (5x)	1/8	2	862508	43.00
1/8	.020	<b>3/8</b> (3x)	1/8	1-1/2	69908	34.60
1/8	.030	<b>3/16</b> (1.5x)	1/8	1-1/2	768708	35.20
1/8	.030	<b>3/8</b> (3x)	1/8	1-1/2	70708	34.60
1/8	.030	<b>5/8</b> (5x)	1/8	2	863108	43.00
3/16	.005	<b>9/16</b> (3x)	3/16	2	54112	45.60
3/16	.010	<b>9/16</b> (3x)	3/16	2	55512	45.60
3/16	.015	<b>9/16</b> (3x)	3/16	2	56412	46.50
3/16	.020	<b>9/16</b> (3x)	3/16	2	69912	45.60
3/16	.030	<b>9/16</b> (3x)	3/16	2	70712	46.50
3/16	.030	<b>1</b> (5x)	3/16	3	863112	56.90

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## END MILLS FOR PLASTICS

### Corner Radius Upcut – 2 Flute (cont.)

continued from previous page

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
					2 FL	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	R $\begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub>	L <sub>1</sub>		
1/4	.010	<b>3/4</b> (3x)	1/4	2-1/2	55516	58.40
1/4	.015	<b>3/4</b> (3x)	1/4	2-1/2	56416	58.40
1/4	.020	<b>3/8</b> (1.5x)	1/4	2-1/2	767116	58.40
1/4	.020	<b>3/4</b> (3x)	1/4	2-1/2	69916	58.40
1/4	.020	<b>1-1/4</b> (5x)	1/4	4	767716	68.50
1/4	.030	<b>3/4</b> (3x)	1/4	2-1/2	70716	58.40
1/4	.030	<b>1-1/4</b> (5x)	1/4	4	863116	67.90
3/8	.015	<b>1-1/8</b> (3x)	3/8	3	56424	91.80
3/8	.030	<b>1-1/8</b> (3x)	3/8	3	70724	91.80
3/8	.060	<b>1-1/8</b> (3x)	3/8	3	739124	92.70 <span style="color: red;">NEW</span>
1/2	.015	<b>1-1/2</b> (3x)	1/2	4	56432	158.60
1/2	.030	<b>1-1/2</b> (3x)	1/2	4	70732	158.60
1/2	.060	<b>1-1/2</b> (3x)	1/2	4	739132	160.10 <span style="color: red;">NEW</span>

PLEASE SEE SPEEDS & FEEDS ON PAGE 238

PLASTICS

**MACHINING ADVISOR PRO**

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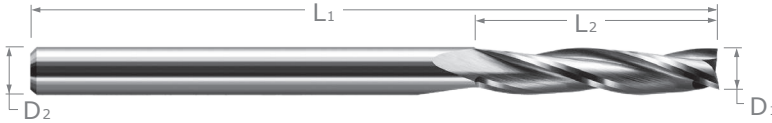
[machiningadvisorpro.com](http://machiningadvisorpro.com)





# END MILLS FOR PLASTICS

## Finishers – Square Upcut – 3 Flute (Slow Helix)



Wiper Flat  
Option for an Improved Finish

- 3 flute design strengthens rigidity and improves wall finish
- Choose from two types:
  - Without Wiper Flat (Type I): Standard end geometry designed with a dish angle to a sharp corner
  - With Wiper Flat (Type II): Wiper flat end geometry that enhances bottom finish by reducing traditional circular marks; with a slight chamfer to protect corners
- Slower helix (approx. 22°) reduces lifting forces for fiber-reinforced applications and vacuum table setups
- Center cutting • Solid carbide • CNC ground in the USA

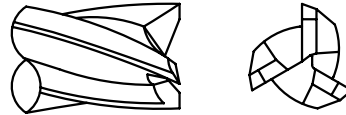
CUTTER DIAMETER	LENGTH OF CUT	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
					3 FL	PRICE	3 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
1/32	<b>3/32</b> (3x)	II	1/8	1-1/2	915631	52.70		
1/32	<b>5/32</b> (5x)	II	1/8	1-1/2	986431	52.20		
1/32	<b>1/4</b> (8x)	II	1/8	1-1/2	992331	57.20		
3/64	<b>1/4</b> (5x)	II	1/8	1-1/2	986447	40.20		
3/64	<b>3/8</b> (8x)	II	1/8	2	992347	44.20		
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
1/16	<b>3/16</b> (3x)	I	1/8	1-1/2	770262	33.30		
1/16	<b>3/16</b> (3x)	II	1/8	1-1/2	915662	33.30		
1/16	<b>5/16</b> (5x)	I	1/8	2	769662	39.10		
1/16	<b>5/16</b> (5x)	II	1/8	2	986462	38.70	986462-C4	58.00
1/16	<b>1/2</b> (8x)	II	1/8	2	992362	42.90		
1/16	<b>5/8</b> (10x)	II	1/8	2	871662	54.30		
5/64	<b>13/32</b> (5x)	II	1/8	2	986478	39.10		
5/64	<b>5/8</b> (8x)	II	1/8	2	992378	42.90		
3/32	<b>9/32</b> (3x)	I	1/8	1-1/2	770293	33.30		
3/32	<b>9/32</b> (3x)	II	1/8	1-1/2	915693	33.00		
3/32	<b>1/2</b> (5x)	I	1/8	2	769693	39.10		
3/32	<b>1/2</b> (5x)	II	1/8	2	986493	38.70	986493-C4	58.00
3/32	<b>3/4</b> (8x)	II	1/8	2	992393	42.90		
1/8	<b>3/8</b> (3x)	I	1/8	1-1/2	770308	33.30		
1/8	<b>3/8</b> (3x)	II	1/8	1-1/2	915708	33.00		
1/8	<b>5/8</b> (5x)	I	1/8	2	769708	39.10		
1/8	<b>5/8</b> (5x)	II	1/8	2	986508	38.70	986508-C4	58.00
1/8	<b>1</b> (8x)	II	1/8	2	992408	42.90		
1/8	<b>1-1/4</b> (10x)	II	1/8	2-1/2	871708	54.30		

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### TYPE I - WITHOUT WIPER



### TYPE II - WITH WIPER FLAT



## END MILLS FOR PLASTICS

### Finishers – Square Upcut – 3 Flute (Slow Helix) (cont.)

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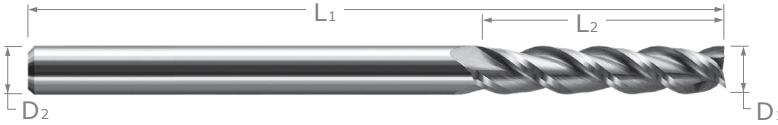
CUTTER DIAMETER	LENGTH OF CUT	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
					3 FL	PRICE	3 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
5/32	<b>15/32</b> (3x)	II	3/16	2	915710	51.70		
5/32	<b>3/4</b> (5x)	II	3/16	3	986510	53.50		
3/16	<b>9/16</b> (3x)	I	3/16	2	770312	51.70		
3/16	<b>9/16</b> (3x)	II	3/16	2	915712	51.20		
3/16	<b>1</b> (5x)	I	3/16	3	769712	54.00		
3/16	<b>1</b> (5x)	II	3/16	3	986512	53.50	986512-C4	71.60
3/16	<b>1-1/2</b> (8x)	II	3/16	3	992412	64.50		
1/4	<b>3/8</b> (1.5x)	II	1/4	2-1/2	869316	51.10		
1/4	<b>3/4</b> (3x)	I	1/4	2-1/2	770316	54.00		
1/4	<b>3/4</b> (3x)	II	1/4	2-1/2	915716	53.50		
1/4	<b>1-1/4</b> (5x)	I	1/4	3	769716	61.10		
1/4	<b>1-1/4</b> (5x)	II	1/4	3	986516	60.50	986516-C4	81.10
1/4	<b>2</b> (8x)	II	1/4	4	992416	80.30		
3/8	<b>9/16</b> (1.5x)	II	3/8	3	869324	86.90		
3/8	<b>1-1/8</b> (3x)	II	3/8	3	915724	89.30		
3/8	<b>2</b> (5x)	II	3/8	4	986524	96.60		
1/2	<b>3/4</b> (1.5x)	II	1/2	4	869332	149.50		
1/2	<b>1-1/2</b> (3x)	II	1/2	4	915732	155.10		
1/2	<b>2-5/8</b> (5x)	II	1/2	5	986532	163.90		

PLEASE SEE SPEEDS & FEEDS ON PAGE 253

PLASTICS

## END MILLS FOR PLASTICS

### Finishers – Square Upcut – 3 Flute (High Helix)

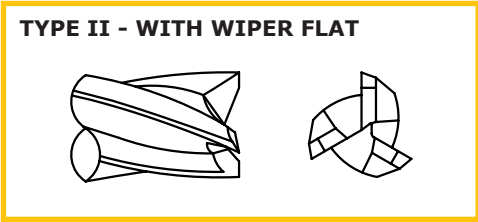
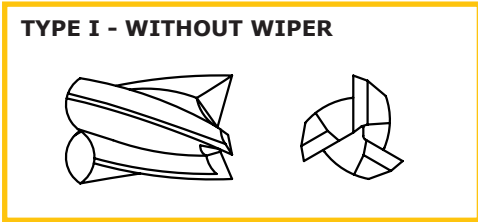


Wiper Flat  
 Option for an Improved Finish

- 3 flute, higher helix (approx. 40°) design strengthens rigidity and increases cutting action to improve wall finish
- Choose from two types:
  - Without Wiper Flat (Type I): Standard end geometry designed with a dish angle to a sharp corner
  - With Wiper Flat (Type II): Wiper flat end geometry that enhances bottom finish by reducing traditional circular marks; with a slight chamfer to protect corners
- Design is ideally suited for thin-walled applications and tightly secured workpieces
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
					3 FL	PRICE	3 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
1/32	<b>3/32</b> (3x)	II	1/8	1-1/2	902131	51.70		
1/32	<b>5/32</b> (5x)	II	1/8	1-1/2	941231	53.80		
1/32	<b>1/4</b> (8x)	II	1/8	1-1/2	900731	58.90		
3/64	<b>1/4</b> (5x)	II	1/8	1-1/2	941247	41.70		
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$	<b>3• FL</b>	<b>PRICE</b>	<b>3 FL</b>	<b>PRICE</b>
1/16	<b>3/16</b> (3x)	I	1/8	1-1/2	736762	38.50		
1/16	<b>3/16</b> (3x)	II	1/8	1-1/2	902162	38.20		
1/16	<b>5/16</b> (5x)	I	1/8	2	769862	40.50		
1/16	<b>5/16</b> (5x)	II	1/8	2	941262	40.20	941262-C4	59.50
1/16	<b>1/2</b> (8x)	II	1/8	2	900762	44.20		
1/16	<b>5/8</b> (10x)	II	1/8	2	854662	46.80		
5/64	<b>13/32</b> (5x)	II	1/8	2	941278	40.20		
3/32	<b>9/32</b> (3x)	I	1/8	1-1/2	736793	38.50		
3/32	<b>9/32</b> (3x)	II	1/8	1-1/2	902193	38.20		
3/32	<b>1/2</b> (5x)	I	1/8	2	769893	40.50		
3/32	<b>1/2</b> (5x)	II	1/8	2	941293	40.20	941293-C4	59.50
3/32	<b>3/4</b> (8x)	II	1/8	2	900793	44.20		
1/8	<b>3/8</b> (3x)	I	1/8	1-1/2	736808	38.50		
1/8	<b>3/8</b> (3x)	II	1/8	1-1/2	902208	38.20		
1/8	<b>5/8</b> (5x)	I	1/8	2	769908	40.20		
1/8	<b>5/8</b> (5x)	II	1/8	2	941308	40.20	941308-C4	59.50
1/8	<b>1</b> (8x)	II	1/8	2	900808	44.20		
1/8	<b>1-1/4</b> (10x)	II	1/8	2-1/2	854708	46.80		

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**PLEASE SEE SPEEDS & FEEDS ON PAGE 254**

## END MILLS FOR PLASTICS

### Finishers – Square Upcut – 3 Flute (High Helix) (cont.)

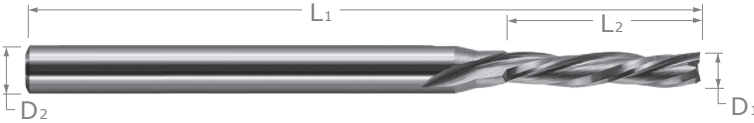
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CUTTER DIAMETER D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	LENGTH OF CUT L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	TYPE	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AMORPHOUS DIAMOND	
					3 FL	PRICE	3 FL	PRICE
5/32	<b>15/32</b> (3x)	II	3/16	2	902210	51.50		
5/32	<b>3/4</b> (5x)	II	3/16	3	941310	53.50		
3/16	<b>9/16</b> (3x)	I	3/16	2	736812	52.00		
3/16	<b>9/16</b> (3x)	II	3/16	2	902212	51.50		
3/16	<b>1</b> (5x)	I	3/16	3	769912	54.00		
3/16	<b>1</b> (5x)	II	3/16	3	941312	53.50	941312-C4	71.60
3/16	<b>1-1/2</b> (8x)	II	3/16	3	900812	58.60		
1/4	<b>3/8</b> (1.5x)	II	1/4	2-1/2	852016	56.50		
1/4	<b>3/4</b> (3x)	I	1/4	2-1/2	736816	59.30		
1/4	<b>3/4</b> (3x)	II	1/4	2-1/2	902216	58.80		
1/4	<b>1-1/4</b> (5x)	I	1/4	3	769916	61.10		
1/4	<b>1-1/4</b> (5x)	II	1/4	3	941316	60.50	941316-C4	81.10
1/4	<b>2</b> (8x)	II	1/4	4	900816	80.30		
3/8	<b>9/16</b> (1.5x)	II	3/8	3	852024	87.10		
3/8	<b>1-1/8</b> (3x)	II	3/8	3	902224	89.30		
3/8	<b>2</b> (5x)	II	3/8	4	941324	97.50		
1/2	<b>3/4</b> (1.5x)	II	1/2	4	852032	148.30		
1/2	<b>1-1/2</b> (3x)	II	1/2	4	902232	153.80		
1/2	<b>2-5/8</b> (5x)	II	1/2	5	941332	162.40		

PLASTICS

## END MILLS FOR PLASTICS

### Finishers – Square Dncut – 3 Flute (Slow Helix)



- 3 left hand spiral, right hand cut flute design strengthens rigidity and improves wall finish
- Slower helix (approx. 22°) ideal for overhung, less secure parts
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	<b>3 FL</b>	<b>PRICE</b>
1/32	<b>5/32</b> (5x)	1/8	1-1/2	880431	52.70
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	D <sub>1</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	<b>3 FL</b>	<b>PRICE</b>
1/16	<b>5/16</b> (5x)	1/8	2	880462	42.20
3/32	<b>1/2</b> (5x)	1/8	2	880493	42.20
1/8	<b>5/8</b> (5x)	1/8	2	880508	42.20
3/16	<b>1</b> (5x)	3/16	3	880512	55.50
1/4	<b>1-1/4</b> (5x)	1/4	3	880516	62.60
3/8	<b>1-1/8</b> (3x)	3/8	3	878124	91.40
1/2	<b>1-1/2</b> (3x)	1/2	4	878132	154.80

PLASTICS

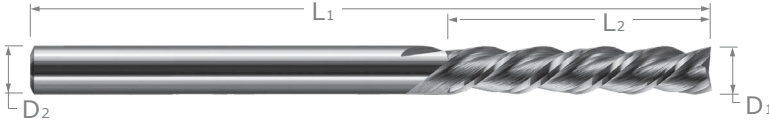
### SPEEDS & FEEDS (3 Flute Plastic Finisher – Slow Helix)

**Important Note:** Values in table are in inches and are based on standard (5x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 1.5x, increase to 120%; for 3x, increase to 110%). For longer lengths of cut, table values of IPT must be reduced (for 8x, reduce to 66%; for 10x, reduce to 55%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

	Material Type	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter													Depth of Cut			
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	Radial	Axial	
Unfilled	Unfilled	800-1200	Semi-Roughing	.00041	.00084	.00128	.00168	.00212	.00253	.00340	.00508	.00679	.00721	.00866	.01155	.01444	.01732	.35 x Dia	1 x Dia
			Finishing	.00013	.00028	.00042	.00055	.00070	.00083	.00112	.00167	.00223	.00237	.00285	.00379	.00474	.00569	.10 x Dia	5 x Dia
Filled Plastics	Carbon/Glass Filled 5% < 20%	600-800	Semi-Roughing	.00041	.00084	.00128	.00168	.00212	.00253	.00340	.00508	.00679	.00721	.00866	.01155	.01444	.01732	.35 x Dia	1 x Dia
			Finishing	.00013	.00028	.00042	.00055	.00070	.00083	.00112	.00167	.00223	.00237	.00285	.00379	.00474	.00569	.10 x Dia	5 x Dia
Filled Plastics	Carbon/Glass Filled 21% < 40%	500-700	Semi-Roughing	.00033	.00069	.00104	.00138	.00173	.00207	.00278	.00416	.00556	.00590	.00709	.00945	.01181	.01417	.35 x Dia	1 x Dia
			Finishing	.00011	.00023	.00034	.00045	.00057	.00068	.00091	.00137	.00183	.00194	.00233	.00310	.00388	.00466	.10 x Dia	5 x Dia
Fiber Reinforced	Carbon/Glass Fiber 5% < 20%	500-700	Semi-Roughing	.00041	.00084	.00128	.00168	.00212	.00253	.00340	.00508	.00679	.00721	.00866	.01155	.01444	.01732	.35 x Dia	1 x Dia
			Finishing	.00013	.00028	.00042	.00055	.00070	.00083	.00112	.00167	.00223	.00237	.00285	.00379	.00474	.00569	.10 x Dia	5 x Dia
	Carbon/Glass Fiber 21% < 40%	300-400	Semi-Roughing	.00033	.00069	.00104	.00138	.00173	.00207	.00278	.00416	.00556	.00590	.00709	.00945	.01181	.01417	.35 x Dia	1 x Dia
			Finishing	.00011	.00023	.00034	.00045	.00057	.00068	.00091	.00137	.00183	.00194	.00233	.00310	.00388	.00466	.10 x Dia	5 x Dia

# END MILLS FOR PLASTICS

## Finishers – Square Downcut – 3 Flute (High Helix)



- 3 left hand spiral, right hand cut flute, higher helix (approx. 40°) design strengthens rigidity and increases cutting action to improve wall finish
- Design is ideally suited for thin-walled applications
- Solid carbide
- Center cutting
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
D <sub>1</sub> <sup>+ .000"</sup> / <sub>-.001"</sub>	D <sub>1</sub> <sup>+ .010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	<b>3 FL</b>	<b>PRICE</b>
1/32	<b>5/32</b> (5x)	1/8	1-1/2	864331	59.00
D <sub>1</sub> <sup>+ .000"</sup> / <sub>-.002"</sub>	D <sub>1</sub> <sup>+ .030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	<b>3 FL</b>	<b>PRICE</b>
1/16	<b>5/16</b> (5x)	1/8	2	864362	47.80
3/32	<b>1/2</b> (5x)	1/8	2	864393	46.30
1/8	<b>3/8</b> (3x)	1/8	1-1/2	873808	36.90
1/8	<b>5/8</b> (5x)	1/8	2	864408	40.70
3/16	<b>9/16</b> (3x)	3/16	2	873812	49.80
3/16	<b>1</b> (5x)	3/16	3	864412	56.00
1/4	<b>3/4</b> (3x)	1/4	2-1/2	873816	56.70
1/4	<b>1-1/4</b> (5x)	1/4	3	864416	62.60
3/8	<b>1-1/8</b> (3x)	3/8	3	873824	91.40
1/2	<b>1-1/2</b> (3x)	1/2	4	873832	156.00

PLASTICS

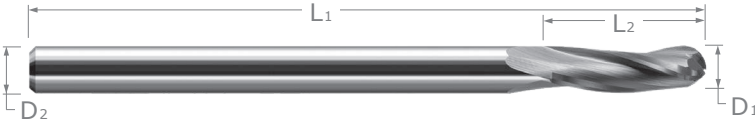
### SPEEDS & FEEDS (3 Flute Plastic Finisher – High Helix)

**Important Note:** Values are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cut, table values of IPT must be increased (for 1.5x, increase 115%). For longer lengths of cuts, table values of IPT must be reduced (for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Material Type	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter													Depth of Cut			
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	Radial	Axial	
Unfilled	800-1200	Unfilled	Semi-Roughing	.00043	.00089	.00135	.00178	.00224	.00267	.00359	.00536	.00717	.00761	.00914	.01219	.01524	.01829	.35 x Dia	1 x Dia
		Unfilled	Finishing	.00024	.00049	.00074	.00097	.00123	.00146	.00196	.00294	.00393	.00417	.00501	.00668	.00835	.01002	.10 x Dia	3 x Dia
Filled Plastics	600-800	Carbon/Glass Filled 5% < 20%	Semi-Roughing	.00043	.00089	.00135	.00178	.00224	.00267	.00359	.00536	.00717	.00761	.00914	.01219	.01524	.01829	.35 x Dia	1 x Dia
		Carbon/Glass Filled 21% < 40%	Finishing	.00024	.00049	.00074	.00097	.00123	.00146	.00196	.00294	.00393	.00417	.00501	.00668	.00835	.01002	.10 x Dia	3 x Dia
Fiber Reinforced	500-700	Carbon/Glass Fiber 5% < 20%	Semi-Roughing	.00035	.00073	.00110	.00146	.00183	.00218	.00293	.00439	.00587	.00622	.00748	.00997	.01247	.01496	.35 x Dia	1 x Dia
		Carbon/Glass Fiber 21% < 40%	Finishing	.00019	.00040	.00060	.00080	.00100	.00120	.00161	.00240	.00321	.00341	.00410	.00546	.00683	.00820	.10 x Dia	3 x Dia
Fiber Reinforced	300-400	Carbon/Glass Fiber 5% < 20%	Semi-Roughing	.00043	.00089	.00135	.00178	.00224	.00267	.00359	.00536	.00717	.00761	.00914	.01219	.01524	.01829	.35 x Dia	1 x Dia
		Carbon/Glass Fiber 21% < 40%	Finishing	.00024	.00049	.00074	.00097	.00123	.00146	.00196	.00294	.00393	.00417	.00501	.00668	.00835	.01002	.10 x Dia	3 x Dia
Fiber Reinforced	300-400	Carbon/Glass Fiber 5% < 20%	Semi-Roughing	.00035	.00073	.00110	.00146	.00183	.00218	.00293	.00439	.00587	.00622	.00748	.00997	.01247	.01496	.35 x Dia	1 x Dia
		Carbon/Glass Fiber 21% < 40%	Finishing	.00019	.00040	.00060	.00080	.00100	.00120	.00161	.00240	.00321	.00341	.00410	.00546	.00683	.00820	.10 x Dia	3 x Dia

## END MILLS FOR PLASTICS

### Finishers – Ball Upcut – 3 Flute (Slow Helix)



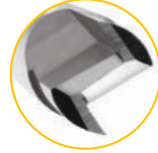
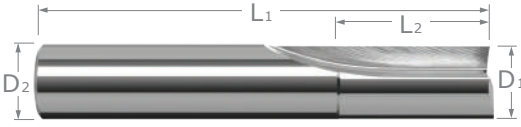
- Ball end has increased rake and relief for improved cutting action at the tip
- 3 flute design strengthens rigidity and improves wall finish
- Slower helix reduces lifting forces for fiber-reinforced applications and vacuum table set ups
- Center cutting
- Ultrafine grain carbide to create a sharp cutting edge
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
				3 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$		
1/16	<b>.186</b> (3x)	1/8	1-1/2	808762	38.20
3/32	<b>.279</b> (3x)	1/8	1-1/2	808793	38.20
1/8	<b>3/8</b> (3x)	1/8	1-1/2	808808	37.90
3/16	<b>.570</b> (3x)	3/16	2	808812	58.10
1/4	<b>3/4</b> (3x)	1/4	2-1/2	808816	61.10
3/8	<b>1-1/8</b> (3x)	3/8	3	808824	97.30
1/2	<b>1-1/2</b> (3x)	1/2	4	808832	165.80

**PLEASE SEE SPEEDS & FEEDS ON PAGE 253**

# END MILLS FOR COMPOSITES

## Square – 2 Straight Flutes



2 Straight Flutes (End View)

- Designed to mill abrasive, glass-filled plastics with reinforcing fiber and other additives
- Straight flute design improves finish and minimizes fraying of fiber-reinforced and layered materials by not "pulling" fibers
- Behind center design with high positive rake for smoother cuts
- Eccentric relief for improved edge life
- Allows shallow ramping, not suited for plunge cutting
- Select sizes available with oversized, router-style shanks
- Solid carbide
- CNC ground in the USA

COMPOSITES

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE	2 FL	PRICE
1/32	<b>3/32</b> (3x)	1/8	1-1/2	69531	53.20	69531-C4	66.30
D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE	2 FL	PRICE
1/16	<b>3/32</b> (1.5x)	1/8	1-1/2	825162	35.80	825162-C4	48.90
1/16	<b>1/8</b> (2x)	1/4*	2	14604	39.80	14604-C4	60.40
1/16	<b>3/16</b> (3x)	1/8	1-1/2	69562	35.40	69562-C4	48.50
1/16	<b>5/16</b> (5x)	1/8	2	70462	40.80	70462-C4	55.20
5/64*	<b>5/32</b> (2x)	1/4*	2	14605	40.50	14605-C4	61.10
5/64	<b>1/4</b> (3x)	1/8	1-1/2	69578	35.80	69578-C4	48.90
5/64	<b>13/32</b> (5x)	1/8	2	70478	41.20	70478-C4	55.80
3/32	<b>9/64</b> (1.5x)	1/8	1-1/2	825193	35.80	825193-C4	48.90
3/32*	<b>3/16</b> (2x)	1/4*	2	14606	39.80	14606-C4	60.40
3/32	<b>5/16</b> (3x)	1/8	1-1/2	69593	35.40	69593-C4	48.50
3/32	<b>1/2</b> (5x)	1/8	2	70493	40.80	70493-C4	55.20
1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	825208	35.10	825208-C4	48.20
1/8*	<b>1/4</b> (2x)	1/4*	2	14608	39.80	14608-C4	60.40
1/8	<b>3/8</b> (3x)	1/8	1-1/2	69608	35.40	69608-C4	48.50
1/8	<b>5/8</b> (5x)	1/8	2	70508	40.80	70508-C4	55.20
5/32	<b>1/2</b> (3x)	3/16	2	69610	37.60	69610-C4	55.70
3/16	<b>5/8</b> (3x)	3/16	2	69612	37.60	69612-C4	55.70
3/16*	<b>5/8</b> (3x)	1/4*	2	14612	39.80	14612-C4	60.40
3/16	<b>1</b> (5x)	3/16	3	70512	44.40	70512-C4	62.50
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	825216	36.90	825216-C4	57.50
1/4*	<b>3/4</b> (3x)	1/4	2-1/2	14616	36.20	14616-C4	56.80
1/4	<b>1-1/4</b> (5x)	1/4	3	70516	50.40	70516-C4	71.00
5/16	<b>5/8</b> (2x)	5/16	2-1/2	14620	69.10	14620-C4	93.90
3/8*	<b>7/8</b> (2x)	3/8	2-1/2	14624	68.40	14624-C4	93.20
3/8	<b>2</b> (5x)	3/8	4	70524	84.20	70524-C4	109.00
1/2*	<b>1</b> (2x)	1/2	3	14632	108.60	14632-C4	138.50
1/2	<b>2-1/2</b> (5x)	1/2	4	70532	134.00		

\*Cutter diameter tolerance is +.000/-0.004". Tools are ground on oversized, router-style shank.

### SPEEDS & FEEDS (2 Straight Flutes)

**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For longer lengths of cut, table values of IPT must be reduced (for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Material Type	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter													Depth of Cut		
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	Radial	Axial
Filled Plastics Carbon/Glass Filled 5% < 20%	600-800	Slot - Rough	.0004	.0008	.0012	.0016	.0020	.0024	.0032	.0048	.0064	.0068	.0082	.0109	.0137	.0164	1 x Dia	1 x Dia
		Profile	.0004	.0009	.0014	.0018	.0023	.0028	.0037	.0055	.0074	.0079	.0094	.0126	.0157	.0189	.35 x Dia	1 x Dia
Filled Plastics Carbon/Glass Filled 21% < 40%	500-700	Slot - Rough	.0003	.0007	.0010	.0013	.0016	.0020	.0026	.0039	.0053	.0056	.0067	.0090	.0112	.0134	1 x Dia	1 x Dia
		Profile	.0004	.0008	.0011	.0015	.0019	.0023	.0030	.0045	.0061	.0064	.0077	.0103	.0129	.0154	.35 x Dia	1 x Dia
Fiber Reinforced Carbon/Glass Fiber 5% < 20%	500-700	Slot - Rough	.0004	.0008	.0012	.0016	.0020	.0024	.0032	.0048	.0064	.0068	.0082	.0109	.0137	.0164	1 x Dia	1 x Dia
		Profile	.0004	.0009	.0014	.0018	.0023	.0028	.0037	.0055	.0074	.0079	.0094	.0126	.0157	.0189	.35 x Dia	1 x Dia
Fiber Reinforced Carbon/Glass Fiber 21% < 40%	300-400	Slot - Rough	.0003	.0007	.0010	.0013	.0016	.0020	.0026	.0039	.0053	.0056	.0067	.0090	.0112	.0134	1 x Dia	1 x Dia
		Profile	.0004	.0008	.0011	.0015	.0019	.0023	.0030	.0045	.0061	.0064	.0077	.0103	.0129	.0154	.35 x Dia	1 x Dia



# END MILLS FOR COMPOSITES

## Compression Cutter



Prevents Burrs & Delamination!

- Counteracting flute geometries compress material inwardly to avoid burrs, tear out, and delamination
- Produces enhanced edge finish on top and bottom of workpiece
- Offered in two diamond coatings for increased tool life in a variety of abrasive composite materials
- Stocked in 2, 4, and 6 flute configurations for rough and finish machining
- Center cutting
- Solid carbide
- CNC ground in the USA


CUTTER DIAMETER	LENGTH OF CUT	OVERLAP CENTER	OVERLAP LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AMORPHOUS DIAMOND		CVD DIAMOND (9 μm)	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>4</sub>		D <sub>2</sub>	L <sub>1</sub>						
1/32	3/32	<b>1/32</b>	.006	2	1/8	1-1/2	994331	55.80	994331-C4	68.40	995031	126.30
3/64	9/64	<b>3/64</b>	.009	2	1/8	1-1/2	994347	55.80	994347-C4	69.10	995047	125.10
1/16	3/16	<b>1/16</b>	.013	2	1/8	1-1/2	994362	53.10	994362-C4	65.80	995062	122.20
5/64	1/4	<b>5/64</b>	.016	2	1/8	1-1/2	994378	53.10	994378-C4	66.40	995078	123.30
3/32	9/32	<b>3/32</b>	.019	2	1/8	1-1/2	994393	53.10	994393-C4	65.80	995093	123.30
1/8	3/8	<b>1/8</b>	.025	2	1/8	1-1/2	994408	51.00	994408-C4	64.10	995108	119.40
1/8	3/8	<b>1/8</b>	.028	4	1/8	1-1/2	993708	54.30	993708-C4	67.50	997708	124.70
3/16	9/16	<b>3/16</b>	.038	2	3/16	2	994412	56.90	994412-C4	75.00	995112	138.80
3/16	9/16	<b>3/16</b>	.041	4	3/16	2	993712	61.00	993712-C4	78.90	997712	146.30
1/4	3/4	<b>1/4</b>	.050	2	1/4	2-1/2	994416	68.00	994416-C4	88.40	995116	164.20
1/4	3/4	<b>1/4</b>	.055	4	1/4	2-1/2	993716	72.40	993716-C4	92.80	997716	171.50
5/16	1	<b>5/16</b>	.075	6	5/16	2-1/2	920120	87.40	920120-C4	112.40	918820	201.10
3/8	1-1/8	<b>3/8</b>	.090	6	3/8	2-1/2	920124	108.10	920124-C4	132.80	918824	266.30
1/2	1-1/2	<b>1/2</b>	.120	6	1/2	3	920132	195.30	920132-C4	223.30	918832	384.00

COMPOSITES

**Choosing the Right Diamond**


**AMORPHOUS DIAMOND**

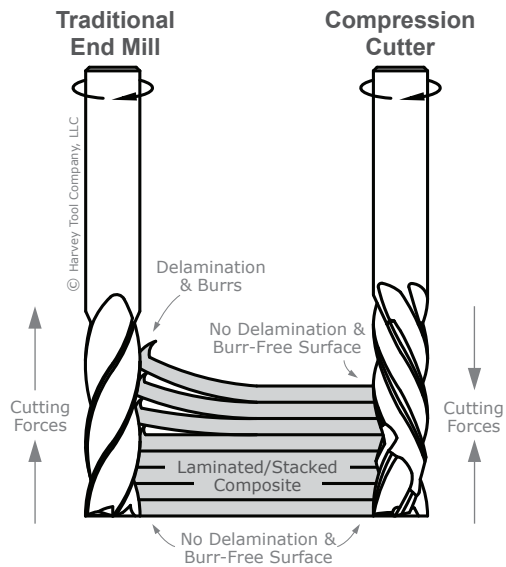
A PVD amorphous diamond coating which improves lubricity and wear resistance. Coating is thin relative to CVD diamond, preventing edge rounding. Sharp edges improve results (performance and finish) over CVD in certain abrasive materials.

Thin coating maintains sharper edge. 

**CVD DIAMOND**

True Crystalline CVD diamond is grown directly into a carbide end mill. This dramatically improves hardness, which improves abrasion resistance and extends tool life up to 50x, allowing higher feed rates than uncoated carbide. Ideal for machining abrasive composite materials with high fiber or fill concentration (G10, FR4, etc.) Diamond layer is approximately 5 times thicker than Amorphous Diamond, improving wear resistance. Well suited for high production environments.

Thicker diamond layer for increased wear resistance. 



**Traditional End Mills:** Upward lifting force causes burrs and delamination at the top of the part.

**Compression Cutters:** Counteracting cutting forces compress the material and stabilize the workpiece, creating a superior finish on the top and bottom of the part.

# END MILLS FOR COMPOSITES

## Chipbreaker Cutter



Type I  
Bur-Style End



Type II  
Center Cutting

- Optimized geometry with chipbreakers efficiently shears fibers and shortens chips for improved chip removal
- Suited for roughing and profiling in composite materials with high fiber or fill concentration (G10, FR4, etc.)
- Choose from two types:
  - Type I: Bur-style end allows for shallow ramping (not suited for plunge cutting)
  - Type II: Center cutting end allows for plunge cutting, reduced flute count prevents chip packing, designed specifically for CFRP
- Solid carbide • CNC ground in the USA

COMPOSITES

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND		CVD DIAMOND (9 µm)	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$						
1/32	<b>3/32</b> (3x)	4	I	1/8	1-1/2	969231	53.70	969231-C4	66.80		
3/64	<b>9/64</b> (3x)	4	I	1/8	1-1/2	969247	53.20	969247-C4	66.30		
1/16	<b>.186</b> (3x)	3	II	1/8	1-1/2	801962	53.10			803762	122.20
1/16	<b>.186</b> (3x)	4	I	1/8	1-1/2	969262	51.00	969262-C4	64.10		
5/64	<b>15/64</b> (3x)	4	I	1/8	1-1/2	969278	51.50	969278-C4	64.60		
3/32	<b>.279</b> (3x)	3	II	1/8	1-1/2	801993	53.10			803793	122.20
3/32	<b>.279</b> (3x)	4	I	1/8	1-1/2	969293	51.00	969293-C4	64.10	791593	123.30
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$						
1/8	<b>3/8</b> (3x)	5	II	1/8	1-1/2	802008	50.70	802008-C4	63.80	803808	119.10
1/8	<b>3/8</b> (3x)	6	I	1/8	1-1/2	969308	49.20	969308-C4	62.30	791608	120.30
1/8	<b>5/8</b> (5x)	5	II	1/8	1-1/2	818508	54.30	<b>818508-C4</b>	67.40	803008	122.20
1/8	<b>5/8</b> (5x)	6	I	1/8	1-1/2	884908	52.70	884908-C4	65.80		
3/16	<b>9/16</b> (3x)	5	II	3/16	2	802012	56.60			803812	137.90
3/16	<b>9/16</b> (3x)	6	I	3/16	2	969312	54.30	969312-C4	72.40		
3/16	<b>1</b> (3x)	5	II	3/16	2	818512	59.50			803012	142.30
3/16	<b>1</b> (5x)	6	I	3/16	2	884912	57.80	884912-C4	75.90		
1/4	<b>3/4</b> (3x)	5	II	1/4	2-1/2	802016	67.00	802016-C4	87.60	803816	163.20
1/4	<b>3/4</b> (3x)	6	I	1/4	2-1/2	969316	65.10	969316-C4	85.70	791616	163.20
1/4	<b>1-1/4</b> (5x)	5	II	1/4	2-1/2	818516	70.90	<b>818516-C4</b>	91.50	803016	171.00
1/4	<b>1-1/4</b> (5x)	6	I	1/4	2-1/2	884916	68.90	884916-C4	89.50		
3/8	<b>1-1/8</b> (3x)	5	II	3/8	3	802024	111.10			803824	265.80
3/8	<b>1-1/8</b> (3x)	8	I	3/8	3	969324	106.80	969324-C4	131.60	791624	268.30
1/2	<b>1-1/2</b> (3x)	5	II	1/2	4	802032	194.10			803832	381.00
1/2	<b>1-1/2</b> (3x)	8	I	1/2	4	969332	188.40	969332-C4	218.20		

NEW

NEW

## END MILLS FOR COMPOSITES

## Diamond Cut – Bur Style



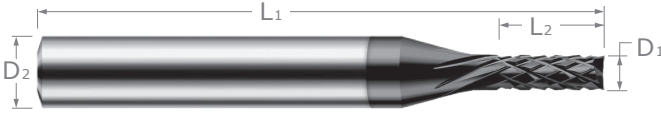
Bur-Style End

- Diamond cut style and high flute count allows for effective deburring with the outer diameter in abrasive composites
- Ideally suited for Carbon and Glass Fiber composites and other composites with high fiber reinforcement
- Bur-style end allows for shallow ramping, not suited for plunge cutting
- Total flute count on the bur-style end is equal to the amount of right hand teeth
- Downcut geometry on the OD
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.062 (1/16)	<b>.186</b> (3x)	6	8	1/8	1-1/2	798462	42.70	798462-C4	55.80
.078 (5/64)	<b>.234</b> (3x)	7	9	1/8	1-1/2	798478	42.70	798478-C4	55.80
.093 (3/32)	<b>.279</b> (3x)	7	9	1/8	1-1/2	798493	42.70	798493-C4	55.80
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$	<b>TOOL #</b>	<b>PRICE</b>	<b>TOOL #</b>	<b>PRICE</b>
.125 (1/8)	<b>.375</b> (3x)	8	10	1/8	1-1/2	798508	42.70	798508-C4	55.80
.187 (3/16)	<b>.563</b> (3x)	9	11	3/16	2	798512	50.90	798512-C4	69.00
.250 (1/4)	<b>.750</b> (3x)	10	12	1/4	2-1/2	798516	70.30	798516-C4	90.90

# END MILLS FOR COMPOSITES

## Diamond Cut – End Mill Style



End Mill Style

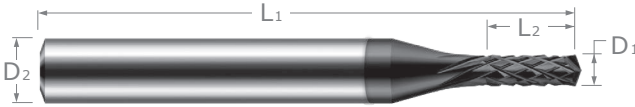
- Diamond cut style and high flute count allows for effective roughing and profiling in abrasive composites
- Ideally suited for Carbon and Glass Fiber composites and other composites with high fiber reinforcement
- Center cutting (two flutes to center) on end with downcut geometry on OD
- Solid carbide
- CNC ground in the USA

COMPOSITES

CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND		CVD DIAMOND (4 μm)	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.020"</sup> / <sub>-.000"</sub>			D2	L1	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.062 (1/16)	<b>.186</b> (3x)	6	8	1/8	1-1/2	920962	42.70	920962-C4	55.80		
.078 (5/64)	<b>.234</b> (3x)	7	9	1/8	1-1/2	920978	42.70	920978-C4	55.80		
.093 (3/32)	<b>.279</b> (3x)	7	9	1/8	1-1/2	920993	42.70	920993-C4	55.80		
.109 (7/64)	<b>.327</b> (3x)	8	10	1/8	1-1/2	921002	46.20	921002-C4	59.30		
D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>			D2	L1	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	<b>.375</b> (3x)	8	10	1/8	1-1/2	921008	42.70	921008-C4	55.80	799008	95.00
.125 (1/8)	<b>.625</b> (5x)	8	10	1/8	1-1/2	894508	46.20	894508-C4	59.30		
.125 (1/8)	<b>1.000</b> (8x)	8	10	1/8	2-1/2	785208	48.70	785208-C4	61.80		
.156 (5/32)	<b>.469</b> (3x)	9	11	3/16	2	921010	50.90	921010-C4	69.00		
.187 (3/16)	<b>.563</b> (3x)	9	11	3/16	2	921012	50.90	921012-C4	69.00	799012	113.40
.187 (3/16)	<b>1.000</b> (5x)	9	11	3/16	2	894512	55.50	894512-C4	73.60		
.250 (1/4)	<b>.750</b> (3x)	10	12	1/4	2-1/2	921016	70.30	921016-C4	90.90	799016	142.00
.250 (1/4)	<b>1.250</b> (5x)	10	12	1/4	2-1/2	894516	76.40	894516-C4	97.00		
.250 (1/4)	<b>2.000</b> (8x)	10	12	1/4	4	785216	94.90	785216-C4	115.50		
.312 (5/16)	<b>1.000</b> (3x)	10	12	5/16	2-1/2	921020	91.20	921020-C4	116.00		
.375 (3/8)	<b>1.125</b> (3x)	11	13	3/8	2-1/2	921024	110.50	921024-C4	135.30		
.375 (3/8)	<b>2.000</b> (5x)	11	13	3/8	4	894524	126.60	894524-C4	151.40		
.500 (1/2)	<b>1.500</b> (3x)	12	14	1/2	3	921032	187.30	921032-C4	217.20		
.500 (1/2)	<b>2.625</b> (5x)	12	14	1/2	4	894532	208.20	894532-C4	238.00		

# END MILLS FOR COMPOSITES

## Diamond Cut – Drill Mill Style



Drill Point

- 140° point angle allows for efficient plunging through composite sheet material
- Diamond cut style and high flute count allows for effective roughing and profiling in abrasive composites
- Ideally suited for Carbon and Glass Fiber composites and other composites with high fiber reinforcement
- Downcut geometry on OD
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.062 (1/16)	<b>.186</b> (3x)	6	8	1/8	1-1/2	908062	45.50	908062-C4	58.60
.078 (5/64)	<b>.234</b> (3x)	7	9	1/8	1-1/2	908078	45.50	908078-C4	58.60
.093 (3/32)	<b>.279</b> (3x)	7	9	1/8	1-1/2	908093	45.50	908093-C4	58.60
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.125 (1/8)	<b>.375</b> (3x)	8	10	1/8	1-1/2	908108	45.50	908108-C4	58.60
.187 (3/16)	<b>.563</b> (3x)	9	11	3/16	2	908112	53.70	908112-C4	71.80
.250 (1/4)	<b>.750</b> (3x)	10	12	1/4	2-1/2	908116	73.90	908116-C4	94.50
.375 (3/8)	<b>1.125</b> (3x)	11	13	3/8	2-1/2	908124	87.70	908124-C4	112.50
.500 (1/2)	<b>1.500</b> (3x)	12	14	1/2	3	908132	179.40	908132-C4	209.30

COMPOSITES

**MACHINING  
ADVISOR PRO**

FREE for desktop,  
tablet, and mobile



Customizable Running Parameters  
For Optimized Machining

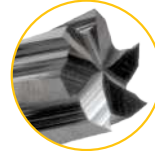


[machiningadvisorpro.com](http://machiningadvisorpro.com)



# END MILLS FOR COMPOSITES

## Finisher



Type I  
Bur-Style End



Type II  
Center Cutting

- Optimized geometry and high flute count for finishing in composite materials with high fiber or fill concentration
- Slow helix improves finish and minimizes fraying of fiber-reinforced and layered materials by reducing vertical forces on the workpiece
- Choose from two types:
  - Type I: Bur-style end allows for shallow ramping (not suited for plunge cutting)
  - Type II: Center cutting end allows for plunge cutting, reduced flute count prevents chip packing, designed specifically for CFRP
- Solid carbide
- CNC ground in the USA

COMPOSITES

CUTTER DIAMETER	LENGTH OF CUT	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND		CVD DIAMOND (9 μm)	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>			D <sub>2</sub>	L <sub>1</sub>						
1/32	<b>3/32</b> (3x)	I	4	1/8	1-1/2	944731	53.80	944731-C4	66.90		
3/64	<b>9/64</b> (3x)	I	4	1/8	1-1/2	944747	53.80	944747-C4	66.90		
1/16	<b>.186</b> (3x)	I	6	1/8	1-1/2	944762	51.30	944762-C4	64.40	798862	122.20
1/16	<b>5/16</b> (5x)	I	6	1/8	1-1/2	889262	53.80	889262-C4	66.90		
5/64	<b>15/64</b> (3x)	I	6	1/8	1-1/2	944778	51.30	944778-C4	64.40		
3/32	<b>9/64</b> (1.5x)	I	6	1/8	1-1/2	794793	51.80	794793-C4	64.90		
3/32	<b>.279</b> (3x)	I	6	1/8	1-1/2	944793	51.30	944793-C4	64.40	798893	122.20
3/32	<b>1/2</b> (5x)	I	6	1/8	1-1/2	889293	53.80	889293-C4	66.90		
3/32	<b>3/4</b> (8x)	I	6	1/8	2	<b>751693</b>	57.90	<b>751693-C4</b>	77.20		NEW
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>			D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
1/8	<b>3/16</b> (1.5x)	I	8	1/8	1-1/2	794808	50.00	794808-C4	63.10		
1/8	<b>3/8</b> (3x)	I	8	1/8	1-1/2	944808	49.50	944808-C4	62.60	798908	119.10
1/8	<b>3/8</b> (3x)	II	5	1/8	1-1/2	<b>756808</b>	46.60			<b>731208</b>	110.90
1/8	<b>5/8</b> (5x)	I	8	1/8	2	889208	52.00	889208-C4	65.30		
1/8	<b>1</b> (8x)	I	8	1/8	2-1/2	<b>751708</b>	55.10	<b>751708-C4</b>	68.20		NEW
3/16	<b>9/16</b> (3x)	I	8	3/16	2	944812	54.70	944812-C4	72.80	798912	137.60
3/16	<b>9/16</b> (3x)	II	5	3/16	2	<b>756812</b>	51.40			<b>731212</b>	128.30
3/16	<b>1</b> (5x)	I	8	3/16	2-1/2	889212	57.30	889212-C4	75.40		
3/16	<b>1-1/2</b> (8x)	I	8	3/16	3	<b>751712</b>	60.30	<b>751712-C4</b>	78.40		NEW
1/4	<b>3/8</b> (1.5x)	I	8	1/4	2-1/2	794816	65.60	794816-C4	86.20		
1/4	<b>3/4</b> (3x)	I	8	1/4	2-1/2	944816	65.60	944816-C4	86.20	798916	152.40
1/4	<b>3/4</b> (3x)	II	5	1/4	2-1/2	<b>756816</b>	61.70			<b>731216</b>	142.00
1/4	<b>1-1/4</b> (5x)	I	8	1/4	2-1/2	889216	79.90	889216-C4	100.50		
3/8	<b>1-1/8</b> (3x)	I	10	3/8	3	944824	107.80	944824-C4	132.60		
3/8	<b>1-1/8</b> (3x)	II	5	3/8	3	<b>756824</b>	101.30			<b>731224</b>	202.40
1/2	<b>1-1/2</b> (3x)	I	10	1/2	4	944832	189.70	944832-C4	219.50	798932	382.60
1/2	<b>1-1/2</b> (3x)	II	5	1/2	4	<b>756832</b>	178.30			<b>731232</b>	356.30

## END MILLS FOR WOOD

### Square Upcut



Outstanding in MDF and Plywood!

- Designed for milling natural and engineered woods
- Wedge angle optimized for shearing wood fiber materials without causing tear-out or leaving a fuzzy grain finish
- 2-flute style with deep flute valleys to maximize space for chip evacuation
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$				
1/16	<b>.186</b> (3x)	1/4	2	809562	39.40	809562-C4	60.00
1/16	<b>.312</b> (5x)	1/4	2-1/2	809362	43.20	809362-C4	63.80
5/64	<b>.234</b> (3x)	1/4	2	809578	39.40	809578-C4	60.00
5/64	<b>.406</b> (5x)	1/4	2-1/2	809378	43.20	809378-C4	63.80
3/32	<b>.279</b> (3x)	1/4	2	809593	39.40	809593-C4	60.00
3/32	<b>.500</b> (5x)	1/4	2-1/2	809393	43.20	809393-C4	63.80
1/8	<b>.375</b> (3x)	1/4	2	809608	39.40	809608-C4	60.00
1/8	<b>.625</b> (5x)	1/4	2-1/2	809408	43.20	809408-C4	63.80
3/16	<b>.563</b> (3x)	1/4	2	809612	39.40	809612-C4	60.00
3/16	<b>1.000</b> (5x)	1/4	3	809412	46.40	809412-C4	67.00
1/4	<b>.750</b> (3x)	1/4	2-1/2	809616	48.50	809616-C4	69.10
1/4	<b>1.250</b> (5x)	1/4	3	809416	55.60	809416-C4	76.20
3/8	<b>1.125</b> (3x)	3/8	3	809624	83.40	809624-C4	108.20
3/8	<b>1.875</b> (5x)	3/8	4	809424	98.00	809424-C4	122.80
1/2	<b>1.500</b> (3x)	1/2	4	809632	149.60	809632-C4	179.40
1/2	<b>2.500</b> (5x)	1/2	5	809432	172.00	809432-C4	202.20

WOOD

PLEASE SEE SPEEDS & FEEDS ON PAGE 264

# END MILLS FOR WOOD

## Square Downcut



Outstanding in MDF and Plywood!

- Designed for milling natural and engineered woods
- Wedge angle optimized for shearing wood fiber materials without causing tear-out or leaving a fuzzy grain finish
- Prevents tear-outs and splintering on the top of the workpiece
- Prevents lifting on vacuum tables
- 2 left hand spiral, right hand cut flutes
- Deep flute valleys to maximize space for chip evacuation
- Center cutting
- Solid carbide
- CNC ground in the USA

WOOD

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>				
1/16	.186 (3x)	1/4	2	809162	46.30	809162-C4	66.90
1/16	.312 (5x)	1/4	2-1/2	808962	50.90	808962-C4	71.50
5/64	.234 (3x)	1/4	2	809178	46.30	809178-C4	66.90
5/64	.406 (5x)	1/4	2-1/2	808978	51.90	808978-C4	72.50
3/32	.279 (3x)	1/4	2	809193	46.30	809193-C4	66.90
3/32	.500 (5x)	1/4	2-1/2	808993	51.90	808993-C4	72.50
1/8	.375 (3x)	1/4	2	809208	46.30	809208-C4	66.90
1/8	.625 (5x)	1/4	2-1/2	809008	50.90	809008-C4	71.50
3/16	.563 (3x)	1/4	2	809212	46.30	809212-C4	66.90
3/16	1.000 (5x)	1/4	3	809012	54.70	809012-C4	75.30
1/4	.750 (3x)	1/4	2-1/2	809216	56.70	809216-C4	77.30
1/4	1.250 (5x)	1/4	3	809016	61.90	809016-C4	82.50
3/8	1.125 (3x)	3/8	3	809224	96.50	809224-C4	121.30
3/8	1.875 (5x)	3/8	4	809024	113.10	809024-C4	137.90
1/2	1.500 (3x)	1/2	4	809232	173.80	809232-C4	203.60
1/2	2.500 (5x)	1/2	5	809032	196.40	809032-C4	226.60

### SPEEDS & FEEDS (Square – End Mills for Wood)

**Important Note:** Values in table are in inches and are based on (3x Dia) length of cut end mills. For longer length of cuts, table values of IPT must be reduced (for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

Material	Janka Hardness	SFM		Chip Load Per Tooth (IPT) By Cutter Diameter																Depth of Cut	
				.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	.625	.750	1.000	Radial	Axial	
<b>Softer Woods</b> White Pine, Sugar Pine, Western Red Cedar, Douglas Fir, Redwood	< 1200	400 - 2000	Slot - Rough	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0088	.0118	.0125	.0150	.0200	.0250	.0300	.0400	1 x Dia	1 x Dia	
		800 - 2400	Finishing	.0005	.0011	.0017	.0022	.0028	.0033	.0045	.0067	.0090	.0097	.0116	.0155	.0194	.0233	.0310	.1 x Dia	3 x Dia	
<b>Harder Woods</b> Red Oak, Maple, Ash, Hickory, Black Walnut, Cherry, Beech	> 1200	400 - 2000	Slot - Rough	.0006	.0013	.0020	.0026	.0033	.0039	.0053	.0079	.0106	.0112	.0135	.0180	.0225	.0270	.0360	1 x Dia	1 x Dia	
		800 - 2400	Finishing	.0005	.0010	.0015	.0020	.0025	.0030	.0041	.0061	.0081	.0087	.0105	.0140	.0174	.0209	.0279	.1 x Dia	3 x Dia	
<b>Engineered Woods</b> Medium Density Fiberboard (MDF), Particle Board, Laminated Board	Varies	400 - 2000	Slot - Rough	.0008	.0016	.0024	.0032	.0040	.0048	.0065	.0097	.0129	.0137	.0165	.0220	.0275	.0330	.0440	1 x Dia	1 x Dia	
		800 - 2400	Finishing	.0006	.0012	.0019	.0025	.0031	.0037	.0050	.0074	.0099	.0106	.0128	.0171	.0213	.0256	.0341	.1 x Dia	3 x Dia	
Phenolic Wood	Varies	400 - 1200	Slot - Rough	.0003	.0006	.0009	.0012	.0015	.0017	.0024	.0035	.0047	.0050	.0060	.0080	.0100	.0120	.0160	1 x Dia	1 x Dia	
		800 - 1600	Finishing	.0002	.0004	.0007	.0009	.0011	.0013	.0018	.0027	.0036	.0039	.0047	.0062	.0078	.0093	.0124	.1 x Dia	3 x Dia	

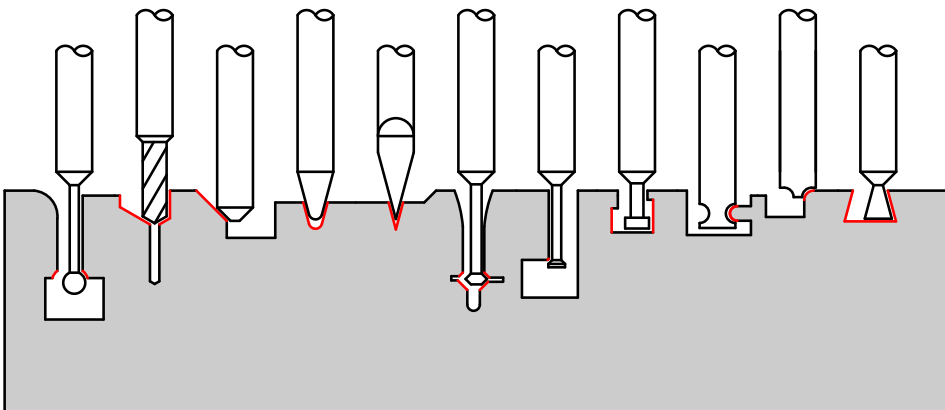


## SPECIALTY PROFILES

At Harvey Tool, we know the details are critical to your machining processes. With that in mind, we offer a broad range of Specialty Profiles to help you make those difficult cuts. For printer-friendly **Speeds & Feeds** and downloadable **Simulation Files** for all products, visit [www.harveytool.com/technical](http://www.harveytool.com/technical).

<b>Undercutting End Mills</b> <b>New Sizes!</b> .....		266
<b>Drill/End Mills</b> .....		281
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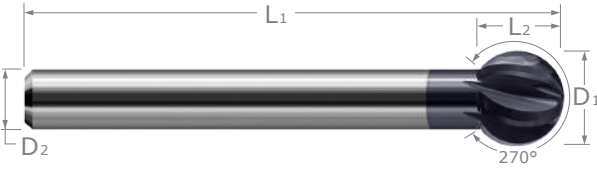
### Machine a Variety of Difficult Profiles!



## UNDERCUTTING END MILLS

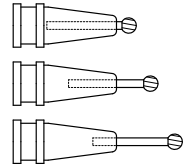
### 270° Reduced Shank

UNDERCUTTING END MILLS



- 270° spherical ball
- Designed for undercutting, deburring, and multi-axis machining
- Reduced straight shank allows any chucking depth
- Center cutting
- Solid carbide construction for maximum rigidity
- 6 flutes
- CNC ground in the USA

**Chuck at Any Depth!**



CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					6 FL	PRICE	6 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
1/4	.217	6	4 mm	3-1/2	956116	255.40	956116-C3	264.30
5/16	.273	6	3/16	3-1/2	956120	260.40	956120-C3	269.30
3/8	.324	6	6 mm	3-1/2	956124	263.00	956124-C3	273.10
1/2	.432	6	5/16	4	956132	276.40	956132-C3	291.50
5/8	.546	6	3/8	4	956140	316.90	956140-C3	333.20
3/4	.645	6	1/2	5	956148	455.90	956148-C3	463.90
1	.873	6	5/8	5	956164	645.10	956164-C3	672.40

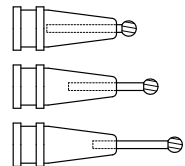
## UNDERCUTTING END MILLS

### 300° Reduced Shank



- 300° spherical ball
- Designed for undercutting, deburring, and multi-axis machining
- Reduced straight shank allows any chucking depth
- Center cutting
- Solid carbide construction for maximum rigidity
- 6 flutes
- CNC ground in the USA

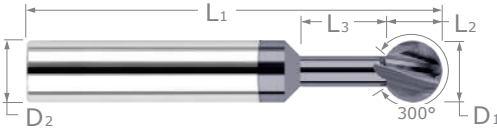
**Chuck at Any Depth!**



CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					6 FL	PRICE	6 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
1/4	.232	6	3 mm	3-1/2	947416	273.70	947416-C3	282.60
3/8	.355	6	4 mm	3-1/2	947424	280.30	947424-C3	290.40
1/2	.472	6	3/16	4	947432	293.60	947432-C3	308.70
5/8	.589	6	1/4	4	947440	334.00	947440-C3	350.30
3/4	.706	6	5/16	5	947448	473.00	947448-C3	490.40
1	.939	6	7/16	5	947464	661.30	947464-C3	688.60

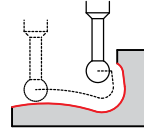
# UNDERCUTTING END MILLS

**300°**



- 300° spherical ball
- Designed for undercutting, deburring, and multi-axis machining
- Center cutting
- Solid carbide
- CNC ground in the USA

Ideal for Undercutting, Deburring, and Profiling



Stocked in Multiple Reach Lengths



UNDERCUTTING END MILLS

CUTTER DIAMETER	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
1/32	.028	.010	<b>.031</b>	2	1/8	1-1/2	983931	72.60	983931-C3	77.80
1/32	.028	.010	<b>.062</b>	2	1/8	1-1/2	979131	72.60	979131-C3	77.80
.0394 (1 mm)	.036	.014	<b>.047</b>	2	1/8	1-1/2	98391M	72.60	98391M-C3	77.80
.0394 (1 mm)	.036	.014	<b>.078</b>	2	1/8	1-1/2	97911M	72.60	97911M-C3	77.80
3/64	.043	.018	<b>.062</b>	2	1/8	1-1/2	983947	72.60	983947-C3	77.80
3/64	.043	.018	<b>.093</b>	2	1/8	1-1/2	979147	72.60	979147-C3	77.80
3/64	.043	.018	<b>.125</b>	2	1/8	1-1/2	940047	72.60	940047-C3	77.80
1/16	.057	.024	<b>.031</b>	2	1/8	1-1/2	989562	51.50	989562-C3	56.70
1/16	.057	.024	<b>.062</b>	2	1/8	1-1/2	875762	51.50	875762-C3	56.70
1/16	.057	.024	<b>.078</b>	2	1/8	1-1/2	983962	51.50	983962-C3	56.70
1/16	.057	.024	<b>.125</b>	2	1/8	1-1/2	979162	51.50	979162-C3	56.70
1/16	.057	.024	<b>.187</b>	2	1/8	1-1/2	940062	51.50	940062-C3	56.70
1/16	.057	.024	<b>.250</b>	2	1/8	1-1/2	767862	51.50	767862-C3	56.70
5/64	.072	.031	<b>.047</b>	2	1/8	1-1/2	989578	51.50	989578-C3	56.70
5/64	.072	.031	<b>.093</b>	2	1/8	1-1/2	983978	51.50	983978-C3	56.70
5/64	.072	.031	<b>.156</b>	2	1/8	1-1/2	979178	51.50	979178-C3	56.70
5/64	.072	.031	<b>.218</b>	2	1/8	1-1/2	940078	51.50	940078-C3	56.70
3/32	.086	.038	<b>.062</b>	2	1/8	1-1/2	989593	51.50	989593-C3	56.70
3/32	.086	.038	<b>.093</b>	2	1/8	1-1/2	875793	51.50	875793-C3	56.70
3/32	.086	.038	<b>.125</b>	2	1/8	1-1/2	983993	51.50	983993-C3	56.70
3/32	.086	.038	<b>.156</b>	2	1/8	1-1/2	926893	51.50	926893-C3	56.70
3/32	.086	.038	<b>.218</b>	2	1/8	1-1/2	979193	51.50	979193-C3	56.70
3/32	.086	.038	<b>.281</b>	2	1/8	1-1/2	940093	51.50	940093-C3	56.70
3/32	.086	.038	<b>.375</b>	2	1/8	1-1/2	766693	51.50	766693-C3	56.70
7/64	.101	.047	<b>.156</b>	2	1/8	1-1/2	984007	52.10	984007-C3	57.30
7/64	.101	.047	<b>.250</b>	2	1/8	1-1/2	979207	52.10	979207-C3	57.30
.1181 (3 mm)	.110	.051	<b>.078</b>	2	1/8	1-1/2	98953M	51.50	98953M-C3	56.70
.1181 (3 mm)	.110	.051	<b>.156</b>	2	1/8	1-1/2	98393M	51.50	98393M-C3	56.70
.1181 (3 mm)	.110	.051	<b>.218</b>	2	1/8	1-1/2	92683M	51.50	92683M-C3	56.70
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$	TOOL #	PRICE	TOOL #	PRICE
1/8	.116	.053	<b>.047</b>	4	1/8	1-1/2	943608	38.20	943608-C3	43.40
1/8	.116	.053	<b>.093</b>	4	1/8	1-1/2	990608	42.00	990608-C3	47.20
1/8	.116	.053	<b>.125</b>	4	1/8	1-1/2	933008	45.20	933008-C3	50.40
1/8	.116	.053	<b>.156</b>	4	1/8	1-1/2	875808	49.10	875808-C3	54.30
1/8	.116	.053	<b>.187</b>	4	1/8	1-1/2	984008	49.10	984008-C3	54.30
1/8	.116	.053	<b>.250</b>	4	1/8	1-1/2	843208	54.80	843208-C3	60.00
1/8	.116	.053	<b>.281</b>	4	1/8	1-1/2	979208	54.80	979208-C3	60.00

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# UNDERCUTTING END MILLS

300° (cont.)

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UNDERCUTTING END MILLS

CUTTER DIAMETER	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000</sup> / <sub>-.002</sub> "	L <sub>2</sub> <sup>+0.020</sup> / <sub>-.000</sub> "		L <sub>3</sub> <sup>+0.030</sup> / <sub>-.000</sub> "		D <sub>2</sub>	L <sub>1</sub>				
1/8	.116	.053	<b>.312</b>	4	1/8	1-1/2	794608	56.90	794608-C3	62.10
1/8	.116	.053	<b>.375</b>	4	1/8	1-1/2	940108	60.40	940108-C3	65.60
1/8	.116	.053	<b>.437</b>	4	1/8	1-1/2	739008	62.60	739008-C3	67.80
1/8	.116	.053	<b>.500</b>	4	1/8	1-1/2	952308	64.70	952308-C3	69.90
1/8	.116	.053	<b>.625</b>	4	1/8	2	911908	87.20	911908-C3	92.40
1/8	.116	.053	<b>.750</b>	4	1/8	3	877908	90.10	877908-C3	95.30
9/64	.130	.062	<b>.125</b>	4	3/16	2	933009	56.80	933009-C3	62.40
9/64	.130	.062	<b>.218</b>	4	3/16	2	984009	59.10	984009-C3	64.70
9/64	.130	.062	<b>.312</b>	4	3/16	2	979209	66.10	979209-C3	71.70
5/32	.145	.071	<b>.047</b>	4	3/16	2	943610	53.00	943610-C3	58.60
5/32	.145	.071	<b>.125</b>	4	3/16	2	990610	53.00	990610-C3	58.60
5/32	.145	.071	<b>.187</b>	4	3/16	2	738810	56.60	738810-C3	62.20
5/32	.145	.071	<b>.250</b>	4	3/16	2	984010	60.10	984010-C3	65.70
5/32	.145	.071	<b>.375</b>	4	3/16	2	979210	69.50	979210-C3	75.10
5/32	.145	.071	<b>.500</b>	4	3/16	2	940110	73.40	940110-C3	79.00
5/32	.145	.071	<b>.625</b>	4	3/16	2	952310	74.90	952310-C3	80.50
3/16	.174	.082	<b>.062</b>	4	3/16	2	943612	53.00	943612-C3	58.60
3/16	.174	.082	<b>.125</b>	4	3/16	2	990612	53.00	990612-C3	58.60
3/16	.174	.082	<b>.187</b>	4	3/16	2	933012	56.60	933012-C3	62.20
3/16	.174	.082	<b>.250</b>	4	3/16	2	984012	60.10	984012-C3	65.70
3/16	.174	.082	<b>.312</b>	4	3/16	2	926912	64.70	926912-C3	70.30
3/16	.174	.082	<b>.375</b>	4	3/16	2	843212	67.00	843212-C3	72.60
3/16	.174	.082	<b>.437</b>	4	3/16	2	979212	69.50	979212-C3	75.10
3/16	.174	.082	<b>.500</b>	4	3/16	2	794612	70.80	794612-C3	76.40
3/16	.174	.082	<b>.625</b>	4	3/16	2	940112	72.00	940112-C3	77.60
3/16	.174	.082	<b>.750</b>	4	3/16	2	952312	75.50	952312-C3	81.10
3/16	.174	.082	<b>.875</b>	4	3/16	2-1/2	834612	78.70	834612-C3	84.30
3/16	.174	.082	<b>1.000</b>	4	3/16	2-1/2	911912	80.30	911912-C3	85.90
3/16	.174	.082	<b>1.250</b>	4	3/16	3	877912	83.60	877912-C3	89.20
.1969 (5 mm)	.182	.086	<b>.156</b>	4	1/4	2-1/2	99065M	73.30	99065M-C3	80.90
.1969 (5 mm)	.182	.086	<b>.250</b>	4	1/4	2-1/2	98405M	76.80	98405M-C3	84.40
7/32	.203	.098	<b>.156</b>	4	1/4	2-1/2	990614	73.30	990614-C3	80.90
7/32	.203	.098	<b>.312</b>	4	1/4	2-1/2	984014	81.50	984014-C3	89.10
.2362 (6 mm)	.220	.106	<b>.156</b>	4	1/4	2-1/2	99066M	72.30	99066M-C3	79.90
.2362 (6 mm)	.220	.106	<b>.312</b>	4	1/4	2-1/2	98406M	81.50	98406M-C3	89.10
.2362 (6 mm)	.220	.106	<b>.437</b>	4	1/4	2-1/2	92696M	84.30	92696M-C3	91.90
.2362 (6 mm)	.220	.106	<b>.562</b>	4	1/4	2-1/2	97926M	88.80	97926M-C3	96.40
1/4	.233	.112	<b>.093</b>	4	1/4	2-1/2	943616	71.00	943616-C3	78.60
1/4	.233	.112	<b>.187</b>	4	1/4	2-1/2	990616	71.00	990616-C3	78.60
1/4	.233	.112	<b>.250</b>	4	1/4	2-1/2	933016	74.90	933016-C3	82.50
1/4	.233	.112	<b>.375</b>	4	1/4	2-1/2	984016	78.20	984016-C3	85.80
1/4	.233	.112	<b>.437</b>	4	1/4	2-1/2	738616	82.30	738616-C3	89.90
1/4	.233	.112	<b>.500</b>	4	1/4	2-1/2	926916	86.30	926916-C3	93.90
1/4	.233	.112	<b>.625</b>	4	1/4	2-1/2	979216	94.70	979216-C3	102.30
1/4	.233	.112	<b>.750</b>	4	1/4	2-1/2	940116	100.90	940116-C3	108.50
1/4	.233	.112	<b>1.000</b>	4	1/4	2-1/2	952316	108.20	952316-C3	115.80
1/4	.233	.112	<b>1.250</b>	4	1/4	3	911916	116.90	911916-C3	124.50
1/4	.233	.112	<b>1.500</b>	4	1/4	4	877916	125.50	877916-C3	134.40

continued on next page

# UNDERCUTTING END MILLS

300° (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
9/32	.262	.127	<b>.187</b>	4	5/16	2-1/2	990618	100.20	990618-C3	109.10
9/32	.262	.127	<b>.375</b>	4	5/16	2-1/2	984018	117.60	984018-C3	126.50
5/16	.291	.143	<b>.250</b>	4	5/16	2-1/2	990620	96.90	990620-C3	105.80
5/16	.291	.143	<b>.437</b>	4	5/16	2-1/2	984020	115.20	984020-C3	124.10
5/16	.291	.143	<b>.750</b>	4	5/16	2-1/2	979220	129.50	979220-C3	138.40
5/16	.291	.143	<b>1.000</b>	4	5/16	2-1/2	940120	144.00	940120-C3	152.90
3/8	.349	.172	<b>.156</b>	4	3/8	2-1/2	943624	101.70	943624-C3	111.80
3/8	.349	.172	<b>.250</b>	4	3/8	2-1/2	990624	103.40	990624-C3	113.50
3/8	.349	.172	<b>.375</b>	4	3/8	2-1/2	933024	112.40	933024-C3	122.50
3/8	.349	.172	<b>.500</b>	4	3/8	2-1/2	984024	121.40	984024-C3	131.50
3/8	.349	.172	<b>.687</b>	4	3/8	2-1/2	926924	131.10	926924-C3	141.20
3/8	.349	.172	<b>.750</b>	4	3/8	2-1/2	843224	134.80	843224-C3	144.90
3/8	.349	.172	<b>1.000</b>	4	3/8	3	979224	141.00	979224-C3	151.10
3/8	.349	.172	<b>1.250</b>	4	3/8	3	940124	147.60	940124-C3	157.70
3/8	.349	.172	<b>1.500</b>	4	3/8	4	952324	171.40	952324-C3	185.20
.3937 (10 mm)	.366	.181	<b>.312</b>	4	7/16	2-3/4	990625	127.60	990625-C3	140.20
.3937 (10 mm)	.366	.181	<b>.562</b>	4	7/16	2-3/4	984025	151.80	984025-C3	164.40
1/2	.466	.230	<b>.187</b>	4	1/2	3	943632	156.60	943632-C3	171.70
1/2	.466	.230	<b>.312</b>	4	1/2	3	990632	157.80	990632-C3	172.90
1/2	.466	.230	<b>.750</b>	4	1/2	3	984032	179.20	984032-C3	194.30
1/2	.466	.230	<b>1.000</b>	4	1/2	3	926932	193.90	926932-C3	209.00
1/2	.466	.230	<b>1.250</b>	4	1/2	4	979232	217.70	979232-C3	232.80
1/2	.466	.230	<b>1.625</b>	4	1/2	4	940132	213.80	940132-C3	228.90
1/2	.466	.230	<b>2.000</b>	4	1/2	4	952332	239.00	952332-C3	254.10
5/8	.583	.292	<b>1.625</b>	4	5/8	4	979240	272.50	979240-C3	288.80
3/4	.699	.355	<b>2.000</b>	4	3/4	6	979248	343.80	979248-C3	367.40

UNDERCUTTING END MILLS

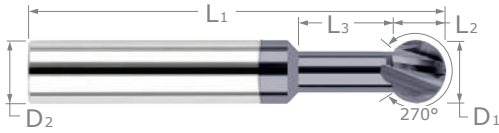


**Check Out All of Our Undercutting Solutions!**

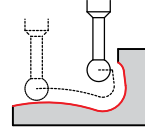
# UNDERCUTTING END MILLS

270°

UNDERCUTTING END MILLS



Ideal for Undercutting, Deburring, and Profiling



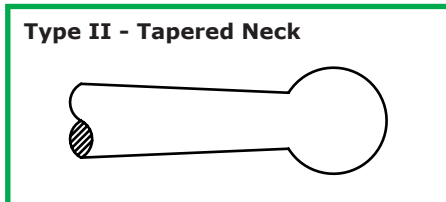
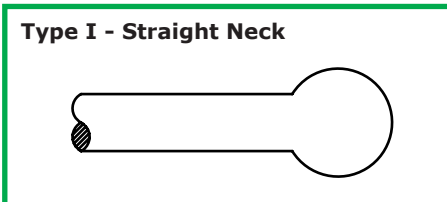
Stocked in Multiple Reach Lengths



- 270° spherical ball
- Designed for undercutting, deburring, and multi-axis machining
- Center cutting
- Choose from two types:
  - Type I: Straight neck
  - Type II: Tapered neck provides increased tool rigidity
- Solid carbide • CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND		
								TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>		L3 <sup>+0.020"</sup> / <sub>-.000"</sub>			D2	L1	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
.0200	.017	.012	<b>.016</b>	I	2	1/8	1-1/2	974220	75.30	974220-C3	80.50			
.0200	.017	.012	<b>.031</b>	I	2	1/8	1-1/2	52820	75.30	52820-C3	80.50			
.0200	.017	.012	<b>.047</b>	I	2	1/8	1-1/2	23200	80.20	23200-C3	85.40			
.0200	.017	.012	<b>.062</b>	I	2	1/8	1-1/2	54620	82.70	54620-C3	87.90			
.0250	.021	.014	<b>.031</b>	I	2	1/8	1-1/2	974225	66.40	974225-C3	71.60			
.0250	.021	.014	<b>.047</b>	I	2	1/8	1-1/2	52825	66.40	52825-C3	71.60			
.0250	.021	.014	<b>.062</b>	I	2	1/8	1-1/2	23201	71.40	23201-C3	76.60			
.0250	.021	.014	<b>.078</b>	I	2	1/8	1-1/2	54625	73.90	54625-C3	79.10			
1/32	.027	.016	<b>.015</b>	I	2	1/8	1-1/2	931502	60.90	931502-C3	66.10			
1/32	.027	.016	<b>.031</b>	I	2	1/8	1-1/2	23102	60.90	23102-C3	66.10			
1/32	.027	.016	<b>.047</b>	I	2	1/8	1-1/2	974231	60.90	974231-C3	66.10			
1/32	.027	.016	<b>.047</b>	II	2	1/8	1-1/2	<b>758431</b>	62.10	<b>758431-C3</b>	67.30		NEW	
1/32	.027	.016	<b>.062</b>	I	2	1/8	1-1/2	52831	60.90	52831-C3	66.10			
1/32	.027	.016	<b>.078</b>	I	2	1/8	1-1/2	39731	60.90	39731-C3	66.10			
1/32	.027	.016	<b>.093</b>	I	2	1/8	1-1/2	23202	62.50	23202-C3	67.70			
1/32	.027	.016	<b>.125</b>	I	2	1/8	1-1/2	54631	71.40	54631-C3	76.60			
1/32	.027	.016	<b>.187</b>	I	2	1/8	1-1/2	55202	71.40	55202-C3	76.60			
1/32	.027	.016	<b>.218</b>	I	2	1/8	1-1/2	867731	60.90	867731-C3	66.10			
.0394 (1 mm)	.033	.024	<b>.047</b>	I	2	1/8	1-1/2	2311M	60.90	2311M-C3	66.10			
.0394 (1 mm)	.033	.024	<b>.062</b>	I	2	1/8	1-1/2	97421M	60.90	97421M-C3	66.10			
.0394 (1 mm)	.033	.024	<b>.078</b>	I	2	1/8	1-1/2	5281M	61.40	5281M-C3	66.60			
.0394 (1 mm)	.033	.024	<b>.093</b>	I	2	1/8	1-1/2	3971M	60.90	3971M-C3	66.10			
.0394 (1 mm)	.033	.024	<b>.125</b>	I	2	1/8	1-1/2	2321M	69.60	2321M-C3	74.80			
.0394 (1 mm)	.033	.024	<b>.187</b>	I	2	1/8	1-1/2	54639	71.40	54639-C3	76.60			
.0394 (1 mm)	.033	.024	<b>.250</b>	I	2	1/8	1-1/2	5521M	78.90	5521M-C3	84.10			
.0400	.034	.024	<b>.093</b>	I	2	1/8	1-1/2	39771	60.90	39771-C3	66.10			
.0400	.034	.024	<b>.125</b>	I	2	1/8	1-1/2	23271	61.40	23271-C3	66.60			
3/64	.040	.029	<b>.047</b>	I	2	1/8	1-1/2	23103	60.90	23103-C3	66.10			
3/64	.040	.029	<b>.062</b>	I	2	1/8	1-1/2	974247	60.90	974247-C3	66.10			
3/64	.040	.029	<b>.062</b>	II	2	1/8	1-1/2	<b>758447</b>	62.10	<b>758447-C3</b>	67.30		NEW	
3/64	.040	.029	<b>.093</b>	I	2	1/8	1-1/2	52847	60.90	52847-C3	66.10	<b>52847-C4</b>	74.00	NEW

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**UNDERCUTTING END MILLS**

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	CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AISI COATED		AMORPHOUS DIAMOND	
	D <sub>1</sub> + <sup>.000</sup> / <sub>-.001</sub> "	L <sub>2</sub> + <sup>.010</sup> / <sub>-.000</sub> "		L <sub>3</sub> + <sup>.020</sup> / <sub>-.000</sub> "					D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
NEW	3/64	.040	.029	.125	I	2	1/8	1-1/2	39703	60.90	39703-C3	66.10		
	3/64	.040	.029	.156	I	2	1/8	1-1/2	23203	71.40	23203-C3	76.60	23203-C4	84.50
	3/64	.040	.029	.187	I	2	1/8	1-1/2	41303	71.40	41303-C3	76.60		
	3/64	.040	.029	.250	I	2	1/8	1-1/2	54647	71.40	54647-C3	76.60		
	3/64	.040	.029	.312	I	2	1/8	1-1/2	909047	75.70	909047-C3	80.90		
	3/64	.040	.029	.375	I	2	1/8	1-1/2	55203	75.00	55203-C3	80.20		
	3/64	.040	.029	.437	I	2	1/8	2	867747	82.50	867747-C3	87.70		
	.0500	.042	.030	.093	I	2	1/8	1-1/2	52850	50.70	52850-C3	55.90		
	.0500	.042	.030	.125	I	2	1/8	1-1/2	39750	50.70	39750-C3	55.90		
	.0500	.042	.030	.156	I	2	1/8	1-1/2	23250	61.20	23250-C3	66.40		
	1/16	.053	.037	.031	I	2	1/8	1-1/2	931504	40.50	931504-C3	45.70		
	1/16	.053	.037	.047	I	2	1/8	1-1/2	774262	40.90	774262-C3	46.10		
	1/16	.053	.037	.062	I	2	1/8	1-1/2	23104	40.50	23104-C3	45.70		
	1/16	.053	.037	.078	I	2	1/8	1-1/2	974262	40.90	974262-C3	46.10		
NEW	1/16	.053	.037	.078	II	2	1/8	1-1/2	758462	41.30	758462-C3	46.50		
NEW	1/16	.053	.037	.093	I	2	1/8	1-1/2	52862	40.50	52862-C3	45.70	52862-C4	53.60
	1/16	.053	.037	.125	I	2	1/8	1-1/2	39704	42.20	39704-C3	47.40		
	1/16	.053	.037	.156	I	2	1/8	1-1/2	794362	42.20	794362-C3	47.40		
NEW	1/16	.053	.037	.187	I	2	1/8	1-1/2	23204	42.20	23204-C3	47.40	23204-C4	55.30
	1/16	.053	.037	.218	I	2	1/8	1-1/2	41304	48.00	41304-C3	53.20		
	1/16	.053	.037	.250	I	2	1/8	1-1/2	54662	52.10	54662-C3	57.30		
	1/16	.053	.037	.312	I	2	1/8	1-1/2	909062	52.10	909062-C3	57.30		
	1/16	.053	.037	.375	I	2	1/8	1-1/2	55204	52.10	55204-C3	57.30		
	1/16	.053	.037	.437	I	2	1/8	2	867762	59.70	867762-C3	64.90		
	1/16	.053	.037	.500	I	2	1/8	2	775462	59.70	775462-C3	64.90		
	5/64	.067	.045	.031	I	2	1/8	1-1/2	931505	41.60	931505-C3	46.80		
	5/64	.067	.045	.062	I	2	1/8	1-1/2	23105	41.20	23105-C3	46.40		
	5/64	.067	.045	.093	I	2	1/8	1-1/2	974278	41.60	974278-C3	46.80		
NEW	5/64	.067	.045	.093	II	2	1/8	1-1/2	758478	42.10	758478-C3	47.30		
NEW	5/64	.067	.045	.125	I	2	1/8	1-1/2	52878	41.20	52878-C3	46.40	52878-C4	54.30
	5/64	.067	.045	.187	I	2	1/8	1-1/2	39705	43.50	39705-C3	48.70		
NEW	5/64	.067	.045	.250	I	2	1/8	1-1/2	23205	44.30	23205-C3	49.50	23205-C4	57.40
	5/64	.067	.045	.312	I	2	1/8	1-1/2	41305	44.30	41305-C3	49.50		
	5/64	.067	.045	.375	I	2	1/8	2	54678	53.00	54678-C3	58.20		
	5/64	.067	.045	.500	I	2	1/8	2	55205	53.00	55205-C3	58.20		
	5/64	.067	.045	.625	I	2	1/8	2	867778	53.00	867778-C3	58.20		
	3/32	.079	.054	.031	I	2	1/8	1-1/2	931506	41.20	931506-C3	46.40		
	3/32	.079	.054	.062	I	2	1/8	1-1/2	23106	41.20	23106-C3	46.40		
	3/32	.079	.054	.093	I	2	1/8	1-1/2	789893	41.60	789893-C3	46.80		
	3/32	.079	.054	.125	I	2	1/8	1-1/2	974293	41.20	974293-C3	46.40		
NEW	3/32	.079	.054	.125	II	2	1/8	1-1/2	758493	42.10	758493-C3	47.30		
	3/32	.079	.054	.187	I	2	1/8	1-1/2	905106	41.20	905106-C3	46.40		
NEW	3/32	.079	.054	.250	I	2	1/8	1-1/2	52893	41.20	52893-C3	46.40	52893-C4	54.30
	3/32	.079	.054	.312	I	2	1/8	1-1/2	39706	45.40	39706-C3	50.60		
NEW	3/32	.079	.054	.375	I	2	1/8	1-1/2	23206	45.00	23206-C3	50.20	23206-C4	58.10
	3/32	.079	.054	.437	I	2	1/8	2	41306	53.00	41306-C3	58.20		
	3/32	.079	.054	.500	I	2	1/8	2	54693	53.00	54693-C3	58.20		
	3/32	.079	.054	.625	I	2	1/8	2	55206	60.90	55206-C3	66.10		
	3/32	.079	.054	.750	I	2	1/8	2	867793	61.40	867793-C3	66.60		

UNDERCUTTING END MILLS

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# UNDERCUTTING END MILLS

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UNDERCUTTING END MILLS

CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND		
								TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+ .000"</sup> <sub>-.002"</sub>	L <sub>2</sub> <sup>+ .020"</sup> <sub>-.000"</sub>		L <sub>3</sub> <sup>+ .030"</sup> <sub>-.000"</sub>			D <sub>2</sub>	L <sub>1</sub>							
.1000	.085	.060	.312	I	2	1/8	1-1/2	39783	45.40	39783-C3	50.60			
.1000	.085	.060	.375	I	2	1/8	1-1/2	23283	45.40	23283-C3	50.60			
7/64	.093	.064	.187	I	2	1/8	1-1/2	905107	40.90	905107-C3	46.10			
7/64	.093	.064	.250	I	2	1/8	1-1/2	52907	40.90	52907-C3	46.10			
7/64	.093	.064	.375	I	2	1/8	1-1/2	39707	44.70	39707-C3	49.90			
7/64	.093	.064	.500	I	2	1/8	2	23207	52.10	23207-C3	57.30			
7/64	.093	.064	1.000	I	2	1/8	3	29507	59.70	29507-C3	64.90			
.1181 (3 mm)	.100	.070	.093	I	2	1/8	1-1/2	2313M	40.90	2313M-C3	46.10			
.1181 (3 mm)	.100	.070	.156	II	2	1/8	1-1/2	75843M	41.30	75843M-C3	46.50		NEW	
.1181 (3 mm)	.100	.070	.187	I	2	1/8	1-1/2	90513M	40.90	90513M-C3	46.10			
.1181 (3 mm)	.100	.070	.250	I	2	1/8	1-1/2	5283M	40.90	5283M-C3	46.10			
.1181 (3 mm)	.100	.070	.375	I	2	1/8	1-1/2	3973M	44.70	3973M-C3	49.90			
.1181 (3 mm)	.100	.070	.500	I	2	1/8	2	2323M	52.10	2323M-C3	57.30			
1/8	.107	.076	.062	I	4	1/8	1-1/2	931508	35.70	931508-C3	40.90			
1/8	.107	.076	.093	I	4	1/8	1-1/2	787908	36.00	787908-C3	41.20			
1/8	.107	.076	.125	I	4	1/8	1-1/2	23108	35.70	23108-C3	40.90			
1/8	.107	.076	.187	I	4	1/8	1-1/2	974308	36.60	974308-C3	41.80			
1/8	.107	.076	.187	II	4	1/8	1-1/2	758508	37.30	758508-C3	42.50		NEW	
1/8	.107	.076	.250	I	4	1/8	1-1/2	52908	37.80	52908-C3	43.00	52908-C4	50.90	NEW
1/8	.107	.076	.312	I	4	1/8	1-1/2	828408	38.20	828408-C3	43.40			
1/8	.107	.076	.375	I	4	1/8	1-1/2	39708	38.50	39708-C3	43.70			
1/8	.107	.076	.437	I	4	1/8	1-1/2	794408	41.60	794408-C3	46.80			
1/8	.107	.076	.500	I	4	1/8	1-1/2	23208	41.20	23208-C3	46.40	23208-C4	54.30	NEW
1/8	.107	.076	.625	I	4	1/8	2	922908	44.10	922908-C3	49.30			
1/8	.107	.076	.750	I	4	1/8	2	41308	44.10	41308-C3	49.30			
1/8	.107	.076	.875	I	4	1/8	3	846608	45.90	846608-C3	51.10			
1/8	.107	.076	1.000	I	4	1/8	3	29508	47.80	29508-C3	53.00			
1/8	.107	.076	1.125	I	4	1/8	3	769508	50.00	769508-C3	55.20			
1/8	.107	.076	1.250	I	4	1/8	3	960608	51.20	960608-C3	56.40			
1/8	.107	.076	1.500	I	4	1/8	3	55208	54.60	55208-C3	59.80			
1/8	.107	.076	1.750	I	4	1/8	3	929608	57.40	929608-C3	62.60			
9/64	.119	.084	.125	I	4	3/16	2	23109	42.50	23109-C3	48.10			
9/64	.119	.084	.250	I	4	3/16	2	52909	46.00	52909-C3	51.60			
9/64	.119	.084	.375	I	4	3/16	2	39709	49.50	39709-C3	55.10			
9/64	.119	.084	.500	I	4	3/16	2	23209	51.90	23209-C3	57.50			
9/64	.119	.084	.750	I	4	3/16	2	41309	55.70	41309-C3	61.30			
5/32	.133	.098	.078	I	4	3/16	2	931510	42.50	931510-C3	48.10			
5/32	.133	.098	.125	I	4	3/16	2	23110	42.50	23110-C3	48.10			
5/32	.133	.098	.187	I	4	3/16	2	974310	43.30	974310-C3	48.90		NEW	
5/32	.133	.098	.250	I	4	3/16	2	52910	46.00	52910-C3	51.60			
5/32	.133	.098	.375	I	4	3/16	2	39710	48.50	39710-C3	54.10			
5/32	.133	.098	.500	I	4	3/16	2	23210	51.90	23210-C3	57.50			
5/32	.133	.098	.750	I	4	3/16	2	41310	55.70	41310-C3	61.30			
5/32	.133	.098	1.000	I	4	3/16	3	29510	60.20	29510-C3	65.80			
5/32	.133	.098	1.500	I	4	3/16	3	55210	63.30	55210-C3	68.90			

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# UNDERCUTTING END MILLS

270° (cont.)

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	CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
	D <sub>1</sub> <sup>+0.000"</sup> <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> <sub>-.000"</sub>	D <sub>2</sub>					L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #
	3/16	.160	.117	<b>.078</b>	I	4	3/16	2	931512	42.50	931512-C3	48.10		
	3/16	.160	.117	<b>.093</b>	I	4	3/16	2	787912	42.90	787912-C3	48.50		
	3/16	.160	.117	<b>.125</b>	I	4	3/16	2	23112	42.50	23112-C3	48.10		
	3/16	.160	.117	<b>.187</b>	I	4	3/16	2	974312	46.00	974312-C3	51.60		
NEW	3/16	.160	.117	<b>.187</b>	II	4	3/16	2	758512	47.00	758512-C3	52.60		
NEW	3/16	.160	.117	<b>.250</b>	I	4	3/16	2	52912	46.00	52912-C3	51.60	52912-C4	64.10
	3/16	.160	.117	<b>.375</b>	I	4	3/16	2	39712	48.50	39712-C3	54.10		
	3/16	.160	.117	<b>.437</b>	I	4	3/16	2	794412	50.70	794412-C3	56.30		
NEW	3/16	.160	.117	<b>.500</b>	I	4	3/16	2	23212	50.20	23212-C3	55.80	23212-C4	68.30
	3/16	.160	.117	<b>.625</b>	I	4	3/16	2	922912	53.10	922912-C3	58.70		
	3/16	.160	.117	<b>.750</b>	I	4	3/16	2	41312	55.70	41312-C3	61.30		
	3/16	.160	.117	<b>.875</b>	I	4	3/16	3	846612	58.00	846612-C3	63.60		
	3/16	.160	.117	<b>1.000</b>	I	4	3/16	3	29512	60.20	29512-C3	65.80		
	3/16	.160	.117	<b>1.250</b>	I	4	3/16	3	960612	62.60	960612-C3	68.20		
	3/16	.160	.117	<b>1.500</b>	I	4	3/16	3	55212	64.90	55212-C3	70.50		
	3/16	.160	.117	<b>1.750</b>	I	4	3/16	3	929612	76.70	929612-C3	82.30		
	.1969 (5 mm)	.167	.119	<b>.250</b>	I	4	1/4	2-1/2	5295M	59.50	5295M-C3	67.10		
	.1969 (5 mm)	.167	.119	<b>.500</b>	I	4	1/4	2-1/2	2325M	60.90	2325M-C3	68.50		
	.1969 (5 mm)	.167	.119	<b>1.000</b>	I	4	1/4	4	2955M	69.80	2955M-C3	78.70		
	7/32	.186	.138	<b>.250</b>	I	4	1/4	2-1/2	52914	63.90	52914-C3	71.50		
	7/32	.186	.138	<b>.500</b>	I	4	1/4	2-1/2	23214	66.40	23214-C3	74.00		
	7/32	.186	.138	<b>.750</b>	I	4	1/4	2-1/2	41314	70.00	41314-C3	77.60		
	.2362 (6 mm)	.201	.148	<b>.250</b>	I	4	1/4	2-1/2	97436M	59.00	97436M-C3	66.60		
	.2362 (6 mm)	.201	.148	<b>.375</b>	I	4	1/4	2-1/2	5296M	59.00	5296M-C3	66.60		
	.2362 (6 mm)	.201	.148	<b>.500</b>	I	4	1/4	2-1/2	3976M	62.10	3976M-C3	69.70		
	.2362 (6 mm)	.201	.148	<b>.750</b>	I	4	1/4	2-1/2	2326M	65.90	2326M-C3	73.50		
	.2362 (6 mm)	.201	.148	<b>1.250</b>	I	4	1/4	4	2956M	75.00	2956M-C3	83.90		
	.2362 (6 mm)	.201	.148	<b>2.000</b>	I	4	1/4	4	96066M	87.50	96066M-C3	96.40		
	1/4	.213	.158	<b>.078</b>	I	4	1/4	2-1/2	931516	57.20	931516-C3	64.80		
	1/4	.213	.158	<b>.125</b>	I	4	1/4	2-1/2	23116	56.70	23116-C3	64.30		
	1/4	.213	.158	<b>.187</b>	I	4	1/4	2-1/2	789916	57.20	789916-C3	64.80		
	1/4	.213	.158	<b>.250</b>	I	4	1/4	2-1/2	974316	59.50	974316-C3	67.10		
NEW	1/4	.213	.158	<b>.250</b>	II	4	1/4	2-1/2	758516	61.20	758516-C3	68.80		
	1/4	.213	.158	<b>.312</b>	I	4	1/4	2-1/2	905116	60.10	905116-C3	67.70		
NEW	1/4	.213	.158	<b>.375</b>	I	4	1/4	2-1/2	52916	60.20	52916-C3	67.80	52916-C4	80.80
NEW	1/4	.213	.158	<b>.437</b>	I	4	1/4	2-1/2	828416	61.40	828416-C3	69.00		
	1/4	.213	.158	<b>.500</b>	I	4	1/4	2-1/2	39716	62.10	39716-C3	69.70		
	1/4	.213	.158	<b>.625</b>	I	4	1/4	2-1/2	927616	62.60	927616-C3	70.20		
NEW	1/4	.213	.158	<b>.750</b>	I	4	1/4	2-1/2	23216	65.90	23216-C3	73.50	23216-C4	86.50
	1/4	.213	.158	<b>.875</b>	I	4	1/4	2-1/2	786916	66.50	786916-C3	74.10		
	1/4	.213	.158	<b>1.000</b>	I	4	1/4	2-1/2	922916	66.80	922916-C3	74.40		
	1/4	.213	.158	<b>1.125</b>	I	4	1/4	2-1/2	41316	69.40	41316-C3	77.00		
	1/4	.213	.158	<b>1.250</b>	I	4	1/4	4	846616	74.50	846616-C3	83.40		
	1/4	.213	.158	<b>1.500</b>	I	4	1/4	4	29516	76.30	29516-C3	85.20		
	1/4	.213	.158	<b>2.000</b>	I	4	1/4	4	960616	81.00	960616-C3	89.90		
	1/4	.213	.158	<b>2.250</b>	I	4	1/4	4	55216	85.90	55216-C3	94.80		
	1/4	.213	.158	<b>2.500</b>	I	4	1/4	4	929616	113.10	929616-C3	122.00		

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UNDERCUTTING END MILLS

# UNDERCUTTING END MILLS

270° (cont.)

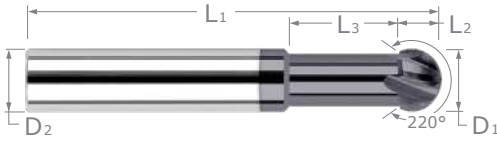
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UNDERCUTTING END MILLS

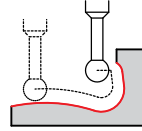
CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND		
								TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>			D <sub>2</sub>	L <sub>1</sub>							
9/32	.240	.180	.375	I	4	5/16	2-1/2	52918	80.20	52918-C3	89.10			
9/32	.240	.180	.750	I	4	5/16	2-1/2	23218	82.50	23218-C3	91.40			
5/16	.266	.201	.187	I	4	5/16	2-1/2	23120	75.90	23120-C3	84.80			
5/16	.266	.201	.375	I	4	5/16	2-1/2	52920	78.90	52920-C3	87.80			
5/16	.266	.201	.500	I	4	5/16	2-1/2	39720	80.80	39720-C3	89.70			
5/16	.266	.201	.750	I	4	5/16	2-1/2	23220	85.10	23220-C3	94.00			
5/16	.266	.201	1.125	I	4	5/16	4	41320	96.60	41320-C3	107.30			
5/16	.266	.201	1.500	I	4	5/16	4	29520	103.30	29520-C3	114.00			
5/16	.266	.201	2.000	I	4	5/16	4	960620	109.60	960620-C3	120.30			
5/16	.266	.201	2.250	I	4	5/16	4	55220	111.40	55220-C3	122.10			
5/16	.266	.201	2.500	I	4	5/16	4	929620	111.40	929620-C3	122.10			
3/8	.320	.241	.093	I	4	3/8	2-1/2	931524	81.90	931524-C3	92.00			
3/8	.320	.241	.187	I	4	3/8	2-1/2	23124	81.90	23124-C3	92.00			
3/8	.320	.241	.250	II	4	3/8	2-1/2	758524	83.50	758524-C3	93.60		NEW	
3/8	.320	.241	.375	I	4	3/8	2-1/2	52924	83.80	52924-C3	93.90	52924-C4	108.60	NEW
3/8	.320	.241	.500	I	4	3/8	2-1/2	39724	83.80	39724-C3	93.90			
3/8	.320	.241	.750	I	4	3/8	2-1/2	23224	85.10	23224-C3	95.20	23224-C4	109.90	NEW
3/8	.320	.241	1.000	I	4	3/8	2-1/2	922924	96.20	922924-C3	106.30			
3/8	.320	.241	1.125	I	4	3/8	4	41324	105.40	41324-C3	119.20			
3/8	.320	.241	1.500	I	4	3/8	4	29524	108.30	29524-C3	122.10			
3/8	.320	.241	2.000	I	4	3/8	4	960624	112.10	960624-C3	125.90			
3/8	.320	.241	2.250	I	4	3/8	4	55224	116.20	55224-C3	130.00			
3/8	.320	.241	2.500	I	4	3/8	4	929624	119.90	929624-C3	133.70			
.3937 (10 mm)	.335	.252	.375	I	4	7/16	2-3/4	52925	118.40	52925-C3	131.00			
.3937 (10 mm)	.335	.252	.750	I	4	7/16	2-3/4	23225	118.80	23225-C3	131.40			
7/16	.373	.285	.500	I	4	7/16	2-3/4	52928	114.90	52928-C3	127.50			
7/16	.373	.285	1.000	I	4	7/16	2-3/4	23228	118.80	23228-C3	131.40			
.4724 (12 mm)	.403	.308	.500	I	4	1/2	3	52931	149.60	52931-C3	164.70			
.4724 (12 mm)	.403	.308	1.000	I	4	1/2	3	23231	158.10	23231-C3	173.20			
1/2	.427	.323	.187	I	4	1/2	3	23132	117.50	23132-C3	132.60			
1/2	.427	.323	.312	II	4	1/2	3	758532	119.80	758532-C3	134.90		NEW	
1/2	.427	.323	.500	I	4	1/2	3	52932	118.60	52932-C3	133.70	52932-C4	148.50	NEW
1/2	.427	.323	.750	I	4	1/2	3	39732	121.70	39732-C3	136.80			
1/2	.427	.323	1.000	I	4	1/2	3	23232	122.50	23232-C3	137.60	23232-C4	152.40	NEW
1/2	.427	.323	1.250	I	4	1/2	3	922932	127.40	922932-C3	142.50			
1/2	.427	.323	1.500	I	4	1/2	6	41332	208.60	41332-C3	223.70			
1/2	.427	.323	2.000	I	4	1/2	6	29532	213.30	29532-C3	228.40			
1/2	.427	.323	2.500	I	4	1/2	6	960632	213.50	960632-C3	228.60			
1/2	.427	.323	3.000	I	4	1/2	6	55232	228.00	55232-C3	243.10			
1/2	.427	.323	3.500	I	4	1/2	6	929632	240.10	929632-C3	255.20			
5/8	.533	.412	1.000	I	4	5/8	3-1/2	39740	246.20	39740-C3	261.30			
5/8	.533	.412	1.500	I	4	5/8	3-1/2	23240	246.20	23240-C3	261.30			
3/4	.640	.500	1.000	I	4	3/4	4	39748	251.10	39748-C3	267.40		NEW	
3/4	.640	.500	1.500	I	4	3/4	4	23248	339.00	23248-C3	355.30			

## UNDERCUTTING END MILLS

220°



Ideal for  
Undercutting,  
Deburring,  
and Profiling



Stocked in  
Multiple Reach  
Lengths



UNDERCUTTING END MILLS

- 220° spherical ball
- Designed for undercutting, deburring, and multi-axis machining
- Center cutting • Solid carbide • CNC ground in the USA

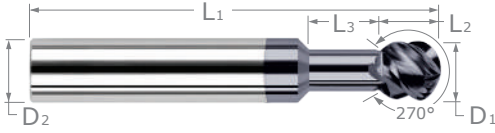
CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
1/32	.021	.023	<b>.093</b>	2	1/8	1-1/2	22802	61.50	22802-C3	66.70
.0394 (1 mm)	.026	.030	<b>.093</b>	2	1/8	1-1/2	785839	62.10	785839-C3	67.30
.0394 (1 mm)	.026	.030	<b>.125</b>	2	1/8	1-1/2	2281M	68.70	2281M-C3	73.90
3/64	.031	.035	<b>.156</b>	2	1/8	1-1/2	22803	61.50	22803-C3	66.70
1/16	.042	.047	<b>.062</b>	2	1/8	1-1/2	22704	41.80	22704-C3	47.00
1/16	.042	.047	<b>.125</b>	2	1/8	1-1/2	785862	43.60	785862-C3	48.80
1/16	.042	.047	<b>.187</b>	2	1/8	1-1/2	22804	43.60	22804-C3	48.80
1/16	.042	.047	<b>.250</b>	2	1/8	1-1/2	22904	43.60	22904-C3	48.80
5/64	.052	.059	<b>.062</b>	2	1/8	1-1/2	22705	41.80	22705-C3	47.00
5/64	.052	.059	<b>.250</b>	2	1/8	1-1/2	22805	43.60	22805-C3	48.80
3/32	.063	.070	<b>.062</b>	2	1/8	1-1/2	22706	41.80	22706-C3	47.00
3/32	.063	.070	<b>.375</b>	2	1/8	1-1/2	22806	44.30	22806-C3	49.50
.1181 (3 mm)	.079	.090	<b>.500</b>	2	1/8	2	2283M	45.40	2283M-C3	50.60

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
1/8	.084	.094	<b>.125</b>	4	1/8	1-1/2	22708	36.10	22708-C3	41.30
1/8	.084	.094	<b>.250</b>	4	1/8	1-1/2	826708	37.80	826708-C3	43.00
1/8	.084	.094	<b>.500</b>	4	1/8	1-1/2	22808	40.70	22808-C3	45.90
1/8	.084	.094	<b>.750</b>	4	1/8	2	833808	43.80	833808-C3	49.00
1/8	.084	.094	<b>1.000</b>	4	1/8	3	22908	47.00	22908-C3	52.20
1/8	.084	.094	<b>1.500</b>	4	1/8	3	971608	57.90	971608-C3	63.10
5/32	.105	.125	<b>.500</b>	4	3/16	2	22810	51.00	22810-C3	56.60
3/16	.126	.141	<b>.125</b>	4	3/16	2	22712	42.90	22712-C3	48.50
3/16	.126	.141	<b>.250</b>	4	3/16	2	826712	45.50	826712-C3	51.10
3/16	.126	.141	<b>.500</b>	4	3/16	2	22812	51.00	22812-C3	56.60
3/16	.126	.141	<b>.750</b>	4	3/16	2	833812	54.90	833812-C3	60.50
3/16	.126	.141	<b>1.000</b>	4	3/16	3	22912	59.00	22912-C3	64.60
.2362 (6 mm)	.158	.172	<b>.750</b>	4	1/4	2-1/2	2286M	64.50	2286M-C3	72.10
1/4	.168	.188	<b>.125</b>	4	1/4	2-1/2	22716	57.60	22716-C3	65.20
1/4	.168	.188	<b>.375</b>	4	1/4	2-1/2	826716	59.80	826716-C3	67.40
1/4	.168	.188	<b>.750</b>	4	1/4	2-1/2	22816	64.50	22816-C3	72.10
1/4	.168	.188	<b>1.000</b>	4	1/4	2-1/2	833816	68.00	833816-C3	75.60
1/4	.168	.188	<b>1.500</b>	4	1/4	4	22916	75.00	22916-C3	83.90
1/4	.168	.188	<b>2.250</b>	4	1/4	4	971616	97.90	971616-C3	106.80
5/16	.210	.235	<b>.187</b>	4	5/16	2-1/2	22720	76.70	22720-C3	85.60
5/16	.210	.235	<b>.750</b>	4	5/16	2-1/2	22820	83.80	22820-C3	92.70
5/16	.210	.235	<b>1.500</b>	4	5/16	4	22920	101.20	22920-C3	111.90
3/8	.252	.281	<b>.187</b>	4	3/8	2-1/2	22724	82.50	22724-C3	92.60
3/8	.252	.281	<b>.750</b>	4	3/8	2-1/2	22824	87.80	22824-C3	97.90
3/8	.252	.281	<b>1.500</b>	4	3/8	4	22924	106.30	22924-C3	120.10
3/8	.252	.281	<b>2.250</b>	4	3/8	4	971624	147.50	971624-C3	161.30
1/2	.336	.375	<b>.187</b>	4	1/2	3	22732	119.10	22732-C3	134.20
1/2	.336	.375	<b>1.000</b>	4	1/2	3	22832	126.60	22832-C3	141.70
1/2	.336	.375	<b>2.000</b>	4	1/2	6	22932	209.70	22932-C3	224.80

# UNDERCUTTING END MILLS

## 270° High Helix

UNDERCUTTING END MILLS



High Helix  
for Improved  
Performance!



270° Spherical Ball

- 45° helix for faster chip removal and better finish
- 270° spherical ball • Center cutting
- Designed for undercutting, deburring, and multi-axis machining
- Solid carbide • CNC ground in the USA

CUTTER DIA.	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AITiN COATED		TiB <sub>2</sub> COATED	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
1/32	.027	.016	<b>.062</b>	2	1/8	1-1/2	951131	70.20	951131-C3	75.40		
1/32	.027	.016	<b>.093</b>	2	1/8	1-1/2	966531	70.20	966531-C3	75.40		
.0394 (1 mm)	.033	.024	<b>.078</b>	2	1/8	1-1/2	95111M	70.20	95111M-C3	75.40		
.0394 (1 mm)	.033	.024	<b>.125</b>	2	1/8	1-1/2	96651M	70.20	96651M-C3	75.40		
3/64	.040	.029	<b>.093</b>	2	1/8	1-1/2	951147	70.20	951147-C3	75.40		
3/64	.040	.029	<b>.156</b>	2	1/8	1-1/2	966547	70.20	966547-C3	75.40		
1/16	.053	.037	<b>.093</b>	2	1/8	1-1/2	951162	50.80	951162-C3	56.00	951162-C8	58.40
1/16	.053	.037	<b>.125</b>	2	1/8	1-1/2	773762	52.50	773762-C3	57.70		
1/16	.053	.037	<b>.187</b>	2	1/8	1-1/2	966562	52.50	966562-C3	57.70	966562-C8	60.10
1/16	.053	.037	<b>.250</b>	2	1/8	1-1/2	970462	64.20	970462-C3	69.40	970462-C8	71.80
5/64	.067	.045	<b>.125</b>	2	1/8	1-1/2	951178	50.80	951178-C3	56.00	951178-C8	58.40
5/64	.067	.045	<b>.250</b>	2	1/8	1-1/2	966578	52.50	966578-C3	57.70	966578-C8	60.10
5/64	.067	.045	<b>.375</b>	2	1/8	2	970478	64.20	970478-C3	69.40	970478-C8	71.80
3/32	.079	.054	<b>.062</b>	2	1/8	1-1/2	774493	48.50	774493-C3	53.70		
3/32	.079	.054	<b>.125</b>	2	1/8	1-1/2	837393	48.50	837393-C3	53.70	837393-C8	56.10
3/32	.079	.054	<b>.250</b>	2	1/8	1-1/2	951193	50.80	951193-C3	56.00	951193-C8	58.40
3/32	.079	.054	<b>.375</b>	2	1/8	1-1/2	966593	55.60	966593-C3	60.80	966593-C8	63.20
3/32	.079	.054	<b>.500</b>	2	1/8	2	970493	64.20	970493-C3	69.40	970493-C8	71.80
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
1/8	.107	.076	<b>.125</b>	4	1/8	1-1/2	934108	44.50	934108-C3	49.70	934108-C8	52.10
1/8	.107	.076	<b>.187</b>	4	1/8	1-1/2	808608	45.40	808608-C3	50.60	808608-C8	53.00
1/8	.107	.076	<b>.250</b>	4	1/8	1-1/2	951208	46.40	951208-C3	51.60	951208-C8	54.00
1/8	.107	.076	<b>.375</b>	4	1/8	1-1/2	863708	48.70	863708-C3	53.90	863708-C8	56.30
1/8	.107	.076	<b>.500</b>	4	1/8	1-1/2	994708	50.80	994708-C3	56.00	994708-C8	58.40
1/8	.107	.076	<b>1.000</b>	4	1/8	3	997108	57.50	997108-C3	62.70	997108-C8	65.10
1/8	.107	.076	<b>1.500</b>	4	1/8	3	928808	61.30	928808-C3	66.50	928808-C8	68.90
5/32	.133	.098	<b>.250</b>	4	3/16	2	951210	60.20	951210-C3	65.80	951210-C8	67.80
5/32	.133	.098	<b>.500</b>	4	3/16	2	994710	64.70	994710-C3	70.30	994710-C8	72.30
5/32	.133	.098	<b>1.000</b>	4	3/16	3	997110	73.90	997110-C3	79.50	997110-C8	81.50
3/16	.160	.117	<b>.125</b>	4	3/16	2	934112	55.60	934112-C3	61.20	934112-C8	63.20
3/16	.160	.117	<b>.250</b>	4	3/16	2	951212	57.20	951212-C3	62.80	951212-C8	64.80
3/16	.160	.117	<b>.500</b>	4	3/16	2	994712	61.90	994712-C3	67.50	994712-C8	69.50
3/16	.160	.117	<b>.750</b>	4	3/16	2	897712	64.70	897712-C3	70.30	897712-C8	72.30
3/16	.160	.117	<b>1.000</b>	4	3/16	3	997112	73.90	997112-C3	79.50	997112-C8	81.50
3/16	.160	.117	<b>1.250</b>	4	3/16	3	893512	77.80	893512-C3	83.40	893512-C8	85.40

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# UNDERCUTTING END MILLS

## 270° High Helix (cont.)

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CUTTER DIA.	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AlTiN COATED		TiB <sub>2</sub> COATED	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
1/4	.213	.158	<b>.125</b>	4	1/4	2-1/2	934116	79.60	934116-C3	87.20	934116-C8	87.80
1/4	.213	.158	<b>.250</b>	4	1/4	2-1/2	808616	81.40	808616-C3	89.00	808616-C8	89.60
1/4	.213	.158	<b>.375</b>	4	1/4	2-1/2	951216	83.30	951216-C3	90.90	951216-C8	91.50
1/4	.213	.158	<b>.500</b>	4	1/4	2-1/2	863716	85.90	863716-C3	93.50	863716-C8	94.10
1/4	.213	.158	<b>.750</b>	4	1/4	2-1/2	994716	91.20	994716-C3	98.80	994716-C8	99.40
1/4	.213	.158	<b>1.000</b>	4	1/4	2-1/2	808516	92.60	808516-C3	100.20	808516-C8	100.80
1/4	.213	.158	<b>1.125</b>	4	1/4	2-1/2	897716	93.90	897716-C3	101.50	897716-C8	102.10
1/4	.213	.158	<b>1.500</b>	4	1/4	4	997116	100.40	997116-C3	109.30	997116-C8	109.60
1/4	.213	.158	<b>2.250</b>	4	1/4	4	928816	111.10	928816-C3	120.00	928816-C8	120.30
5/16	.266	.201	<b>.750</b>	4	5/16	2-1/2	994720	106.10	994720-C3	115.00	994720-C8	123.50
5/16	.266	.201	<b>1.500</b>	4	5/16	4	997120	126.00	997120-C3	136.70	997120-C8	147.10
3/8	.320	.241	<b>.375</b>	4	3/8	2-1/2	951224	119.00	951224-C3	129.10	951224-C8	140.10
3/8	.320	.241	<b>.750</b>	4	3/8	2-1/2	994724	120.40	994724-C3	130.50	994724-C8	141.50
3/8	.320	.241	<b>1.125</b>	4	3/8	4	897724	129.30	897724-C3	143.10	897724-C8	154.10
3/8	.320	.241	<b>1.500</b>	4	3/8	4	997124	132.60	997124-C3	146.40	997124-C8	157.40
1/2	.427	.323	<b>.500</b>	4	1/2	3	951232	169.90	951232-C3	185.00	951232-C8	194.70
1/2	.427	.323	<b>1.000</b>	4	1/2	3	994732	174.20	994732-C3	189.30	994732-C8	199.00
1/2	.427	.323	<b>1.500</b>	4	1/2	6	897732	250.60	897732-C3	265.70	897732-C8	295.10
1/2	.427	.323	<b>2.000</b>	4	1/2	6	997132	257.30	997132-C3	272.40	997132-C8	301.80
1/2	.427	.323	<b>3.000</b>	4	1/2	6	928832	287.00	928832-C3	302.10	928832-C8	331.50

UNDERCUTTING END MILLS

### MACHINING ADVISOR PRO

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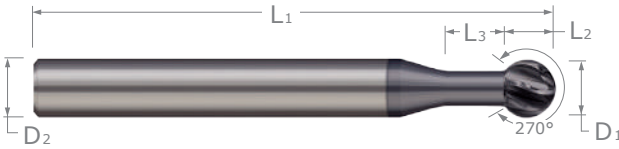
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# UNDERCUTTING END MILLS

270° for Hardened Steels

UNDERCUTTING END MILLS



- Optimized for hardened steels 45-68 Rc
- Increased flute count for added strength and tool life
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- 270° spherical ball
- Designed for undercutting, deburring, and multi-axis machining
- Center cutting
- Solid carbide
- CNC ground in the USA

Stocked in Multiple Reach Lengths



CUTTER DIAMETER	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE
1/32	.027	.016	<b>.062</b>	4	1/8	1-1/2	823231-C6	69.30
1/32	.027	.016	<b>.078</b>	4	1/8	1-1/2	819831-C6	69.30
1/32	.027	.016	<b>.125</b>	4	1/8	1-1/2	745431-C6	69.90
3/64	.040	.029	<b>.093</b>	4	1/8	1-1/2	823247-C6	69.30
3/64	.040	.029	<b>.125</b>	4	1/8	1-1/2	819847-C6	69.30
1/16	.053	.037	<b>.062</b>	4	1/8	1-1/2	831562-C6	47.70
1/16	.053	.037	<b>.093</b>	4	1/8	1-1/2	823262-C6	47.70
1/16	.053	.037	<b>.125</b>	4	1/8	1-1/2	819862-C6	49.60
1/16	.053	.037	<b>.250</b>	4	1/8	1-1/2	745462-C6	50.10
5/64	.067	.045	<b>.125</b>	4	1/8	1-1/2	823278-C6	48.70
5/64	.067	.045	<b>.187</b>	4	1/8	1-1/2	819878-C6	50.50
3/32	.080	.054	<b>.062</b>	4	1/8	1-1/2	831593-C6	48.70
3/32	.080	.054	<b>.125</b>	4	1/8	1-1/2	746493-C6	49.10
3/32	.080	.054	<b>.250</b>	4	1/8	1-1/2	823293-C6	48.70
3/32	.080	.054	<b>.312</b>	4	1/8	1-1/2	819893-C6	52.60
3/32	.080	.054	<b>.375</b>	4	1/8	1-1/2	748893-C6	53.10

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE
1/8	.107	.076	<b>.125</b>	6	1/8	1-1/2	831608-C6	42.70
1/8	.107	.076	<b>.250</b>	6	1/8	1-1/2	823308-C6	44.90
1/8	.107	.076	<b>.375</b>	6	1/8	1-1/2	819908-C6	45.70
1/8	.107	.076	<b>.500</b>	6	1/8	2	748908-C6	48.00
3/16	.160	.117	<b>.125</b>	6	3/16	2	831612-C6	50.40
3/16	.160	.117	<b>.250</b>	6	3/16	2	823312-C6	54.10
3/16	.160	.117	<b>.375</b>	6	3/16	2	819912-C6	56.70
3/16	.160	.117	<b>.500</b>	6	3/16	2	748912-C6	59.50
1/4	.213	.158	<b>.125</b>	8	1/4	2-1/2	831616-C6	67.50
1/4	.213	.158	<b>.375</b>	6	1/4	2-1/2	823316-C6	71.80
1/4	.213	.158	<b>.500</b>	6	1/4	2-1/2	819916-C6	73.10
1/4	.213	.158	<b>.750</b>	6	1/4	2-1/2	748916-C6	76.20
3/8	.320	.241	<b>.375</b>	8	3/8	2-1/2	823324-C6	98.40
3/8	.320	.241	<b>.500</b>	8	3/8	2-1/2	819924-C6	98.40
1/2	.427	.323	<b>.500</b>	8	1/2	3	823332-C6	140.00
1/2	.427	.323	<b>.750</b>	8	1/2	3	819932-C6	143.50

# UNDERCUTTING END MILLS

## 270° Deburring Undercut



High Number of Flutes

Stocked in Multiple Reach Lengths



UNDERCUTTING END MILLS

- 270° spherical ball is ideal for deburring complex shapes and multi-axis machining
- Deburr in your CNC machine with these high-precision burs held to end mill tolerances
- Stop scrapping expensive parts due to handheld operator errors
- High flute count allows for increased feeds which reduces cycle times
- Achieve better finish than with milling-type cutters
- Double cut style flute pattern • Center cutting
- Solid carbide • CNC ground in the USA

CUTTER DIA.	LOC	NECK DIA.	NECK LENGTH	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIA.	OAL	UNCOATED		AIRTIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub>	L <sub>2</sub> $\pm \frac{.010}{-.000}$ "		L <sub>3</sub> $\pm \frac{.020}{-.000}$ "			D <sub>2</sub>	L <sub>1</sub>				
.031 (1/32)	.026	.014	<b>.031</b>	12	10	1/8	1-1/2	899631	72.00	899631-C3	77.20
.031 (1/32)	.026	.014	<b>.062</b>	12	10	1/8	1-1/2	980531	71.40	980531-C3	76.60
.031 (1/32)	.026	.014	<b>.093</b>	12	10	1/8	1-1/2	926431	73.60	926431-C3	78.80
.031 (1/32)	.026	.014	<b>.125</b>	12	10	1/8	1-1/2	883231	76.00	883231-C3	81.20
.039 (1 mm)	.033	.019	<b>.047</b>	12	10	1/8	1-1/2	89961M	71.40	89961M-C3	76.60
.039 (1 mm)	.033	.019	<b>.125</b>	12	10	1/8	1/1/2	92641M	76.00	92641M-C3	81.20
.047 (3/64)	.040	.024	<b>.093</b>	12	10	1/8	1-1/2	980547	71.40	980547-C3	76.60
.047 (3/64)	.040	.024	<b>.125</b>	12	10	1/8	1-1/2	890847	73.60	890847-C3	78.80
.047 (3/64)	.040	.024	<b>.156</b>	12	10	1/8	1-1/2	926447	73.60	926447-C3	78.80
.047 (3/64)	.040	.024	<b>.250</b>	12	10	1/8	1-1/2	883247	76.00	883247-C3	81.20
.062 (1/16)	.053	.032	<b>.062</b>	15	12	1/8	1-1/2	899662	53.60	899662-C3	58.80
.062 (1/16)	.053	.032	<b>.093</b>	15	12	1/8	1-1/2	980562	53.60	980562-C3	58.80
.062 (1/16)	.053	.032	<b>.125</b>	15	12	1/8	1-1/2	890862	55.40	890862-C3	60.60
.062 (1/16)	.053	.032	<b>.187</b>	15	12	1/8	1-1/2	926462	55.40	926462-C3	60.60
.062 (1/16)	.053	.032	<b>.250</b>	15	12	1/8	1-1/2	883262	57.40	883262-C3	62.60
.062 (1/16)	.053	.032	<b>.312</b>	15	12	1/8	1-1/2	808362	57.40	808362-C3	62.60
.078 (5/64)	.067	.035	<b>.062</b>	15	12	1/8	1-1/2	899678	53.60	899678-C3	58.80
.078 (5/64)	.067	.035	<b>.125</b>	15	12	1/8	1-1/2	980578	53.60	980578-C3	58.80
.078 (5/64)	.067	.035	<b>.250</b>	15	12	1/8	1-1/2	926478	55.40	926478-C3	60.60
.078 (5/64)	.067	.035	<b>.375</b>	15	12	1/8	2	883278	56.20	883278-C3	61.40
.093 (3/32)	.079	.038	<b>.062</b>	15	12	1/8	1-1/2	899693	56.90	899693-C3	62.10
.093 (3/32)	.079	.038	<b>.125</b>	15	12	1/8	1-1/2	895393	56.90	895393-C3	62.10
.093 (3/32)	.079	.038	<b>.187</b>	15	12	1/8	1-1/2	809693	56.90	809693-C3	62.10
.093 (3/32)	.079	.038	<b>.250</b>	15	12	1/8	1-1/2	980593	56.90	980593-C3	62.10
.093 (3/32)	.079	.038	<b>.312</b>	15	12	1/8	1-1/2	890893	59.00	890893-C3	64.20
.093 (3/32)	.079	.038	<b>.375</b>	15	12	1/8	1-1/2	926493	58.40	926493-C3	63.60
.093 (3/32)	.079	.038	<b>.500</b>	15	12	1/8	2	883293	64.70	883293-C3	69.90
.118 (3 mm)	.101	.056	<b>.250</b>	15	12	1/8	1-1/2	98053M	59.30	98053M-C3	64.50
.118 (3 mm)	.101	.056	<b>.375</b>	15	12	1/8	1-1/2	89083M	61.40	89083M-C3	66.60
.118 (3 mm)	.101	.056	<b>.500</b>	15	12	1/8	2	92643M	63.00	92643M-C3	68.20

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# UNDERCUTTING END MILLS

## 270° Deburring Undercut (cont.)

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UNDERCUTTING END MILLS

CUTTER DIA.	LOC	NECK DIA.	NECK LENGTH	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>			D <sub>2</sub>	L <sub>1</sub>				
.125 (1/8)	.107	.059	<b>.125</b>	16	13	1/8	1-1/2	899708	54.90	899708-C3	60.10
.125 (1/8)	.107	.059	<b>.187</b>	16	13	1/8	1-1/2	809908	55.10	809908-C3	60.30
.125 (1/8)	.107	.059	<b>.250</b>	16	13	1/8	1-1/2	980608	56.90	980608-C3	62.10
.125 (1/8)	.107	.059	<b>.375</b>	16	13	1/8	1-1/2	890908	57.80	890908-C3	63.00
.125 (1/8)	.107	.059	<b>.500</b>	16	13	1/8	2	926508	59.00	926508-C3	64.20
.125 (1/8)	.107	.059	<b>.750</b>	16	13	1/8	2	886108	61.80	886108-C3	67.00
.125 (1/8)	.107	.059	<b>1.000</b>	16	13	1/8	3	883308	65.40	883308-C3	70.60
.156 (5/32)	.133	.078	<b>.250</b>	16	13	3/16	2	980610	62.40	980610-C3	68.00
.156 (5/32)	.133	.078	<b>.500</b>	16	13	3/16	2	926510	67.20	926510-C3	72.80
.187 (3/16)	.160	.097	<b>.125</b>	16	13	3/16	2	899712	58.40	899712-C3	64.00
.187 (3/16)	.160	.097	<b>.250</b>	16	13	3/16	2	980612	61.80	980612-C3	67.40
.187 (3/16)	.160	.097	<b>.375</b>	16	13	3/16	2	890912	63.90	890912-C3	69.50
.187 (3/16)	.160	.097	<b>.500</b>	16	13	3/16	2	926512	67.20	926512-C3	72.80
.187 (3/16)	.160	.097	<b>.750</b>	16	13	3/16	2	886112	72.50	886112-C3	78.10
.187 (3/16)	.160	.097	<b>1.000</b>	16	13	3/16	3	883312	76.30	883312-C3	81.90
.250 (1/4)	.213	.136	<b>.125</b>	16	13	1/4	2-1/2	899716	73.10	899716-C3	80.70
.250 (1/4)	.213	.136	<b>.375</b>	16	13	1/4	2-1/2	980616	73.90	980616-C3	81.50
.250 (1/4)	.213	.136	<b>.500</b>	16	13	1/4	2-1/2	890916	75.90	890916-C3	83.50
.250 (1/4)	.213	.136	<b>.750</b>	16	13	1/4	2-1/2	926516	79.40	926516-C3	87.00
.250 (1/4)	.213	.136	<b>1.125</b>	16	13	1/4	2-1/2	886116	82.00	886116-C3	89.60
.375 (3/8)	.320	.200	<b>.375</b>	16	13	3/8	2-1/2	980624	98.50	980624-C3	108.60
.375 (3/8)	.320	.200	<b>.750</b>	16	13	3/8	2-1/2	926524	104.30	926524-C3	114.40



# DRILL / END MILLS

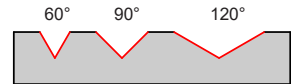
## Helical Tip – 2 Flute



### HELICAL TIP

#### Recommended For

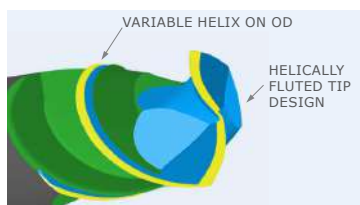
Chamfering	Yes	
O.D. Milling	Yes	
Drilling	No	
Spotting	Light Duty	



Stocked in **Three** Included Angles!

- Designed for chamfering, milling, and some spotting applications
- **Not recommended for drilling**
- 2 flutes
- Specialized helically fluted tip design for superior performance, surface finish and chip evacuation
- Variable helix design on OD (approx. 35°) reduces chatter and harmonics and increases material removal rates
- AlTiN Nano coating for superior performance in ferrous and difficult to machine materials.
- TiB<sub>2</sub> coating for outstanding performance in non-ferrous materials due to its extremely low affinity to aluminum.
- h6 shank tolerance for high precision tool holders • Solid carbide • CNC ground in the USA

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED		TiB <sub>2</sub> COATED	
						2 FL	PRICE	2 FL	PRICE
60°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	W	D <sub>2</sub> (h6)	L <sub>1</sub>				
	1/32	3/32	.003	1/8	1-1/2	872502-C6	53.20	872502-C8	50.80
	1/16	3/16	.005	1/8	1-1/2	872504-C6	52.70	872504-C8	51.30
	1/8	1/2	.008	1/8	1-1/2	872508-C6	52.70	872508-C8	53.20
	3/16	5/8	.009	3/16	2	872512-C6	58.20	872512-C8	58.80
	1/4	3/4	.009	1/4	2-1/2	872516-C6	74.10	872516-C8	74.80
	3/8	7/8	.012	3/8	2-1/2	872524-C6	91.60	872524-C8	91.60
1/2	1	.012	1/2	3	872532-C6	118.20	872532-C8	118.20	
90°	1/32	3/32	.003	1/8	1-1/2	859602-C6	47.80	859602-C8	46.00
	1/16	3/16	.005	1/8	1-1/2	859604-C6	47.80	859604-C8	46.50
	5/64	1/4	.006	1/8	1-1/2	859605-C6	50.10	859605-C8	48.70
	3/32	3/8	.007	1/8	1-1/2	859606-C6	50.10	859606-C8	48.70
	1/8	1/2	.008	1/8	1-1/2	859608-C6	52.70	859608-C8	52.70
	3/16	5/8	.009	3/16	2	859612-C6	58.20	859612-C8	58.20
	1/4	3/4	.009	1/4	2-1/2	859616-C6	74.10	859616-C8	74.10
	3/8	7/8	.012	3/8	2-1/2	859624-C6	91.60	859624-C8	92.50
	1/2	1	.012	1/2	3	859632-C6	117.10	859632-C8	118.20
120°	1/8	1/2	.008	1/8	1-1/2	847708-C6	53.20	847708-C8	53.20
	3/16	5/8	.009	3/16	2	847712-C6	58.80	847712-C8	58.80
	1/4	3/4	.009	1/4	2-1/2	847716-C6	74.10	847716-C8	74.80
	3/8	7/8	.012	3/8	2-1/2	847724-C6	92.50	847724-C8	92.50
	1/2	1	.012	1/2	3	847732-C6	118.20	847732-C8	118.20



# DRILL / END MILLS

## Helical Tip – 4 Flute



Specialized Helically Fluted Tip Design

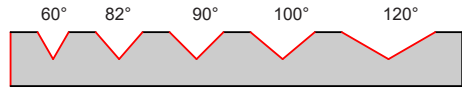
DRILL / END MILLS

- Designed for chamfering, milling, and some spotting applications
- **Not** recommended for **drilling**
- 4 flutes (two flutes to center, two flutes cut back)
- Specialized helically fluted tip design for superior performance, surface finish and chip evacuation
- Variable helix design on OD (approx. 35°) reduces chatter and harmonics and increases material removal rates
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- Solid carbide • CNC ground in the USA

### HELICAL TIP

#### Recommended For

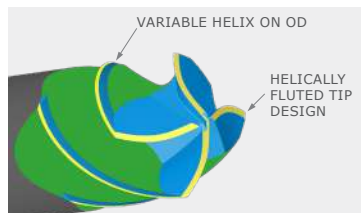
Chamfering	Yes	
O.D. Milling	Yes	
Drilling	No	
Spotting	Light Duty	



Stocked in **Five** Included Angles!

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
						4 FL	PRICE
A $^{+1^{\circ}}$ $^{-1^{\circ}}$	D <sub>1</sub> $^{+.000^{\circ}}$ $^{-.002^{\circ}}$	L <sub>2</sub> $^{+.030^{\circ}}$ $^{-.000^{\circ}}$	W	D <sub>2</sub> (h6)	L <sub>1</sub>		
<b>60°</b>	1/16	3/16	.005	1/8	1-1/2	899204-C6	56.00
	3/32	3/8	.007	1/8	1-1/2	899206-C6	56.00
	1/8	1/2	.008	1/8	1-1/2	899208-C6	55.50
	3/16	5/8	.009	3/16	2	899212-C6	61.40
	1/4	3/4	.009	1/4	2-1/2	899216-C6	78.00
	5/16	13/16	.010	5/16	2-1/2	899220-C6	86.80
	3/8	7/8	.012	3/8	2-1/2	899224-C6	96.30
	1/2	1	.012	1/2	3	899232-C6	123.20
<b>82°</b>	1/8	1/2	.008	1/8	1-1/2	788208-C6	55.50
	3/16	5/8	.009	3/16	2	788212-C6	61.40
	1/4	3/4	.009	1/4	2-1/2	788216-C6	78.00
<b>90°</b>	1/32	3/32	.003	1/8	1-1/2	881102-C6	50.70
	3/64	9/64	.004	1/8	1-1/2	881103-C6	51.10
	1/16	3/16	.005	1/8	1-1/2	881104-C6	50.70
	5/64	1/4	.006	1/8	1-1/2	881105-C6	53.00
	3/32	3/8	.007	1/8	1-1/2	881106-C6	53.00
	1/8	1/2	.008	1/8	1-1/2	881108-C6	55.50
	9/64	9/16	.009	3/16	2	881109-C6	62.00
	5/32	9/16	.009	3/16	2	881110-C6	61.40
	3/16	5/8	.009	3/16	2	881112-C6	61.40
	1/4	3/4	.009	1/4	2-1/2	881116-C6	78.00
	5/16	13/16	.010	5/16	2-1/2	881120-C6	85.90
	3/8	7/8	.012	3/8	2-1/2	881124-C6	96.30
	1/2	1	.012	1/2	3	881132-C6	123.20
	5/8	1-1/4	.014	5/8	3-1/2	881140-C6	163.80
	3/4	1-1/2	.015	3/4	4	881148-C6	204.70

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**DRILL / END MILLS**

Helical Tip – 4 Flute (cont.)

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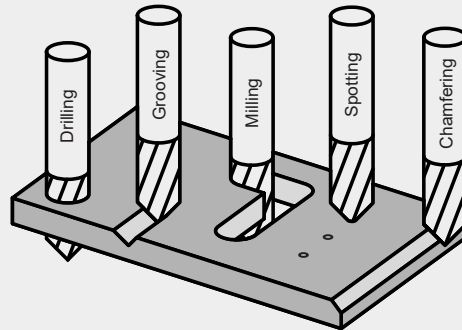
INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
						4 FL	PRICE
A $\begin{matrix} +1^{\circ} \\ -1^{\circ} \end{matrix}$	D1 $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L2 $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	W	D2 (h6)	L1		
<b>100°</b>	1/8	1/2	.008	1/8	1-1/2	826208-C6	55.50
	1/4	3/4	.009	1/4	2-1/2	826216-C6	78.00
	3/8	7/8	.012	3/8	2-1/2	826224-C6	96.30
	1/2	1	.012	1/2	3	826232-C6	123.20
<b>120°</b>	1/8	1/2	.008	1/8	1-1/2	865408-C6	55.50
	3/16	5/8	.009	3/16	2	865412-C6	61.40
	1/4	3/4	.009	1/4	2-1/2	865416-C6	78.00
	3/8	7/8	.012	3/8	2-1/2	865424-C6	96.30
	1/2	1	.012	1/2	3	865432-C6	123.20

DRILL / END MILLS

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# DRILL / END MILLS

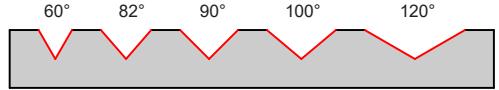
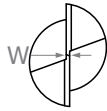
## Mill Style - 2 Flute



### MILL STYLE

Flat relief with end mill style gash to thin web.

Recommended For	Included Angle	
	60°	82°, 90°, 100°, 120°
Chamfering	Yes	Yes
O.D. Milling	Yes	Yes
Drilling	No	Non-Ferrous Only
Spotting	No	Light Duty



Stocked in *Five* Included Angles!

DRILL / END MILLS

- Designed for chamfering, milling, and some spotting applications
- Not recommended for drilling steel
- 2 flutes • Solid carbide • CNC ground in the USA

Outstanding in Aluminum!



INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
						2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
A <sup>+1°</sup> / <sub>-1°</sub>	D <sub>1</sub> <sup>+0.002"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	W	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
60°	.020	1/16	.0020	1/8	1-1/2	991767	33.10	991767-C3	38.30		
	1/32	3/32	.0030	1/8	1-1/2	991702	32.50	991702-C3	37.70		
	3/64	9/64	.0040	1/8	1-1/2	991703	33.10	991703-C3	38.30		
	1/16	3/16	.0050	1/8	1-1/2	991704	32.50	991704-C3	37.70		
	5/64	1/4	.0050	1/8	1-1/2	991705	33.10	991705-C3	38.30		
	3/32	3/8	.0050	1/8	1-1/2	991706	32.50	991706-C3	37.70		
	1/8	1/2	.0050	1/8	1-1/2	991708	32.50	991708-C3	37.70	991708-C8	40.10
	5/32	9/16	.0060	3/16	2	991710	33.80	991710-C3	39.40		
	3/16	5/8	.0060	3/16	2	991712	33.80	991712-C3	39.40	991712-C8	41.40
	1/4	3/4	.0060	1/4	2-1/2	991716	47.70	991716-C3	55.30	991716-C8	55.90
	5/16	13/16	.0070	5/16	2-1/2	991720	50.20	991720-C3	59.10		
	3/8	7/8	.0080	3/8	2-1/2	991724	60.10	991724-C3	70.20	991724-C8	81.20
1/2	1	.0080	1/2	3	991732	95.20	991732-C3	110.30	991732-C8	120.00	
5/8	1-1/4	.0090	5/8	3-1/2	991740	145.60	991740-C3	160.70			
3/4	1-1/2	.0100	3/4	4	991748	220.70	991748-C3	237.00			
82°	1/16	3/16	.0050	1/8	1-1/2	949404	34.90	949404-C3	40.10		
	3/32	3/8	.0050	1/8	1-1/2	949406	34.90	949406-C3	40.10		
	1/8	1/2	.0050	1/8	1-1/2	949408	34.90	949408-C3	40.10	949408-C8	42.50
	3/16	5/8	.0060	3/16	2	949412	35.90	949412-C3	41.50		
	1/4	3/4	.0060	1/4	2-1/2	949416	51.00	949416-C3	58.60	949416-C8	59.20
	5/16	13/16	.0070	5/16	2-1/2	949420	53.70	949420-C3	62.60		
	3/8	7/8	.0080	3/8	2-1/2	949424	64.20	949424-C3	74.30		
1/2	1	.0080	1/2	3	949432	102.50	949432-C3	117.60			
90°	1/64	3/64	.0015	1/8	1-1/2	15301-2	32.50	72201-C3	37.70		
	.020	1/16	.0020	1/8	1-1/2	15367-2	32.50	72220-C3	37.70		
	1/32	3/32	.0030	1/8	1-1/2	15302-2	32.50	72231-C3	37.70	72231-C8	40.10
	1 mm	1/8	.0030	1/8	1-1/2	1531M-2	32.50	72239-C3	37.70		
	.040	1/8	.0030	1/8	1-1/2	15371-2	32.50	72240-C3	37.70		
	3/64	9/64	.0030	1/8	1-1/2	15303-2	32.50	72247-C3	37.70		
	1/16	3/16	.0050	1/8	1-1/2	15304-2	30.60	72262-C3	35.80	72262-C8	38.20

continued on next page

## DRILL / END MILLS

Mill Style – 2 Flute (cont.)

continued from previous page

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
						2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
90°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	W	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
	5/64	1/4	.0050	1/8	1-1/2	15305-2	30.60	72278-C3	35.80	72278-C8	38.20
	3/32	3/8	.0050	1/8	1-1/2	15306-2	30.60	72293-C3	35.80	72293-C8	38.20
	7/64	3/8	.0050	1/8	1-1/2	15307-2	32.50	72302-C3	37.70		
	3 mm	3/8	.0050	1/8	1-1/2	1533M-2	32.50	72305-C3	37.70		
	1/8	1/2	.0050	1/8	1-1/2	15308-2	30.60	72308-C3	35.80	72308-C8	38.20
	9/64	9/16	.0060	3/16	2	15309-2	33.80	72309-C3	39.40		
	5/32	9/16	.0060	3/16	2	15310-2	33.80	72310-C3	39.40		
	3/16	5/8	.0060	3/16	2	15312-2	31.70	72312-C3	37.30	72312-C8	39.30
	1/4	3/4	.0060	1/4	2-1/2	15316-2	44.90	72316-C3	52.50	72316-C8	53.10
	5/16	13/16	.0070	5/16	2-1/2	15320-2	47.00	72320-C3	55.90	72320-C8	64.40
	3/8	7/8	.0080	3/8	2-1/2	15324-2	56.30	72324-C3	66.40	72324-C8	77.40
	1/2	1	.0080	1/2	3	15332-2	89.40	72332-C3	104.50	72332-C8	114.20
	5/8	1-1/4	.0090	5/8	3-1/2	15340-2	136.50	72340-C3	151.60		
3/4	1-1/2	.0100	3/4	4	15348-2	207.20	72348-C3	223.50			
100°	1/16	3/16	.0050	1/8	1-1/2	928562	33.10	928562-C3	38.30		
	3/32	3/8	.0050	1/8	1-1/2	928593	33.10	928593-C3	38.30		
	1/8	1/2	.0050	1/8	1-1/2	928508	34.90	928508-C3	40.10	928508-C8	42.50
	3/16	5/8	.0060	3/16	2	928512	35.90	928512-C3	41.50		
	1/4	3/4	.0060	1/4	2-1/2	928516	51.00	928516-C3	58.60	928516-C8	59.20
	5/16	13/16	.0070	5/16	2-1/2	928520	53.70	928520-C3	62.60		
	3/8	7/8	.0080	3/8	2-1/2	928524	64.80	928524-C3	74.90		
	1/2	1	.0080	1/2	3	928532	102.50	928532-C3	117.60		
120°	1/16	3/16	.0050	1/8	1-1/2	985504	35.20	985504-C3	40.40		
	3/32	3/8	.0050	1/8	1-1/2	985506	34.60	985506-C3	39.80		
	1/8	1/2	.0050	1/8	1-1/2	985508	34.60	985508-C3	39.80	985508-C8	42.20
	5/32	9/16	.0060	3/16	2	985510	36.30	985510-C3	41.90		
	3/16	5/8	.0060	3/16	2	985512	35.60	985512-C3	41.20		
	1/4	3/4	.0060	1/4	2-1/2	985516	50.00	985516-C3	57.60	985516-C8	58.20
	5/16	13/16	.0070	5/16	2-1/2	985520	52.10	985520-C3	61.00		
	3/8	7/8	.0080	3/8	2-1/2	985524	62.00	985524-C3	72.10	985524-C8	83.10
	1/2	1	.0080	1/2	3	985532	97.00	985532-C3	112.10		

DRILL / END MILLS

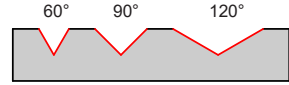


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# DRILL / END MILLS

## Mill Style - 3 Flute



Stocked in *Three* Included Angles!

### MILL STYLE

Flat relief with end mill style and 3 flutes to center.

Recommended For	Included Angle	
	60°, 90°, 120°	
Chamfering	Yes	
O.D. Milling	Yes	
Drilling	No	
Spotting	Light Duty	

DRILL / END MILLS

- Designed for chamfering, milling, and some spotting applications
- Not recommended for drilling
- 3 flutes to center
- Solid carbide
- CNC ground in the USA

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
					3 FL	PRICE	3 FL	PRICE
A $\begin{matrix} +1^\circ \\ -1^\circ \end{matrix}$	D1 $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L2 $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	D2	L1	<b>3 FL</b>	<b>PRICE</b>	<b>3 FL</b>	<b>PRICE</b>
<b>60°</b>	1/8	1/2	1/8	1-1/2	784808	30.60	784808-C3	35.80
	1/4	3/4	1/4	2-1/2	784816	44.90	784816-C3	52.50
	3/8	7/8	3/8	2-1/2	784824	56.80	784824-C3	66.90
<b>90°</b>	1/16	3/16	1/8	1-1/2	823762	31.50	823762-C3	36.70
	3/32	3/8	1/8	1-1/2	823793	30.60	823793-C3	35.80
	1/8	1/2	1/8	1-1/2	823808	30.60	823808-C3	37.90
	5/32	9/16	3/16	2	823810	32.00	823810-C3	37.60
	3/16	5/8	3/16	2	823812	31.70	823812-C3	37.30
	1/4	3/4	1/4	2-1/2	823816	44.90	823816-C3	50.40
	5/16	13/16	5/16	2-1/2	823820	52.30	823820-C3	61.20
	3/8	7/8	3/8	2-1/2	823824	56.30	823824-C3	66.40
1/2	1	1/2	3	823832	85.90	823832-C3	101.00	
<b>120°</b>	1/8	1/2	1/8	1-1/2	784508	30.60	784508-C3	35.80
	1/4	3/4	1/4	2-1/2	784516	44.90	784516-C3	52.50
	3/8	7/8	3/8	2-1/2	784524	57.90	784524-C3	68.00

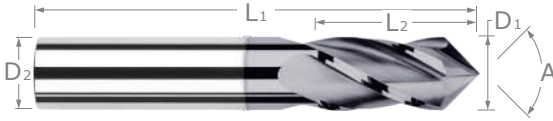


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# DRILL / END MILLS

## Mill Style – 4 Flute

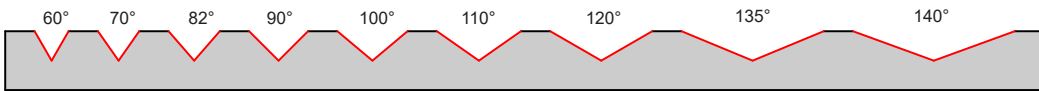


- Designed for chamfering, milling, and some spotting applications
- Not recommended for drilling steel • 4 flutes (two flutes to center, two flutes cut back)
- Solid carbide • CNC ground in the USA

### MILL STYLE

Flat relief with end mill style gash to thin web.

Recommended For	Included Angle		
	60°, 70°	82°, 90°, 100°, 110°, 120°, 135°, 140°	
Chamfering	Yes	Yes	
O.D. Milling	Yes	Yes	
Drilling	No	Non-Ferrous Only	
Spotting	No	Light Duty	



Stocked in *Nine* Included Angles!

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TIN COATED		A/TIN COATED	
						4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
A <sup>+1°</sup> / <sub>-1°</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	W	D <sub>2</sub>	L <sub>1</sub>						
60°	1/32	3/32	.003	1/8	1-1/2	15402	32.50			15402-C3	37.70
	3/64	9/64	.004	1/8	1-1/2	15403	32.50			15403-C3	37.70
	1/16	3/16	.005	1/8	1-1/2	15404	32.50			15404-C3	37.70
	5/64	1/4	.005	1/8	1-1/2	15405	32.50			15405-C3	37.70
	3/32	3/8	.005	1/8	1-1/2	15406	32.50			15406-C3	37.70
	7/64	3/8	.005	1/8	1-1/2	15407	34.40			15407-C3	39.60
	3 mm	3/8	.005	1/8	1-1/2	1543M	35.20			1543M-C3	40.40
	1/8	1/2	.005	1/8	1-1/2	15408	32.50			15408-C3	37.70
	9/64	9/16	.006	3/16	2	15409	33.80			15409-C3	39.40
	5/32	9/16	.006	3/16	2	15410	33.80			15410-C3	39.40
	3/16	5/8	.006	3/16	2	15412	33.80			15412-C3	39.40
	1/4	3/4	.006	1/4	2-1/2	15416	47.70			15416-C3	55.30
	5/16	13/16	.007	5/16	2-1/2	15420	50.20			15420-C3	59.10
	3/8	7/8	.008	3/8	2-1/2	15424	60.10			15424-C3	70.20
	7/16	1	.008	7/16	2-3/4	15428	94.80			15428-C3	107.40
	1/2	1	.008	1/2	3	15432	95.20			15432-C3	110.30
5/8	1-1/4	.009	5/8	3-1/2	15440	145.60			15440-C3	160.70	
3/4	1-1/2	.010	3/4	4	15448	220.70			15448-C3	237.00	
1	2	.010	1	4	15464	332.50			15464-C3	357.30	
70°	1/8	1/2	.005	1/8	1-1/2	824608	36.70			824608-C3	41.90
	1/4	3/4	.006	1/4	2-1/2	824616	53.10			824616-C3	60.70
	3/8	7/8	.008	3/8	2-1/2	824624	66.30			824624-C3	76.40
	1/2	1	.008	1/2	3	824632	104.60			824632-C3	119.70

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DRILL / END MILLS

# DRILL / END MILLS

## Mill Style - 4 Flute (cont.)

continued from previous page

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TIN COATED		AIRTIN COATED		
						4 FL	PRICE	4 FL	PRICE	4 FL	PRICE	
82°	A $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.000^{\circ}$ $-0.002^{\circ}$	L <sub>2</sub> $+0.030^{\circ}$ $-0.000^{\circ}$	W	D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
	1/32	3/32	.003	1/8	1-1/2	26502	37.10			26502-C3	42.30	
	1/16	3/16	.005	1/8	1-1/2	26504	36.70			26504-C3	41.90	
	5/64	1/4	.005	1/8	1-1/2	26505	37.10			26505-C3	42.30	
	3/32	3/8	.005	1/8	1-1/2	26506	36.70			26506-C3	41.90	
	1/8	1/2	.005	1/8	1-1/2	26508	36.70			26508-C3	41.90	
	5/32	9/16	.006	3/16	2	26510	38.10			26510-C3	43.70	
	3/16	5/8	.006	3/16	2	26512	38.10			26512-C3	43.70	
	1/4	3/4	.006	1/4	2-1/2	26516	53.10			26516-C3	60.70	
	5/16	13/16	.007	5/16	2-1/2	26520	55.40			26520-C3	64.30	
	3/8	7/8	.008	3/8	2-1/2	26524	66.30			26524-C3	76.40	
	1/2	1	.008	1/2	3	26532	103.60			26532-C3	118.70	
5/8	1-1/4	.009	5/8	3-1/2	26540	158.30			26540-C3	173.40		
3/4	1-1/2	.010	3/4	4	26548	239.40			26548-C3	255.70		
90°	1/64	3/64	.0015	1/8	1-1/2	15301	32.50			15301-C3	37.70	
	.020	1/16	.002	1/8	1-1/2	15367	32.50			15367-C3	37.70	
	1/32	3/32	.003	1/8	1-1/2	15302	32.50			15302-C3	37.70	
	1 mm	1/8	.003	1/8	1-1/2	1531M	35.20			1531M-C3	40.40	
	3/64	9/64	.004	1/8	1-1/2	15303	32.50			15303-C3	37.70	
	1/16	3/16	.005	1/8	1-1/2	15304	30.60	15304-C1	34.10	15304-C3	35.80	
	1/16	5/16	.005	1/8	2-1/2	823904	33.50			823904-C3	38.70	
	5/64	1/4	.005	1/8	1-1/2	15305	30.60	15305-C1	34.10	15305-C3	35.80	
	3/32	3/8	.005	1/8	1-1/2	15306	30.60	15306-C1	34.10	15306-C3	35.80	
	7/64	3/8	.005	1/8	1-1/2	15307	32.50			15307-C3	37.70	
	3 mm	3/8	.005	1/8	1-1/2	1533M	32.50			1533M-C3	37.70	
	1/8	1/2	.005	1/8	1-1/2	15308	30.60	15308-C1	34.10	15308-C3	35.80	
	1/8	1/2	.005	1/8	3	LONG 824208	34.70			824208-C3	42.20	
	1/8	5/8	.005	1/8	2-1/2	824008	33.50			824008-C3	38.70	
	9/64	9/16	.006	3/16	2	15309	33.80			15309-C3	39.40	
	5/32	9/16	.006	3/16	2	15310	33.80			15310-C3	39.40	
	11/64	5/8	.006	3/16	2	15311	33.80			15311-C3	39.40	
	3/16	5/8	.006	3/16	2	15312	31.70	15312-C1	35.60	15312-C3	37.30	
	3/16	1	.006	3/16	3	824012	35.20			824012-C3	40.80	
	13/64	3/4	.006	1/4	2-1/2	15313	49.80			15313-C3	57.40	
	7/32	3/4	.006	1/4	2-1/2	15314	50.70			15314-C3	58.30	
	6 mm	3/4	.006	1/4	2-1/2	1536M	50.40			1536M-C3	58.00	
	1/4	3/4	.006	1/4	2-1/2	15316	44.90	15316-C1	49.00	15316-C3	52.50	
	1/4	3/4	.006	1/4	4	824216	50.00			824216-C3	55.50	
	1/4	1-1/4	.006	1/4	4	824016	52.40			824016-C3	61.30	
	5/16	13/16	.007	5/16	2-1/2	15320	47.00	15320-C1	52.80	15320-C3	55.90	
	3/8	7/8	.008	3/8	2-1/2	15324	56.30	15324-C1	62.30	15324-C3	66.40	
	3/8	2	.008	3/8	4	824024	60.30			824024-C3	74.10	
	7/16	1	.008	7/16	2-3/4	15328	93.00			15328-C3	105.60	
	1/2	1	.008	1/2	3	15332	89.40	15332-C1	96.20	15332-C3	104.50	
	1/2	1	.008	1/2	6	LONG 824032	111.80			824032-C3	126.90	
	5/8	1-1/4	.009	5/8	3-1/2	15340	137.90	15340-C1	146.80	15340-C3	153.00	
3/4	1-1/2	.010	3/4	4	15348	209.20	15348-C1	219.30	15348-C3	225.50		
7/8	2	.010	7/8	4	15356	338.90			15356-C3	355.80		
1	2	.010	1	4	15364	332.50			15364-C3	357.30		

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## DRILL / END MILLS

Mill Style – 4 Flute (cont.)

continued from previous page

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TIN COATED		A/TIN COATED	
						4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
100°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	W	D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
	1/32	3/32	.003	1/8	1-1/2	27402	37.10			27402-C3	42.30
	1/16	3/16	.005	1/8	1-1/2	27404	36.70			27404-C3	41.90
	5/64	1/4	.005	1/8	1-1/2	27405	37.10			27405-C3	42.30
	3/32	3/8	.005	1/8	1-1/2	27406	36.70			27406-C3	41.90
	1/8	1/2	.005	1/8	1-1/2	27408	36.70			27408-C3	41.90
	5/32	9/16	.006	3/16	2	27410	38.10			27410-C3	43.70
	3/16	5/8	.006	3/16	2	27412	38.10			27412-C3	43.70
	1/4	3/4	.006	1/4	2-1/2	27416	53.10			27416-C3	60.70
	5/16	13/16	.007	5/16	2-1/2	27420	55.40			27420-C3	64.30
	3/8	7/8	.008	3/8	2-1/2	27424	66.30			27424-C3	76.40
	1/2	1	.008	1/2	3	27432	103.60			27432-C3	118.70
	5/8	1-1/4	.009	5/8	3-1/2	27440	158.30			27440-C3	173.40
3/4	1-1/2	.010	3/4	4	27448	239.40			27448-C3	255.70	
110°	1/8	1/2	.005	1/8	1-1/2	824408	36.70			824408-C3	41.90
	1/4	3/4	.006	1/4	2-1/2	824416	53.10			824416-C3	60.70
	3/8	7/8	.008	3/8	2-1/2	824424	66.30			824424-C3	76.40
	1/2	1	.008	1/2	3	824432	103.60			824432-C3	118.70
120°	1/32	3/32	.003	1/8	1-1/2	988102	34.60			988102-C3	39.80
	1/16	3/16	.005	1/8	1-1/2	988104	34.60			988104-C3	39.80
	3/32	3/8	.005	1/8	1-1/2	988106	34.60			988106-C3	39.80
	7/64	3/8	.005	1/8	1-1/2	988107	33.80			988107-C3	39.00
	3 mm	3/8	.005	1/8	1-1/2	98813M	35.20			98813M-C3	40.40
	1/8	1/2	.005	1/8	1-1/2	988108	34.60			988108-C3	39.80
	9/64	9/16	.006	3/16	2	988109	36.30			988109-C3	41.90
	5/32	9/16	.006	3/16	2	988110	35.60			988110-C3	41.20
	3/16	5/8	.006	3/16	2	988112	35.60			988112-C3	41.20
	1/4	3/4	.006	1/4	2-1/2	988116	50.00			988116-C3	57.60
	5/16	13/16	.007	5/16	2-1/2	988120	52.10			988120-C3	61.00
	3/8	7/8	.008	3/8	2-1/2	988124	62.00			988124-C3	72.10
	1/2	1	.008	1/2	3	988132	97.00			988132-C3	112.10
	5/8	1-1/4	.009	5/8	3-1/2	988140	147.10			988140-C3	162.20
3/4	1-1/2	.010	3/4	4	988148	222.30			988148-C3	238.60	
1	2	.010	1	4	988164	334.20			988164-C3	359.00	
135°	1/8	1/2	.005	1/8	1-1/2	870208	36.70			870208-C3	41.90
	3/16	5/8	.006	3/16	2	870212	38.10			870212-C3	43.70
	1/4	3/4	.006	1/4	2-1/2	870216	53.10			870216-C3	60.70
	3/8	7/8	.008	3/8	2-1/2	870224	66.90			870224-C3	77.00
	1/2	1	.008	1/2	3	870232	104.60			870232-C3	119.70
140°	1/8	1/2	.005	1/8	1-1/2	817208	36.70			817208-C3	41.90
	1/4	3/4	.006	1/4	2-1/2	817216	53.10			817216-C3	60.70

DRILL / END MILLS

# DRILL / END MILLS

## Drill Style – 2 Flute



### DRILL STYLE

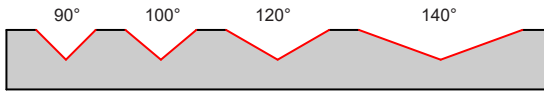
Fluted relief with split point with "S" style gash to thin web.

#### Recommended For

Chamfering	Light Duty	
O.D. Milling	Yes	
Drilling	Yes	
Spotting	Yes	

DRILL / END MILLS

- Designed for drilling and milling applications
- 2 flutes
- Solid carbide
- CNC ground in the USA



Stocked in *Four* Included Angles!

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED		TiB <sub>2</sub> COATED	
						2 FL	PRICE	2 FL	PRICE	TOOL #	PRICE
90°	1/32	3/32	.003	1/8	1-1/2	46502	35.20	46502-C3	40.40		
	1 mm	1/8	.003	1/8	1-1/2	4651M	37.90	4651M-C3	43.10		
	3/64	9/64	.004	1/8	1-1/2	46503	35.20	46503-C3	40.40	46503-C8	42.80
	1/16	3/16	.005	1/8	1-1/2	46504	35.20	46504-C3	40.40		
	5/64	1/4	.005	1/8	1-1/2	46505	35.20	46505-C3	40.40		
	3/32	3/8	.005	1/8	1-1/2	46506	35.20	46506-C3	40.40		
	7/64	3/8	.005	1/8	1-1/2	46507	35.20	46507-C3	40.40		
	3 mm	3/8	.005	1/8	1-1/2	4653M	37.90	4653M-C3	43.10		
	1/8	1/2	.005	1/8	1-1/2	46508	35.20	46508-C3	40.40	46508-C8	42.80
	9/64	9/16	.006	3/16	2	46509	35.60	46509-C3	41.20		
	5/32	9/16	.006	3/16	2	46510	35.60	46510-C3	41.20		
	3/16	5/8	.006	3/16	2	46512	35.60	46512-C3	41.20		
	7/32	3/4	.006	1/4	2-1/2	46514	50.00	46514-C3	57.60		
	1/4	3/4	.006	1/4	2-1/2	46516	50.00	46516-C3	57.60	46516-C8	58.20
	5/16	13/16	.007	5/16	2-1/2	46520	52.10	46520-C3	61.00		
	3/8	7/8	.008	3/8	2-1/2	46524	62.00	46524-C3	72.10		
	7/16	1	.008	7/16	2-3/4	46528	95.00	46528-C3	107.60		
	1/2	1	.008	1/2	3	46532	97.00	46532-C3	112.10		
	5/8	1-1/4	.010	5/8	3-1/2	46540	147.10	46540-C3	162.20		
	3/4	1-1/2	.012	3/4	4	46548	222.30	46548-C3	238.60		
1	2	.015	1	4	46564	329.10	46564-C3	353.90			
100°	1/8	1/2	.005	1/8	1-1/2	849108	37.10	849108-C3	42.30		
	3/16	5/8	.006	3/16	2	849112	38.10	849112-C3	43.70		
	1/4	3/4	.006	1/4	2-1/2	849116	53.10	849116-C3	60.70		
	3/8	7/8	.008	3/8	2-1/2	849124	66.90	849124-C3	77.00		

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## DRILL / END MILLS

Drill Style – 2 Flute (cont.)

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INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
						2 FL	PRICE	2 FL	PRICE	TOOL #	PRICE
120°	1/32	3/32	.003	1/8	1-1/2	12902	35.20	12902-C3	40.40		
	1 mm	1/8	.003	1/8	1-1/2	1291M	37.90	1291M-C3	43.10		
	3/64	9/64	.004	1/8	1-1/2	12903	35.20	12903-C3	40.40		
	1/16	3/16	.005	1/8	1-1/2	12904	33.00	12904-C3	38.20		
	5/64	1/4	.005	1/8	1-1/2	12905	33.00	12905-C3	38.20		
	3/32	3/8	.005	1/8	1-1/2	12906	33.00	12906-C3	38.20		
	3 mm	3/8	.005	1/8	1-1/2	1293M	37.90	1293M-C3	43.10		
	1/8	1/2	.005	1/8	1-1/2	12908	33.00	12908-C3	38.20	12908-C8	40.60
	9/64	9/16	.006	3/16	2	12909	35.60	12909-C3	41.20		
	5/32	9/16	.006	3/16	2	12910	35.60	12910-C3	41.20		
	3/16	5/8	.006	3/16	2	12912	33.60	12912-C3	39.20		
	7/32	3/4	.006	1/4	2-1/2	12914	50.00	12914-C3	57.60		
	1/4	3/4	.006	1/4	2-1/2	12916	46.90	12916-C3	54.50	12916-C8	55.10
	5/16	13/16	.007	5/16	2-1/2	12920	49.00	12920-C3	57.90		
	3/8	7/8	.008	3/8	2-1/2	12924	58.80	12924-C3	68.90	12924-C8	79.90
	7/16	1	.008	7/16	2-3/4	12928	95.00	12928-C3	107.60		
	1/2	1	.008	1/2	3	12932	91.80	12932-C3	106.90		
	5/8	1-1/4	.010	5/8	3-1/2	12940	139.40	12940-C3	154.50		
3/4	1-1/2	.012	3/4	4	12948	210.80	12948-C3	227.10			
1	2	.015	1	4	12964	329.10	12964-C3	353.90			
140°	1/16	3/16	.005	1/8	1-1/2	950504	36.70	950504-C3	41.90		
	5/64	1/4	.005	1/8	1-1/2	950505	36.70	950505-C3	41.90		
	3/32	3/8	.005	1/8	1-1/2	950506	36.70	950506-C3	41.90		
	1/8	1/2	.005	1/8	1-1/2	950508	36.70	950508-C3	41.90		
	3/16	5/8	.006	3/16	2	950512	38.10	950512-C3	43.70		
	1/4	3/4	.006	1/4	2-1/2	950516	53.10	950516-C3	60.70		
	5/16	13/16	.007	5/16	2-1/2	950520	55.40	950520-C3	64.30		
	3/8	7/8	.008	3/8	2-1/2	950524	66.30	950524-C3	76.40		
	1/2	1	.008	1/2	3	950532	103.60	950532-C3	118.70		
	5/8	1-1/4	.010	5/8	3-1/2	950540	158.30	950540-C3	173.40		
	3/4	1-1/2	.012	3/4	4	950548	239.40	950548-C3	255.70		

DRILL / END MILLS

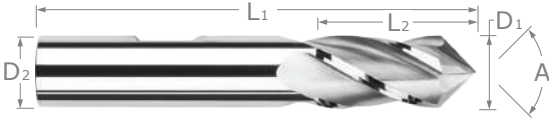


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# DRILL / END MILLS

## Cobalt - Mill Style - 2 & 4 Flute



**MILL STYLE**

END VIEW: 

Flat Relief with end mill style gash to thin web

Recommended For	
Chamfering	Yes
O.D. Milling	Yes
Drilling	Non-Ferrous Only
Spotting	Light Duty

DRILL / END MILLS

- M-42 steel (8% cobalt)
- 90° included angle point
- Weldon flat
- CNC ground in the USA

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	FLUTES*	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
						TOOL #	PRICE
A $+1^\circ$ $-1^\circ$	D1 $+0.000''$ $-0.002''$	L2 $+0.030''$ $-0.000''$		D2	L1		
90°	1/8	3/8	4	3/8	2-5/16	14308	68.30
	1/8	68.30	2	3/8	2-5/16	14308-2	68.30
	3/16	68.30	4	3/8	2-3/8	14312	68.30
	1/4	68.30	4	3/8	2-1/2	14316	68.30
	1/4	68.30	2	3/8	2-1/2	14316-2	68.30
	5/16	68.30	4	3/8	2-1/2	14320	68.30
	3/8	68.30	4	3/8	2-1/2	14324	68.30
	3/8	68.30	2	3/8	2-1/2	14324-2	68.30
	7/16	80.60	4	3/8	2-11/16	14328	80.60
	1/2	80.60	4	1/2	3-1/4	14332	80.60
	5/8	117.90	4	5/8	3-1/4	14340	117.90
	3/4	138.60	4	3/4	3-7/8	14348	138.60
	1	201.90	4	3/4	4-1/8	14364-A	201.90
	1	201.90	4	1	4-1/2	14364	201.90

\*2 flute style is two flutes to center. 4 flute style is two flutes to center and two flutes cut back.



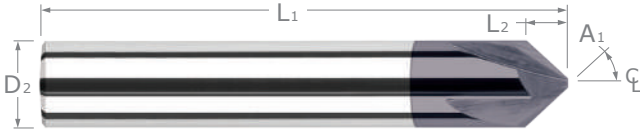
### Check Out Our New CNC Show!

Join Harvey Performance Company National Applications Engineer Don Grandt as he dives into specific cutting tool topics, answering the questions machinists ask most, to help you accomplish more at the spindle.

[YOUTUBE.COM/INTHELOUPETV](https://www.youtube.com/intheloupetv)

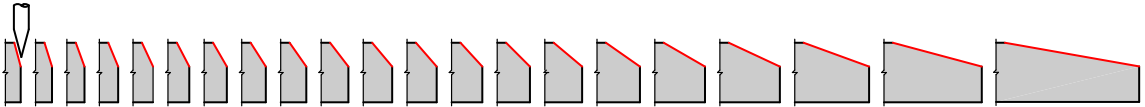
# CHAMFER CUTTERS

Pointed & Flat End



Available in  
2, 3, 4 & 6 Flutes!

- Choose from three types:
  - **Pointed** (Type I): Used for deburring and chamfering in narrow grooves, slots, and, small holes
  - **Flat End** (Type II): (non-cutting) multi-flute design improves tool life and finish for profiling and chamfering larger features
  - **End Cutting** (Type III): 4 flute center cutting geometry to blend the floor and a chamfered wall in a single pass
- Solid carbide • CNC ground in the USA



Stocked in 21 Angles Per Side, Ranging from 15°-80°!

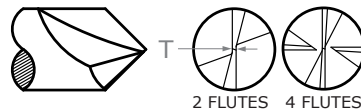
ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC			UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED																
					L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE															
15°	D <sub>2</sub>	2	T <sub>(MAX.)</sub>	I	.233	.233	.075	1-1/2	18715	19.20	18715-C3	24.40	18715-C8	26.80														
															1/8	2	.010	I	.233		3	LONG!	50615	25.00	50615-C3	30.20		
															1/8	3	.040	II	.159	.075	1-1/2		968615	20.40	968615-C3	25.60		
															1/8	4	.040	II	.159	.075	1-1/2		866115	21.50	866115-C3	26.70		
															3/16	2	.010	I	.350		2		72415	26.60	72415-C3	32.20		
															3/16	2	.010	I	.350		4	LONG!	986915	40.10	986915-C3	47.70		
															3/16	3	.040	II	.275	.075	2		978115	30.30	978115-C3	35.90		
															3/16	4	.040	II	.275	.075	2		848715	31.80	848715-C3	37.40		
															1/4	2	.010	I	.448		2-1/2		47615	38.10	47615-C3	45.70	47615-C8	46.30
															1/4	3	.060	II	.355	.112	2-1/2		18515	35.80	18515-C3	43.40		
															1/4	3	.060	II	.355	.112	4	LONG!	48515	49.80	48515-C3	54.60		
															1/4	4	.060	II	.355	.112	2-1/2		876415	40.00	876415-C3	47.60		
															1/4	4	.040	III	.391	.075	2-1/2		833115	42.90	833115-C3	50.50		
															5/16	3	.060	II	.471	.112	2-1/2		977015	44.90	977015-C3	53.80		
															3/8	2	.010	I	.700		2-1/2		72515	51.10	72515-C3	61.20		
															3/8	3	.060	II	.588	.112	2-1/2		18415	48.10	18415-C3	58.20	18415-C8	69.20
															3/8	3	.060	II	.588	.112	4	LONG!	981215	75.20	981215-C3	89.00		
															3/8	4	.060	II	.588	.112	2-1/2		895115	53.70	895115-C3	63.80		

CHAMFER CUTTERS

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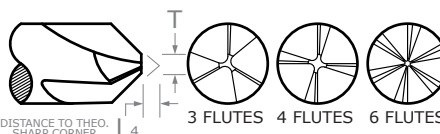
### TYPE I - POINTED

Flat relief ground to center, yielding a web thickness at tip (T)



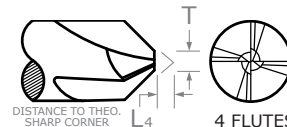
### TYPE II - FLAT END

Flat relief ground to a non-end cutting flat tip (T)



### TYPE III - END CUTTING

Flat relief ground to an end cutting tip diameter (T), two flutes to center



# CHAMFER CUTTERS

## Pointed & Flat End (cont.)

continued from previous page

CHAMFER CUTTERS

ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC			OAL		UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
					L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE		
15°	1/2	2	.010	I	.933			3	960415	86.10	960415-C3	101.20			
	1/2	4	.080	II	.784	.149		3	18315	71.30	18315-C3	86.40			
	1/2	6	.080	II	.784	.149		3	839215	79.80	839215-C3	94.90			
	5/8	6	.080	II	1.017	.149		3-1/2	952815	125.40	952815-C3	140.50			
	3/4	6	.100	II	1.213	.187		4	949315	187.80	949315-C3	204.10			
17.5°	1/8	2	.010	I	.198			1-1/2	18718	22.80	18718-C3	28.00			
	1/4	2	.010	I	.396			2-1/2	47618	41.60	47618-C3	49.20			
	1/4	3	.060	II	.301	.095		2-1/2	18518	41.60	18518-C3	49.20			
	3/8	3	.060	II	.500	.107		2-1/2	18418	54.20	18418-C3	64.30			
	1/2	4	.080	II	.666	.127		3	18318	83.10	18318-C3	98.20			
20°	1/8	2	.010	I	.172			1-1/2	18720	19.20	18720-C3	24.40	18720-C8	26.80	
	1/8	2	.010	I	.172			3 <b>LONG!</b>	50620	25.00	50620-C3	30.20			
	1/8	3	.040	II	.117	.055		1-1/2	968620	20.40	968620-C3	25.60			
	1/8	4	.040	II	.117	.055		1-1/2	866120	21.50	866120-C3	26.70			
	3/16	2	.010	I	.258			2	72420	26.60	72420-C3	32.20	72420-C8	34.20	
	3/16	2	.010	I	.258			4 <b>LONG!</b>	986920	40.10	986920-C3	47.70			
	3/16	3	.040	II	.203	.055		2	978120	30.30	978120-C3	35.90			
	3/16	4	.040	II	.203	.055		2	848720	31.80	848720-C3	37.40			
	1/4	2	.010	I	.343			2-1/2	47620	38.10	47620-C3	45.70	47620-C8	46.30	
	1/4	3	.060	II	.261	.082		2-1/2	18520	35.80	18520-C3	43.40	18520-C8	44.00	
	1/4	3	.060	II	.261	.082		4 <b>LONG!</b>	48520	49.80	48520-C3	58.70			
	1/4	4	.060	II	.261	.082		2-1/2	876420	43.40	876420-C3	51.00			
	1/4	4	.040	III	.288	.055		2-1/2	833120	45.10	833120-C3	52.70			
	5/16	3	.060	II	.347	.082		2-1/2	977020	51.10	977020-C3	60.00			
	3/8	2	.010	I	.515			2-1/2	72520	51.10	72520-C3	61.20			
	3/8	3	.060	II	.433	.082		2-1/2	18420	48.10	18420-C3	58.20			
	3/8	3	.060	II	.433	.082		4 <b>LONG!</b>	981220	75.20	981220-C3	89.00			
	3/8	4	.060	II	.433	.082		2-1/2	895120	58.30	895120-C3	68.40			
1/2	2	.010	I	.687			3	960420	86.10	960420-C3	101.20				
1/2	4	.080	II	.577	.110		3	18320	71.30	18320-C3	86.40				
1/2	6	.080	II	.577	.110		3	839220	79.80	839220-C3	94.90				
22.5°	1/8	2	.010	I	.151			1-1/2	18723	22.10	18723-C3	27.30	18723-C8	29.70	
	1/8	3	.040	II	.103	.048		1-1/2	968623	22.10	968623-C3	27.30			
	3/16	2	.010	I	.226			2	72423	29.00	72423-C3	34.60			
	3/16	3	.040	II	.178	.048		2	978123	29.00	978123-C3	34.60			
	1/4	2	.010	I	.302			2-1/2	47623	41.60	47623-C3	49.20			
	1/4	3	.060	II	.229	.072		2-1/2	18523	41.60	18523-C3	49.20			
	3/8	2	.010	I	.453			2-1/2	72523	55.90	72523-C3	66.00			
	3/8	3	.060	II	.380	.072		2-1/2	18423	55.90	18423-C3	66.00			
	1/2	2	.010	I	.604			3	960423	89.00	960423-C3	104.10			
	1/2	4	.080	II	.507	.097		3	18323	78.70	18323-C3	93.80			

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# CHAMFER CUTTERS

Pointed & Flat End (cont.)

continued from previous page

ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC			UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
					OAL	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE		
A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	D <sub>2</sub>		T <sub>(MAX.)</sub>		L <sub>2</sub>	L <sub>4 (MAX.)</sub>	L <sub>1</sub>						
25°	1/8	2	.010	I	.134		1-1/2	18725	22.10	18725-C3	27.30	18725-C8	29.70
	1/8	3	.040	II	.091	.043	1-1/2	968625	22.10	968625-C3	27.30		
	3/16	2	.010	I	.201		2	72425	28.80	72425-C3	34.40		
	3/16	3	.040	II	.158	.043	2	978125	28.80	978125-C3	34.40		
	1/4	2	.010	I	.268		2-1/2	47625	41.60	47625-C3	49.20		
	1/4	3	.060	II	.204	.064	2-1/2	18525	41.40	18525-C3	49.00		
	1/4	4	.060	II	.204	.064	2-1/2	876425	43.20	876425-C3	50.80		
	3/8	2	.010	I	.402		2-1/2	72525	55.50	72525-C3	65.60		
	3/8	3	.060	II	.338	.064	2-1/2	18425	55.50	18425-C3	65.60		
	1/2	2	.010	I	.536		3	960425	88.10	960425-C3	103.20		
1/2	4	.080	II	.450	.086	3	18325	77.80	18325-C3	92.90			
27.5°	1/8	2	.010	I	.120		1-1/2	18728	22.80	18728-C3	28.00		
	1/4	2	.010	I	.240		2-1/2	47628	41.60	47628-C3	49.20		
	1/4	3	.060	II	.182	.058	2-1/2	18528	41.60	18528-C3	49.20		
	1/2	4	.080	II	.403	.077	3	18328	78.70	18328-C3	93.80		
30°	3 mm	2	.120 mm	I	2.60 mm		38 mm	900230	21.50	900230-C3	26.70		
	1/8	2	.010	I	.108		1-1/2	18730	19.20	18730-C3	24.40	18730-C8	26.80
	1/8	2	.010	I	.108		3	<b>LONG!</b> 50630	25.00	50630-C3	30.20		
	1/8	3	.040	II	.074	.035	1-1/2	968630	20.40	968630-C3	25.60		
	1/8	4	.040	II	.074	.035	1-1/2	866130	21.50	866130-C3	26.70		
	1/8	4	.040	III	.074	.035	1-1/2	802830	24.00	802830-C3	29.20		
	3/16	2	.010	I	.162		2	72430	26.60	72430-C3	32.20	72430-C8	34.20
	3/16	2	.010	I	.162		4	<b>LONG!</b> 986930	40.10	986930-C3	47.70		
	3/16	3	.040	II	.128	.035	2	978130	33.00	978130-C3	38.60		
	3/16	4	.040	II	.128	.035	2	848730	34.50	848730-C3	40.10		
	1/4	2	.010	I	.217		2-1/2	47630	38.10	47630-C3	45.70	47630-C8	46.30
	1/4	3	.060	II	.165	.052	2-1/2	18530	35.80	18530-C3	43.40	18530-C8	44.00
	1/4	3	.060	II	.165	.052	4	<b>LONG!</b> 48530	49.80	48530-C3	54.60		
	1/4	4	.060	II	.165	.052	2-1/2	876430	40.00	876430-C3	47.60		
	1/4	4	.040	III	.181	.035	2-1/2	833130	42.60	833130-C3	50.20		
	5/16	2	.010	I	.271		2-1/2	880330	46.10	880330-C3	55.00		
	5/16	3	.060	II	.219	.052	2-1/2	977030	44.90	977030-C3	53.80		
	5/16	4	.060	II	.219	.052	2-1/2	873230	47.80	873230-C3	56.70		
	3/8	2	.010	I	.325		2-1/2	72530	51.10	72530-C3	61.20		
	3/8	3	.060	II	.273	.052	2-1/2	18430	48.10	18430-C3	58.20	18430-C8	69.20
	3/8	3	.060	II	.273	.052	4	<b>LONG!</b> 981230	75.20	981230-C3	89.00		
	3/8	4	.060	II	.273	.052	2-1/2	895130	53.70	895130-C3	63.80		
	3/8	4	.060	III	.273	.052	2-1/2	827830	57.40	827830-C3	67.50		
	1/2	2	.010	I	.433		3	960430	81.30	960430-C3	96.40		
	1/2	3	.080	II	.364	.069	3	871830	80.00	871830-C3	95.10		
	1/2	4	.080	II	.364	.069	3	18330	67.30	18330-C3	82.40	18330-C8	92.10
	1/2	4	.080	III	.364	.069	3	820230	74.80	820230-C3	89.90		
	1/2	6	.080	II	.364	.069	3	839230	75.20	839230-C3	90.30		
	5/8	6	.080	II	.472	.069	3-1/2	952830	125.40	952830-C3	140.50		
	3/4	6	.100	II	.563	.087	4	949330	187.80	949330-C3	204.10		

CHAMFER CUTTERS

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# CHAMFER CUTTERS

## Pointed & Flat End (cont.)

continued from previous page

CHAMFER CUTTERS

ANGLE PER SIDE A <sub>1</sub> <sup>+0°30'</sup> <sub>-0°30'</sub>	DIA.	FLUTES	TIP	TYPE	LOC			OAL		UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
					L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE		
32.5°	1/8	2	.010	I	.098			1-1/2	18733	22.80	18733-C3	28.00			
	1/4	3	.060	II	.149	.047		2-1/2	18533	41.60	18533-C3	49.20			
	1/2	4	.080	II	.330	.063		3	18333	78.70	18333-C3	93.80			
35°	1/8	2	.010	I	.089			1-1/2	18735	21.20	18735-C3	26.40			
	1/8	3	.040	II	.061	.029		1-1/2	968635	21.40	968635-C3	26.60			
	3/16	2	.010	I	.134			2	72435	27.40	72435-C3	33.00			
	3/16	3	.040	II	.105	.029		2	978135	27.40	978135-C3	33.00			
	1/4	2	.010	I	.179			2-1/2	47635	50.00	47635-C3	57.60			
	1/4	3	.060	II	.136	.043		2-1/2	18535	39.30	18535-C3	46.90			
	3/8	2	.010	I	.268			2-1/2	72535	53.00	72535-C3	63.10			
	3/8	3	.060	II	.225	.043		2-1/2	18435	53.00	18435-C3	63.10			
	1/2	2	.010	I	.357			3	960435	84.10	960435-C3	99.20			
1/2	4	.080	II	.300	.057		3	18335	74.10	18335-C3	89.20				
37.5°	1/8	2	.010	I	.081			1-1/2	18738	22.80	18738-C3	28.00			
	1/4	2	.010	I	.163			2-1/2	47638	53.00	47638-C3	60.60			
	1/4	3	.060	II	.124	.039		2-1/2	18538	41.60	18538-C3	49.20			
	1/2	4	.080	II	.274	.052		3	18338	78.70	18338-C3	93.80			
40°	1/8	2	.010	I	.074			1-1/2	18740	21.20	18740-C3	26.40			
	1/8	3	.040	II	.051	.024		1-1/2	968640	20.40	968640-C3	25.60			
	1/8	4	.040	II	.051	.024		1-1/2	866140	21.50	866140-C3	26.70			
	3/16	2	.010	I	.112			2	72440	27.40	72440-C3	33.00			
	1/4	2	.010	I	.149			2-1/2	47640	50.00	47640-C3	57.60			
	1/4	3	.060	II	.113	.036		2-1/2	18540	39.30	18540-C3	46.90			
	1/4	4	.040	III	.125			2-1/2	833140	48.70	833140-C3	56.30			
	1/4	4	.060	II	.113	.036		2-1/2	876440	42.70	876440-C3	50.30			
	3/8	3	.060	II	.188	.036		2-1/2	18440	53.00	18440-C3	63.10			
1/2	4	.080	II	.25	.048		3	18340	74.10	18340-C3	89.20				
41°	1/8	2	.010	I	.072			1-1/2	18741	20.20	18741-C3	25.40	18741-C8	27.80	
	1/8	3	.040	II	.049	.023		1-1/2	968641	23.50	968641-C3	28.70			
	3/16	2	.010	I	.108			2	72441	30.40	72441-C3	36.00			
	3/16	3	.040	II	.085	.023		2	978141	28.90	978141-C3	34.50			
	1/4	2	.010	I	.144			2-1/2	47641	43.10	47641-C3	50.70			
	1/4	3	.060	II	.109	.035		2-1/2	18541	38.00	18541-C3	45.60			
	3/8	2	.010	I	.216			2-1/2	72541	58.90	72541-C3	69.00			
	3/8	3	.060	II	.181	.035		2-1/2	18441	58.90	18441-C3	69.00			
	1/2	2	.010	I	.288			3	960441	89.00	960441-C3	104.10			
1/2	4	.080	II	.242	.046		3	18341	71.30	18341-C3	86.40				
42.5°	1/8	2	.010	I	.068			1-1/2	18743	22.80	18743-C3	28.00			
	1/4	3	.060	II	.104	.033		2-1/2	18543	41.60	18543-C3	49.20			
	1/2	4	.080	II	.229	.044		3	18343	78.70	18343-C3	93.80			

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# CHAMFER CUTTERS

Pointed & Flat End (cont.)

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ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC			OAL		UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
					L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE		
A <sub>1</sub> <sup>+0°30'</sup> -0°30'	3 mm	2	.25 mm	I	1.50 mm		38 mm	900245	23.60	900245-C3	28.80				
	3 mm	3	1.00 mm	II	1.00 mm	.500 mm	38 mm	899545	23.60	899545-C3	28.80				
	3 mm	4	1.00 mm	III	1.00 mm	.500 mm	38 mm	764845	25.30	764845-C3	30.50				
	1/8	2	.010	I	.063		1-1/2	18745	19.20	18745-C3	24.40	18745-C8	26.80		
	1/8	2	.010	I	.063		3 <b>LONG!</b>	50645	25.00	50645-C3	30.20	50645-C8	32.60		
	1/8	3	.040	II	.043	.020	1-1/2	968645	20.40	968645-C3	25.60	968645-C8	28.00		
	1/8	3	.040	II	.043	.020	3 <b>LONG!</b>	790245	25.40	790245-C3	30.60				
	1/8	4	.010	I	.058		1-1/2	744445	21.50	744445-C3	26.70				
	1/8	4	.040	II	.043	.020	1-1/2	866145	21.50	866145-C3	26.70	866145-C8	29.10		
	1/8	4	.040	III	.042	.020	1-1/2	802845	23.10	802845-C3	28.30				
	4 mm	2	.25 mm	I	2.00 mm		50 mm	878445	30.10	878445-C3	35.70				
	4 mm	3	1.00 mm	II	1.50 mm	.500 mm	50 mm	863845	30.10	863845-C3	35.70				
	3/16	2	.010	I	.094		2	72445	27.70	72445-C3	33.30	72445-C8	35.30		
	3/16	2	.010	I	.094		4 <b>LONG!</b>	986945	40.10	986945-C3	47.70				
	3/16	3	.040	II	.074	.020	2	978145	33.00	978145-C3	38.60	978145-C8	40.60		
	3/16	3	.040	II	.074	.020	3 <b>LONG!</b>	790945	33.00	790945-C3	38.60				
	3/16	4	.010	I	.089		2	743745	34.50	743745-C3	41.70				
	3/16	4	.040	II	.074	.020	2	848745	34.50	848745-C3	40.10				
	3/16	4	.040	III	.073	.020	2	809745	36.10	809745-C3	41.70				
	6 mm	2	.25 mm	I	3.00 mm		63 mm	840045	41.80	840045-C3	49.40	840045-C8	50.00		
	6 mm	3	1.50 mm	II	2.25 mm	.750 mm	63 mm	837745	41.80	837745-C3	49.40				
	6 mm	4	1.50 mm	II	2.25 mm	.750 mm	63 mm	777645	43.70	777645-C3	51.30				
	6 mm	4	1.50 mm	III	2.25 mm	.750 mm	63 mm	764545	47.10	764545-C3	54.70				
	1/4	2	.010	I	.125		2-1/2	47645	38.10	47645-C3	45.70	47645-C8	46.30		
	1/4	2	.010	I	.125		4 <b>LONG!</b>	790345	48.90	790345-C3	57.80				
	1/4	3	.060	II	.095	.030	2-1/2	18545	36.00	18545-C3	43.60	18545-C8	44.20		
	1/4	3	.060	II	.095	.030	4 <b>LONG!</b>	48545	49.80	48545-C3	54.60				
	1/4	4	.010	I	.120		2-1/2	743145	44.90	743145-C3	52.50				
	1/4	4	.060	II	.095	.030	2-1/2	876445	44.90	876445-C3	52.50	876445-C8	53.10		
	1/4	4	.060	II	.095	.030	4 <b>LONG!</b>	771545	58.00	771545-C3	66.90				
	1/4	4	.040	III	.105	.020	2-1/2	833145	48.70	833145-C3	56.30	833145-C8	56.90		
	1/4	4	.060	III	.095	.030	2-1/2	794145	48.70	794145-C3	56.30				
	5/16	2	.010	I	.156		2-1/2	880345	44.90	880345-C3	53.80				
	5/16	3	.060	II	.126	.030	2-1/2	977045	44.90	977045-C3	53.80				
	5/16	4	.060	II	.126	.030	2-1/2	873245	47.80	873245-C3	56.70				
	5/16	4	.060	III	.126	.030	2-1/2	777545	51.30	777545-C3	60.20				
8 mm	3	1.50 mm	II	3.25 mm	.750 mm	63 mm	868845	55.40	868845-C3	64.30					
3/8	2	.010	I	.188		2-1/2	72545	53.00	72545-C3	63.10	72545-C8	74.10			
3/8	2	.010	I	.188		4 <b>LONG!</b>	791745	76.60	791745-C3	90.40					
3/8	3	.060	II	.158	.030	2-1/2	18445	48.10	18445-C3	58.20	18445-C8	69.20			
3/8	3	.060	II	.158	.030	4 <b>LONG!</b>	981245	75.20	981245-C3	89.00					
3/8	4	.010	I	.183		2-1/2	742745	55.80	742745-C3	65.90					
3/8	4	.060	II	.158	.030	2-1/2	895145	55.80	895145-C3	65.90					
3/8	4	.040	III	.167	.020	2-1/2	764245	59.80	764245-C3	69.90					
3/8	4	.060	III	.158	.030	2-1/2	827845	59.30	827845-C3	69.40					

CHAMFER CUTTERS

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# CHAMFER CUTTERS

## Pointed & Flat End (cont.)

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CHAMFER CUTTERS

ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC			OAL		UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
					L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE		
45°	10 mm	4	1.50 mm	II	4.25 mm	.750 mm	75 mm	871045	86.70	871045-C3	101.80				
	12 mm	4	1.50 mm	II	5.25 mm	.750 mm	75 mm	881245	86.70	881245-C3	101.80				
	1/2	2	.010	I	.250		3	960445	81.30	960445-C3	96.40	960445-C8	106.10		
	1/2	3	.080	II	.210	.040	3	871845	80.00	871845-C3	95.10				
	1/2	4	.010	I	.245		3	742245	68.00	742245-C3	83.10				NEW
	1/2	4	.080	II	.210	.040	3	18345	67.30	18345-C3	82.40	18345-C8	92.10		
	1/2	4	.080	II	.210	.040	6	LONG!	982445	126.00	982445-C3	141.10			
	1/2	4	.080	III	.210	.040	3	820245	74.80	820245-C3	89.90				
	1/2	6	.080	II	.210	.040	3	839245	75.20	839245-C3	90.30				
	5/8	4	.080	II	.273	.040	3-1/2	763645	121.40	763645-C3	136.50				
	5/8	4	.080	III	.273	.040	3-1/2	765445	122.80	765445-C3	137.90				
	5/8	6	.080	II	.273	.040	3-1/2	952845	125.40	952845-C3	140.50				
	3/4	4	.100	II	.325	.050	4	764045	184.00	764045-C3	200.30				
	3/4	4	.100	III	.325	.050	4	765145	183.60	765145-C3	199.90				
	3/4	6	.100	II	.325	.050	4	949345	187.80	949345-C3	204.10				
1	6	.120	II	.440	.060	4	884745	333.50	884745-C3	358.30					
50°	1/8	2	.010	I	.052		1-1/2	18750	21.20	18750-C3	26.40	18750-C8	28.80		
	1/8	3	.040	II	.036	.017	1-1/2	968650	21.40	968650-C3	26.60				
	3/16	2	.010	I	.079		2	72450	27.40	72450-C3	33.00				
	3/16	3	.040	II	.062	.017	2	978150	34.00	978150-C3	39.60				
	1/4	2	.010	I	.105		2-1/2	47650	39.70	47650-C3	47.30				
	1/4	3	.060	II	.080	.025	2-1/2	18550	39.30	18550-C3	46.90				
	1/4	4	.060	II	.080	.025	2-1/2	876450	42.70	876450-C3	50.30				
	1/4	4	.040	III	.088	.017	2-1/2	833150	48.70	833150-C3	56.30				
	3/8	2	.010	I	.157		2-1/2	72550	53.00	72550-C3	63.10	72550-C8	74.10		
	3/8	3	.060	II	.132	.025	2-1/2	18450	53.00	18450-C3	63.10				
	3/8	4	.060	II	.132	.025	2-1/2	895150	56.20	895150-C3	66.30				
	1/2	2	.010	I	.210		3	960450	84.10	960450-C3	99.20				
1/2	4	.080	II	.176	.034	3	18350	74.10	18350-C3	89.20					
55°	1/8	2	.010	I	.044		1-1/2	18755	23.50	18755-C3	28.70				
	3/16	2	.010	I	.066		2	72455	29.00	72455-C3	34.60				
	1/4	2	.010	I	.088		2-1/2	47655	55.10	47655-C3	62.70				
	1/4	3	.060	II	.067	.021	2-1/2	18555	43.10	18555-C3	50.70				
	3/8	3	.060	II	.110	.021	2-1/2	18455	55.90	18455-C3	66.00				
	1/2	4	.080	II	.147	.028	3	18355	80.80	18355-C3	95.90				

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# CHAMFER CUTTERS

Pointed & Flat End (cont.)

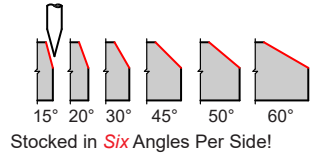
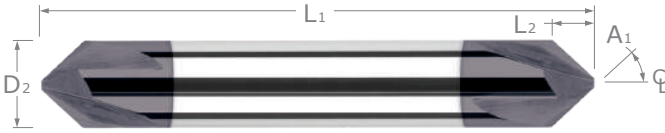
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ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC		OAL	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
					L <sub>2</sub>	L <sub>4</sub> (MAX.)		L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #
60°	A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	D <sub>2</sub>	T (MAX.)			L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>					
	3 mm	2	.120 mm	I		.87 mm		38 mm	900260	21.00	900260-C3	26.20	
	1/8	2	.010	I		.036		1-1/2	18760	19.20	18760-C3	24.40	18760-C8 26.80
	1/8	2	.010	I		.036		3 <b>LONG!</b>	50660	25.00	50660-C3	30.20	
	1/8	3	.040	II		.025	.012	1-1/2	968660	20.40	968660-C3	25.60	
	3/16	2	.010	I		.054		2	72460	26.60	72460-C3	32.20	
	3/16	3	.040	II		.043	.012	2	978160	33.00	978160-C3	38.60	
	1/4	2	.010	I		.072		2-1/2	47660	38.10	47660-C3	45.70	
	1/4	3	.060	II		.055	.017	2-1/2	18560	35.80	18560-C3	43.40	
	1/4	3	.060	II		.055	.017	4 <b>LONG!</b>	48560	49.80	48560-C3	54.60	
	1/4	4	.060	II		.055	.017	2-1/2	876460	40.00	876460-C3	47.60	
	1/4	4	.040	III		.060	.012	2-1/2	833160	41.80	833160-C3	49.40	
	5/16	3	.060	II		.073	.017	2-1/2	977060	44.90	977060-C3	53.80	
	3/8	2	.010	I		.108		2-1/2	72560	51.10	72560-C3	61.20	
	3/8	3	.060	II		.091	.017	2-1/2	18460	48.10	18460-C3	58.20	18460-C8 69.20
	3/8	4	.060	II		.091	.017	2-1/2	895160	52.60	895160-C3	62.70	
	3/8	4	.060	III		.091	.017	2-1/2	827860	58.70	827860-C3	68.80	
	1/2	2	.010	I		.144		3	960460	81.30	960460-C3	96.40	
1/2	4	.080	II		.121	.023	3	18360	67.30	18360-C3	82.40		
1/2	4	.080	III		.121	.023	3	820260	72.20	820260-C3	87.30		
5/8	6	.080	II		.157	.023	3-1/2	952860	125.40	952860-C3	140.50		
3/4	6	.100	II		.188	.029	4	949360	187.80	949360-C3	204.10		
65°	1/8	2	.010	I		.029		1-1/2	18765	22.10	18765-C3	27.30	
	3/16	2	.010	I		.044		2	72465	29.00	72465-C3	34.60	
	1/4	2	.010	I		.058		2-1/2	47665	53.00	47665-C3	60.60	
	1/4	3	.060	II		.044	.014	2-1/2	18565	41.60	18565-C3	49.20	
	3/8	3	.060	II		.073	.014	2-1/2	18465	55.90	18465-C3	66.00	
1/2	4	.080	II		.098	.019	3	18365	78.70	18365-C3	93.80		
70°	1/8	2	.010	I		.023		1-1/2	18770	21.20	18770-C3	26.40	
	3/16	2	.010	I		.034		2	72470	27.40	72470-C3	33.00	
	1/4	2	.010	I		.045		2-1/2	47670	50.00	47670-C3	57.60	
	1/4	3	.060	II		.035	.011	2-1/2	18570	39.30	18570-C3	46.90	
	3/8	3	.060	II		.057	.011	2-1/2	18470	57.10	18470-C3	67.20	
1/2	4	.080	II		.076	.015	3	18370	74.10	18370-C3	89.20		
75°	1/8	2	.010	I		.017		1-1/2	18775	23.50	18775-C3	28.70	18775-C8 31.10
	1/8	3	.040	II		.011	.005	1-1/2	968675	23.50	968675-C3	28.70	
	3/16	2	.010	I		.025		2	72475	30.40	72475-C3	36.00	
	3/16	3	.040	II		.020	.005	2	978175	35.90	978175-C3	40.90	
	1/4	2	.010	I		.033		2-1/2	47675	43.10	47675-C3	50.70	
	1/4	3	.060	II		.025	.008	2-1/2	18575	43.80	18575-C3	51.40	
	1/4	4	.060	II		.025	.008	2-1/2	876475	47.20	876475-C3	54.80	
	3/8	2	.010	I		.050		2-1/2	72575	58.90	72575-C3	69.00	
	3/8	3	.060	II		.042	.008	2-1/2	18475	58.90	18475-C3	69.00	
1/2	2	.010	I		.067		3	960475	93.40	960475-C3	108.50		
1/2	4	.080	II		.056	.011	3	18375	82.50	18375-C3	97.60		
80°	1/8	2	.010	I		.011		1-1/2	18780	23.30	18780-C3	28.50	
	1/4	3	.060	II		.017	.005	2-1/2	18580	31.20	18580-C3	38.80	
	1/2	4	.080	II		.037	.007	3	18380	96.80	18380-C3	111.90	

CHAMFER CUTTERS

# CHAMFER CUTTERS

## Pointed & Flat End – Double-Ended



CHAMFER CUTTERS

- Double-ended
- Choose from three types:
  - **Pointed** (Type I): 2 flute style for deburring and chamfering in narrow grooves, slots, and small holes
  - **Flat End** (Type II): (non-cutting) multi-flute design improves tool life and finish for profiling and chamfering larger features
  - **End Cutting** (Type III): 4 flute center cutting geometry to blend the floor and a chamfered wall in a single pass
- Solid carbide • CNC ground in the USA

ANGLE PER SIDE	DIAMETER	FLUTES	TIP	TYPE	LENGTH OF CUT		OVERALL LENGTH	UNCOATED		A1TiN COATED	
					L <sub>2</sub>	L <sub>4</sub> (MAX.)		TOOL #	PRICE	TOOL #	PRICE
A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	D <sub>2</sub>		T (MAX.)		L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
15°	1/8	2	.010	I	.233		1-1/2	988415	38.80	988415-C3	45.20
	1/4	2	.010	I	.467		2-1/2	977615	57.00	977615-C3	67.10
	1/4	3	.060	II	.355	.112	2-1/2	891015	63.40	891015-C3	73.50
	3/8	2	.010	I	.700		3	998315	82.60	998315-C3	95.20
	3/8	3	.060	II	.588	.112	2-1/2	934015	95.40	934015-C3	110.50
	1/2	4	.080	II	.784	.149	3	18615	115.00	18615-C3	135.70
20°	1/8	2	.010	I	.172		1-1/2	988420	38.80	988420-C3	45.20
	1/4	2	.010	I	.343		2-1/2	977620	57.00	977620-C3	67.10
	1/4	3	.060	II	.261	.082	2-1/2	891020	63.40	891020-C3	73.50
	3/8	2	.010	I	.515		2-1/2	998320	82.60	998320-C3	97.70
	3/8	3	.060	II	.433	.082	2-1/2	934020	95.40	934020-C3	110.50
	1/2	4	.080	II	.577	.110	3	18620	115.00	18620-C3	135.70
30°	1/8	2	.010	I	.108		1-1/2	988430	33.00	988430-C3	39.40
	3/16	2	.010	I	.162		2	902330	33.00	902330-C3	40.60
	3/16	3	.040	II	.128	.035	2	897130	44.20	897130-C3	51.80
	1/4	2	.010	I	.217		2-1/2	977630	50.90	977630-C3	61.00
	1/4	3	.060	II	.165	.052	2-1/2	891030	59.80	891030-C3	69.90
	3/8	2	.010	I	.325		2-1/2	998330	76.60	998330-C3	91.70
	3/8	3	.060	II	.273	.052	2-1/2	934030	83.90	934030-C3	99.00
	1/2	2	.010	I	.433		3	905830	103.60	905830-C3	124.30
	1/2	4	.080	II	.364	.069	3	18630	105.50	18630-C3	126.20

continued on next page

**TYPE I - POINTED**  
 Flat relief ground to center, yielding a web thickness at tip (T)

2 FLUTES

**TYPE II - FLAT END** Flat relief ground to a non-end cutting flat tip (T)

3 FLUTES 4 FLUTES

**TYPE III - END CUTTING**  
 Flat relief ground to an end cutting tip diameter (T), two flutes to center

4 FLUTES

## CHAMFER CUTTERS

Pointed &amp; Flat End – Double-Ended (cont.)

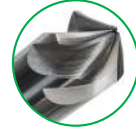
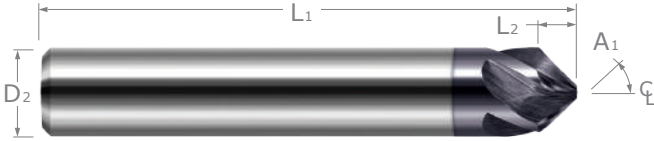
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ANGLE PER SIDE	DIAMETER	FLUTES	TIP	TYPE	LENGTH OF CUT		OVERALL LENGTH	UNCOATED		A1TIN COATED	
					L <sub>2</sub>	L <sub>4</sub> (MAX.)		L <sub>1</sub>	TOOL #	PRICE	TOOL #
45°	A <sub>1</sub> <sup>+0°30'</sup> -0°30'	D <sub>2</sub>	T <sub>(MAX.)</sub>								
	1/8	2	.010	I	.063		1-1/2	988445	33.00	988445-C3	39.40
	1/8	3	.040	II	.043	.020	1-1/2	873945	42.70	873945-C3	49.10
	1/8	4	.040	II	.043	.020	1-1/2	808245	44.70	808245-C3	51.10
	1/8	4	.040	III	.043	.020	1-1/2	794245	47.30	794245-C3	53.70
	3/16	2	.010	I	.094		2	902345	33.00	902345-C3	40.60
	3/16	3	.040	II	.074	.020	2	897145	42.70	897145-C3	50.30
	3/16	4	.040	II	.074	.020	2	808145	45.10	808145-C3	50.50
	3/16	4	.040	III	.073	.020	2	754545	47.40	754545-C3	55.00
	1/4	2	.010	I	.125		2-1/2	977645	50.90	977645-C3	61.00
	1/4	3	.060	II	.095	.030	2-1/2	891045	59.80	891045-C3	69.90
	1/4	4	.060	II	.095	.030	2-1/2	842445	63.80	842445-C3	73.90
	1/4	4	.040	III	.105	.020	2-1/2	790045	65.30	790045-C3	75.40
	5/16	3	.060	II	.126	.030	2-1/2	966645	65.90	966645-C3	78.50
	3/8	2	.010	I	.188		2-1/2	998345	76.60	998345-C3	91.70
	3/8	3	.060	II	.158	.030	2-1/2	934045	83.90	934045-C3	99.00
	3/8	4	.060	II	.158	.030	2-1/2	833645	89.30	833645-C3	104.40
	3/8	4	.040	III	.167	.030	2-1/2	752845	92.50	752845-C3	107.60
	1/2	2	.010	I	.250		3	905845	103.60	905845-C3	124.30
	1/2	4	.080	II	.210	.040	3	18645	105.50	18645-C3	126.20
1/2	4	.080	III	.210	.040	3	788045	110.50	788045-C3	131.20	
5/8	4	.080	II	.273	.040	3-1/2	976445	152.70	976445-C3	175.20	
3/4	4	.100	II	.325	.050	4	984645	194.00	984645-C3	220.00	
50°	1/8	2	.010	I	.052		1-1/2	988450	33.00	988450-C3	39.40
	1/4	2	.010	I	.105		2-1/2	977650	51.90	977650-C3	62.00
	1/4	3	.060	II	.080	.025	2-1/2	891050	61.90	891050-C3	72.00
	3/8	2	.010	I	.157		2-1/2	998350	78.10	998350-C3	93.20
	3/8	3	.060	II	.132	.025	2-1/2	934050	86.70	934050-C3	101.80
	1/2	2	.010	I	.210		3	905850	103.60	905850-C3	124.30
	1/2	4	.080	II	.173	.034	3	18650	109.20	18650-C3	129.90
60°	1/8	2	.010	I	.036		1-1/2	988460	33.00	988460-C3	39.40
	3/16	2	.010	I	.054		2	902360	33.00	902360-C3	40.60
	1/4	2	.010	I	.072		2-1/2	977660	50.90	977660-C3	61.00
	1/4	3	.060	II	.055	.017	2-1/2	891060	59.80	891060-C3	69.90
	3/8	2	.010	I	.108		2-1/2	998360	76.60	998360-C3	91.70
	3/8	3	.060	II	.091	.017	2-1/2	934060	83.90	934060-C3	99.00
	1/2	2	.010	I	.144		3	905860	103.60	905860-C3	124.30
	1/2	4	.080	II	.121	.023	3	18660	105.50	18660-C3	126.20

CHAMFER CUTTERS

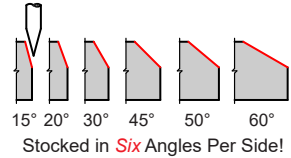
# CHAMFER CUTTERS

## Pointed & Flat End – Helical Flutes



Free Cutting Action for Excellent Surface Finish

- **Specialized helical flute design for superior performance**
- Free cutting action provides excellent surface finish and chip evacuation
- Choose from three types:
  - **Pointed** (Type I): Used for deburring and chamfering in narrow grooves, slots and small holes
  - **Flat End** (Type II): (non-cutting) Improves tool life for profiling and chamfering larger features
  - **End Cutting** (Type III): Center cutting geometry to blend the floor and a chamfered wall in a single pass
- h6 shank tolerance for high precision tool holders • Solid carbide • CNC ground in the USA



CHAMFER CUTTERS

ANGLE PER SIDE	DIAMETER	FLUTES	TIP	TYPE	LENGTH OF CUT			UNCOATED		A1TiN COATED	
					L2	L4 (MAX.)	L1	TOOL #	PRICE	TOOL #	PRICE
15°	D <sub>2</sub> (h6)		T*								
	1/8	3	.040	II	.159	.078	1-1/2	831308	24.40	831308-C3	29.60
	1/4	3	.060	II	.355	.116	2-1/2	831316	41.60	831316-C3	48.60
	1/4	5	.060	II	.355	.116	2-1/2 <b>LONG!</b>	832516	43.90	832516-C3	50.90
	3/8	3	.070	II	.569	.134	2-1/2	831324	56.70	831324-C3	65.00
	3/8	5	.070	II	.569	.134	2-1/2	832524	57.90	832524-C3	67.10
	1/2	3	.080	II	.784	.153	3	831332	79.50	831332-C3	90.70
20°	1/8	3	.040	II	.117	.085	1-1/2	844608	24.40	844608-C3	29.60
	1/4	3	.060	II	.261	.085	2-1/2	844616	41.60	844616-C3	48.60
	1/4	5	.060	II	.261	.085	2-1/2	851416	44.80	851416-C3	50.90
	3/8	3	.070	II	.419	.099	2-1/2	844624	55.60	844624-C3	65.00
	3/8	5	.070	II	.419	.099	2-1/2	851424	59.00	851424-C3	67.10
	1/2	3	.080	II	.577	.113	3	844632	78.00	844632-C3	90.70
	1/2	5	.080	II	.577	.113	3	851432	80.30	851432-C3	93.10

\* Tolerance for Type I is +.000"/-.005". Tolerance for type II is +.002"/-.002".

continued on next page

**TYPE I - POINTED** Flat relief ground to center, yielding a web thickness at tip (T)

2 FLUTES      4 FLUTES

**TYPE II - FLAT END** Flat relief ground to a non-end cutting flat tip (T)

3 FLUTES      5 FLUTES

**TYPE III - END CUTTING** Flat relief ground to an end cutting tip diameter (T), one flute to center

5 FLUTES

# CHAMFER CUTTERS

Pointed & Flat End – Helical Flutes (cont.)

continued from previous page

ANGLE PER SIDE	DIAMETER	FLUTES	TIP	TYPE	LENGTH OF CUT		OAL	UNCOATED		AISI COATED		
					L <sub>2</sub>	L <sub>4 (MAX.)</sub>		L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
<b>30°</b>	A <sub>1</sub> <sup>+0°15'</sup> / <sub>-0°15'</sub>	D <sub>2</sub> (h6)	T*									
		1/8	2	.010	I	.100		1-1/2	900108	24.40	900108-C3	29.40
		1/8	3	.040	II	.074	.036	1-1/2	916508	24.90	916508-C3	29.90
		1/8	4	.010	I	.100		1-1/2	889708	26.90	889708-C3	32.10
		1/8	5	.040	II	.074	.036	1-1/2	899008	26.90	899008-C3	31.70
		3/16	2	.010	I	.154		2	900112	33.70	900112-C3	38.10
		3/16	3	.050	II	.119	.045	2	916512	33.70	916512-C3	38.10
		3/16	4	.010	I	.154		2	889712	35.20	889712-C3	40.40
		3/16	5	.050	II	.119	.045	2	899012	35.90	899012-C3	40.40
		1/4	2	.010	I	.208		2-1/2	900116	41.60	900116-C3	48.60
		1/4	3	.060	II	.164	.054	2-1/2	916516	38.90	916516-C3	45.50
		1/4	4	.010	I	.208		2-1/2	889716	43.90	889716-C3	50.90
		1/4	5	.060	II	.164	.054	2-1/2	899016	42.50	899016-C3	47.70
		3/8	2	.010	I	.316		2-1/2	900124	55.60	900124-C3	65.00
		3/8	3	.070	II	.264	.062	2-1/2	916524	52.20	916524-C3	60.90
		3/8	4	.010	I	.316		2-1/2	889724	55.60	889724-C3	65.00
		3/8	5	.070	II	.264	.062	2-1/2	899024	52.20	899024-C3	60.90
		1/2	2	.010	I	.424		3	900132	78.00	900132-C3	90.70
		1/2	3	.080	II	.364	.071	3	916532	73.20	916532-C3	85.20
		1/2	4	.010	I	.424		3	889732	78.00	889732-C3	90.70
		1/2	5	.080	II	.364	.071	3	899032	73.20	899032-C3	85.20
		5/8	3	.090	II	.463	.080	3	916540	75.40	916540-C3	87.50
		5/8	5	.090	II	.463	.080	3	899040	132.00	899040-C3	141.40
		3/4	3	.100	II	.562	.088	3	916548	187.00	916548-C3	201.70
		3/4	4	.015	I	.637		3	889748	193.70	889748-C3	212.80
		3/4	5	.100	II	.562	.088	3	899048	189.50	899048-C3	198.30
	<b>45°</b>		1/8	2	.010	I	.058		1-1/2	860508	24.40	860508-C3
		1/8	3	.040	II	.043	.021	1-1/2	897208	24.40	897208-C3	29.40
		1/8	4	.010	I	.058		1-1/2	859708	26.90	859708-C3	32.10
		1/8	4	.010	I	.058		3	<b>LONG!</b> 765008	29.70	765008-C3	34.90
		1/8	5	.040	II	.043	.021	1-1/2	908408	26.90	908408-C3	31.70
		1/8	5	.040	II	.043	.021	3	<b>LONG!</b> 789008	29.70	789008-C3	34.90
		1/8	5	.040	III	.043	.021	1-1/2	773608	26.90	773608-C3	32.10
		3/16	2	.010	I	.089		2	860512	33.00	860512-C3	38.10
		3/16	3	.050	II	.069	.026	2	897212	33.00	897212-C3	38.10
		3/16	4	.010	I	.089		2	859712	35.20	859712-C3	40.40
		3/16	5	.050	II	.069	.026	2	908412	35.20	908412-C3	40.40
		1/4	2	.010	I	.120		2-1/2	860516	41.60	860516-C3	48.60
		1/4	3	.060	II	.095	.031	2-1/2	897216	38.90	897216-C3	45.50
		1/4	3	.060	II	.095	.031	4	<b>LONG!</b> 765316	50.70	765316-C3	59.60
		1/4	4	.010	I	.120		2-1/2	859716	43.90	859716-C3	50.90
		1/4	4	.010	I	.120		4	<b>LONG!</b> 765016	49.80	765016-C3	58.70
		1/4	5	.060	II	.095	.031	2-1/2	908416	41.30	908416-C3	47.70
		1/4	5	.060	II	.095	.031	4	<b>LONG!</b> 789016	49.80	789016-C3	58.70
		1/4	5	.060	III	.095	.031	2-1/2	773616	42.30	773616-C3	49.90

NEW

CHAMFER CUTTERS

\* Tolerance for Type I is +.000"/-.005". Tolerance for type II is +.002"/-.002".

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# CHAMFER CUTTERS

## Pointed & Flat End – Helical Flutes (cont.)

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CHAMFER CUTTERS

ANGLE PER SIDE	DIAMETER	FLUTES	TIP	TYPE	LENGTH OF CUT			OAL		UNCOATED		AIRTIN COATED	
					L <sub>2</sub>	L <sub>4 (MAX.)</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE		
45°	5/16	3	.060	II	.126	.031	2-1/2	897220	50.60	897220-C3	59.50		
	5/16	5	.060	II	.126	.031	2-1/2	908420	50.60	908420-C3	59.50		
	3/8	2	.010	I	.183		2-1/2	860524	55.60	860524-C3	65.00		
	3/8	3	.070	II	.153	.036	2-1/2	897224	52.20	897224-C3	60.90		
	3/8	4	.010	I	.183		2-1/2	859724	55.60	859724-C3	65.00		
	3/8	5	.070	II	.153	.036	2-1/2	908424	52.20	908424-C3	60.90		
	3/8	5	.070	II	.153	.036	4	<b>LONG!</b> 789024	49.80	789024-C3	63.60		
	1/2	2	.010	I	.245		3	860532	78.00	860532-C3	90.70		
	1/2	3	.080	II	.210	.041	3	897232	73.20	897232-C3	85.20		
	1/2	4	.010	I	.245		3	859732	78.00	859732-C3	90.70		
	1/2	5	.080	II	.210	.041	3	908432	73.20	908432-C3	85.20		
	1/2	5	.080	III	.210	.041	3	773632	74.90	773632-C3	90.00		
	5/8	3	.090	II	.268	.046	3	897240	129.60	897240-C3	139.00		
	5/8	5	.090	II	.268	.046	3	908440	128.30	908440-C3	141.40		
	3/4	3	.100	II	.325	.051	3	897248	181.70	897248-C3	201.70		
	3/4	4	.015	I	.368		3	859748	193.70	859748-C3	208.80		
	3/4	5	.100	II	.325	.051	3	908448	184.10	908448-C3	198.30		
	50°	1/4	3	.060	II	.080	.026	2-1/2	875016	41.60	875016-C3	48.60	
1/4		5	.060	II	.080	.026	2-1/2	871116	44.80	871116-C3	50.90		
3/8		3	.070	II	.128	.030	2-1/2	875024	55.60	875024-C3	65.00		
3/8		5	.070	II	.128	.030	2-1/2	871124	57.90	871124-C3	67.10		
1/2		3	.080	II	.176	.034	3	875032	78.00	875032-C3	90.70		
1/2		5	.080	II	.176	.034	3	871132	81.90	871132-C3	93.10		
60°	1/8	2	.010	I	.033		1-1/2	872108	26.90	872108-C3	31.70		
	1/8	4	.010	I	.033		1-1/2	888808	26.90	888808-C3	32.10		
	1/8	5	.040	II	.025	.012	1-1/2	867608	26.90	867608-C3	32.10		
	3/16	2	.010	I	.051		2	872112	33.70	872112-C3	38.90		
	3/16	4	.010	I	.051		2	888812	33.70	888812-C3	38.10		
	1/4	2	.010	I	.069		2-1/2	872116	41.60	872116-C3	49.60		
	1/4	3	.060	II	.057	.018	2-1/2	863416	40.00	863416-C3	45.50		
	1/4	4	.010	I	.069		2-1/2	888816	43.90	888816-C3	50.90		
	1/4	5	.060	II	.057	.018	2-1/2	867616	42.50	867616-C3	47.70		
	3/8	2	.010	I	.105		2-1/2	872124	56.70	872124-C3	66.20		
	3/8	3	.070	II	.091	.021	2-1/2	863424	52.20	863424-C3	60.90		
	3/8	4	.010	I	.105		2-1/2	888824	59.00	888824-C3	67.10		
	3/8	5	.070	II	.091	.021	2-1/2	867624	55.90	867624-C3	63.10		
	1/2	2	.010	I	.141		3	872132	78.00	872132-C3	92.50		
	1/2	3	.080	II	.126	.024	3	863432	75.30	863432-C3	87.70		
	1/2	4	.010	I	.141		3	888832	78.00	888832-C3	90.70		
	1/2	5	.080	II	.126	.024	3	867632	77.60	867632-C3	87.50		
	5/8	3	.090	II	.157	.027	3	863440	129.60	863440-C3	143.10		
	5/8	5	.090	II	.157	.027	3	867640	132.00	867640-C3	141.40		
	3/4	3	.100	II	.195	.029	3	863448	187.00	863448-C3	201.70		
3/4	4	.015	I	.212		3	888848	197.40	888848-C3	208.80			
3/4	5	.100	II	.195	.029	3	867648	189.50	867648-C3	204.10			

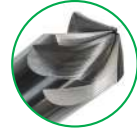
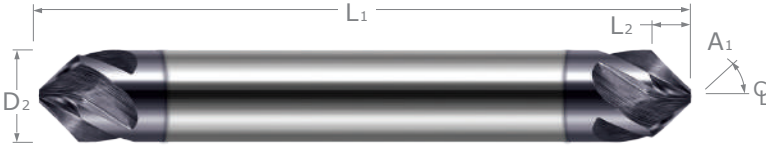
\* Tolerance for Type I is +.000"/-.005". Tolerance for type II is +.002"/-.002".

NEW  
NEW



# CHAMFER CUTTERS

## Pointed & Flat End – Helical Flutes – Double-Ended



Free Cutting Action  
for Excellent  
Surface Finish

- **Specialized helical flute design for superior performance**
- Double-ended
- Free cutting action provides excellent surface finish and chip evacuation
- Offered in Type I pointed and Type II flat end (non-cutting) styles
- 4 and 5 flute options
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA

CHAMFER CUTTERS

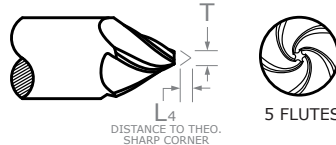
ANGLE PER SIDE	DIAMETER	FLUTES	TIP	TYPE	LENGTH OF CUT		OVERALL LENGTH	UNCOATED		A1TiN COATED	
A1 $+0^{\circ}15'$ $-0^{\circ}15'$	D2 (h6)		T*		L2	L4 (MAX.)	L1	TOOL #	PRICE	TOOL #	PRICE
45°	1/4	4	.010	I	.120		2-1/2	785016	61.00	785016-C3	71.10
	1/4	5	.060	II	.095	.031	2-1/2	784916	58.60	784916-C3	68.70
	3/8	4	.010	I	.183		2-1/2	785024	76.50	785024-C3	91.60
	3/8	5	.070	II	.153	.036	2-1/2	784924	71.70	784924-C3	86.80
	1/2	4	.010	I	.245		3	785032	107.30	785032-C3	128.00
	1/2	5	.080	II	.210	.041	3	784932	100.70	784932-C3	121.40

\* Tolerance for Type I is  $+0.000/-0.005$ ". Tolerance for type II is  $+0.002/-0.002$ ".

**TYPE I - POINTED** Flat relief ground to center, yielding a web thickness at tip (T)



**TYPE II - FLAT END** Flat relief ground to a non-end cutting flat tip (T)



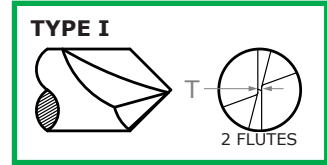
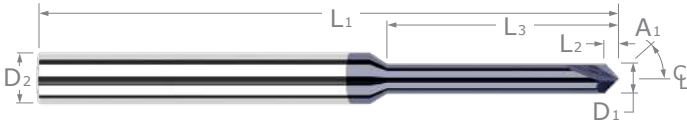
## The Multiple Uses of a Chamfer Mill

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.**

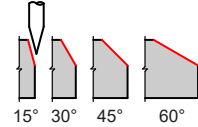
[Read more on harveyperformance.com/in-the-loupe/](https://www.harveyperformance.com/in-the-loupe/)

# CHAMFER CUTTERS

## Pointed - Long Reach



- **Reduced diameter for clearance along walls and in small features**
- Type I pointed style ground to a point, yielding web thickness at tip (T)
- Available in multiple reaches and reduced diameters
- 2 flutes
- Solid carbide
- CNC ground in the USA



Stocked in **Four** Angles Per Side!

CHAMFER CUTTERS

ANGLE PER SIDE	NECK DIAMETER	OVERALL REACH	LENGTH OF CUT	TIP	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							2 FL	PRICE	2 FL	PRICE
A1 <sup>+0°30'</sup> / <sub>-0°30'</sub>	D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L3 <sup>+0.010"</sup> / <sub>-.000"</sub>	L2	T (MAX.)	D2	L1	2 FL	PRICE	2 FL	PRICE
15°	.031 (1/32)	.156 (5x)	.058	.005	1/8	2-1/2	56815	29.20	56815-C3	34.40
	.031 (1/32)	.250 (8x)	.058	.005	1/8	2-1/2	57215	31.70	57215-C3	36.90
	.062 (1/16)	.312 (5x)	.116	.006	1/8	2-1/2	54715	29.20	54715-C3	34.40
	.062 (1/16)	.500 (8x)	.116	.006	1/8	2-1/2	55615	31.70	55615-C3	36.90
	.093 (3/32)	.500 (5x)	.174	.006	1/8	2-1/2	52115	29.50	52115-C3	34.70
	.093 (3/32)	.750 (8x)	.174	.006	1/8	2-1/2	53515	32.00	53515-C3	37.20
30°	.031 (1/32)	.093 (3x)	.027	.005	1/8	1-1/2	994830	27.40	994830-C3	32.60
	.031 (1/32)	.156 (5x)	.027	.005	1/8	2-1/2	56830	29.50	56830-C3	34.70
	.031 (1/32)	.250 (8x)	.027	.005	1/8	2-1/2	57230	31.70	57230-C3	36.90
	.047 (3/64)	.140 (3x)	.041	.005	1/8	1-1/2	911030	27.60	911030-C3	32.80
	.047 (3/64)	.250 (5x)	.041	.005	1/8	2-1/2	996830	28.90	996830-C3	34.10
	.047 (3/64)	.375 (8x)	.041	.005	1/8	2-1/2	999230	29.20	999230-C3	34.40
	.062 (1/16)	.187 (3x)	.054	.006	1/8	1-1/2	998930	27.40	998930-C3	32.60
	.062 (1/16)	.312 (5x)	.054	.006	1/8	2-1/2	54730	29.20	54730-C3	34.40
	.062 (1/16)	.500 (8x)	.054	.006	1/8	2-1/2	55630	31.70	55630-C3	36.90
	.078 (5/64)	.406 (5x)	.068	.006	1/8	2-1/2	996930	28.90	996930-C3	34.10
	.093 (3/32)	.279 (3x)	.081	.006	1/8	1-1/2	995330	27.60	995330-C3	32.80
	.093 (3/32)	.500 (5x)	.081	.006	1/8	2-1/2	52130	29.20	52130-C3	34.40
.093 (3/32)	.750 (8x)	.081	.006	1/8	2-1/2	53530	32.00	53530-C3	37.20	
45°	.015 (1/64)	.078 (5x)	.008	.003	1/8	2-1/2	997545	33.10	997545-C3	38.30
	.015 (1/64)	.125 (8x)	.008	.003	1/8	2-1/2	995945	36.90	995945-C3	42.10
	.020	.060 (3x)	.010	.003	1/8	1-1/2	794045	32.50	794045-C3	37.70
	.020	.100 (5x)	.010	.003	1/8	2-1/2	940245	32.50	940245-C3	37.70
	.020	.160 (8x)	.010	.003	1/8	2-1/2	948545	36.30	948545-C3	41.50
	.020	.200 (10x)	.010	.003	1/8	2-1/2	765545	38.10	765545-C3	43.30
	.025	.125 (5x)	.013	.003	1/8	2-1/2	821945	32.50	821945-C3	37.70
	.031 (1/32)	.093 (3x)	.016	.005	1/8	1-1/2	994845	27.80	994845-C3	33.00
	.031 (1/32)	.125 (4x)	.016	.005	1/8	2-1/2	862745	29.50	862745-C3	34.70
	.031 (1/32)	.156 (5x)	.016	.005	1/8	2-1/2	56845	29.20	56845-C3	34.40
	.031 (1/32)	.187 (6x)	.016	.005	1/8	2-1/2	870845	30.70	870845-C3	35.90
	.031 (1/32)	.218 (7x)	.016	.005	1/8	2-1/2	855445	30.70	855445-C3	35.90
	.031 (1/32)	.250 (8x)	.016	.005	1/8	2-1/2	57245	31.70	57245-C3	36.90
	.031 (1/32)	.312 (10x)	.016	.005	1/8	2-1/2	838445	33.40	838445-C3	38.60
	.031 (1/32)	.375 (12x)	.016	.005	1/8	2-1/2	998245	35.30	998245-C3	40.50
	.031 (1/32)	.470 (15x)	.016	.005	1/8	2-1/2	918245	38.10	918245-C3	43.30
	.039	.203 (5x)	.020	.005	1/8	2-1/2	788445	29.40	788445-C3	34.60

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## CHAMFER CUTTERS

Pointed Long Reach (cont.)

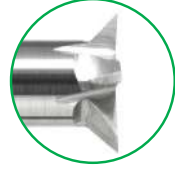
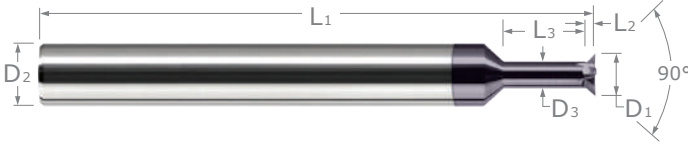
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ANGLE PER SIDE	NECK DIAMETER	OVERALL REACH	LENGTH OF CUT	TIP	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							2 FL	PRICE	2 FL	PRICE
A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>2</sub>	T (MAX.)	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
45°	.040	.203 (5x)	.020	.005	1/8	2-1/2	830645	29.40	830645-C3	34.60
	.047 (3/64)	.141 (3x)	.024	.005	1/8	1-1/2	911045	27.10	911045-C3	32.30
	.047 (3/64)	.187 (4x)	.024	.005	1/8	2-1/2	788745	28.20	788745-C3	33.40
	.047 (3/64)	.250 (5x)	.024	.005	1/8	2-1/2	996845	29.40	996845-C3	34.60
	.047 (3/64)	.281 (6x)	.024	.005	1/8	2-1/2	772545	30.80	772545-C3	36.00
	.047 (3/64)	.375 (8x)	.024	.005	1/8	2-1/2	999245	31.70	999245-C3	36.90
	.047 (3/64)	.570 (12x)	.024	.005	1/8	2-1/2	919045	34.60	919045-C3	39.80
	.050	.250 (5x)	.025	.005	1/8	2-1/2	788645	29.20	788645-C3	34.40
	.060	.312 (5x)	.030	.006	1/8	2-1/2	788545	29.50	788545-C3	34.70
	.062 (1/16)	.187 (3x)	.031	.006	1/8	1-1/2	998945	27.80	998945-C3	33.00
	.062 (1/16)	.250 (4x)	.031	.006	1/8	2-1/2	853945	29.20	853945-C3	34.40
	.062 (1/16)	.312 (5x)	.031	.006	1/8	2-1/2	54745	29.20	54745-C3	34.40
	.062 (1/16)	.375 (6x)	.031	.006	1/8	2-1/2	846045	30.40	846045-C3	35.60
	.062 (1/16)	.437 (7x)	.031	.006	1/8	2-1/2	869745	30.40	869745-C3	35.60
	.062 (1/16)	.500 (8x)	.031	.006	1/8	2-1/2	55645	31.70	55645-C3	36.90
	.062 (1/16)	.625 (10x)	.031	.006	1/8	2-1/2	844145	33.40	844145-C3	38.60
	.062 (1/16)	.750 (12x)	.031	.006	1/8	2-1/2	997245	35.30	997245-C3	40.50
	.062 (1/16)	.950 (15x)	.031	.006	1/8	2-1/2	913345	38.10	913345-C3	43.30
	.078 (5/64)	.234 (3x)	.039	.006	1/8	1-1/2	906645	27.10	906645-C3	32.30
	.078 (5/64)	.312 (4x)	.039	.006	1/8	2-1/2	787045	28.20	787045-C3	33.40
	.078 (5/64)	.406 (5x)	.039	.006	1/8	2-1/2	996945	29.40	996945-C3	34.60
	.078 (5/64)	.625 (8x)	.039	.006	1/8	2-1/2	999545	31.70	999545-C3	36.90
	.078 (5/64)	.800 (10x)	.039	.006	1/8	2-1/2	764145	34.10	764145-C3	39.30
	.078 (5/64)	.940 (12x)	.039	.006	1/8	2-1/2	924045	34.60	924045-C3	39.80
	.093 (3/32)	.279 (3x)	.047	.006	1/8	1-1/2	995345	27.80	995345-C3	33.00
	.093 (3/32)	.375 (4x)	.047	.006	1/8	2-1/2	874345	29.20	874345-C3	34.40
	.093 (3/32)	.500 (5x)	.047	.006	1/8	2-1/2	52145	29.20	52145-C3	34.40
	.093 (3/32)	.585 (6x)	.047	.006	1/8	2-1/2	849445	30.70	849445-C3	35.90
	.093 (3/32)	.670 (7x)	.047	.006	1/8	2-1/2	843045	30.70	843045-C3	35.90
	.093 (3/32)	.750 (8x)	.047	.006	1/8	2-1/2	53545	31.70	53545-C3	36.90
	.093 (3/32)	.950 (10x)	.047	.006	1/8	2-1/2	825645	33.40	825645-C3	38.60
	.093 (3/32)	1.125 (12x)	.047	.006	1/8	2-1/2	999645	35.30	999645-C3	40.50
	.093 (3/32)	1.400 (15x)	.047	.006	1/8	2-1/2	902845	38.10	902845-C3	43.30
.118	.591 (5x)	.059	.006	1/8	2-1/2	788345	29.50	788345-C3	34.70	
60°	.031 (1/32)	.156 (5x)	.009	.005	1/8	2-1/2	56860	29.50	56860-C3	34.70
	.031 (1/32)	.250 (8x)	.009	.005	1/8	2-1/2	57260	31.70	57260-C3	36.90
	.062 (1/16)	.312 (5x)	.018	.006	1/8	2-1/2	54760	29.50	54760-C3	34.70
	.062 (1/16)	.500 (8x)	.018	.006	1/8	2-1/2	55660	32.00	55660-C3	37.20
	.093 (3/32)	.500 (5x)	.027	.006	1/8	2-1/2	52160	29.50	52160-C3	34.70
	.093 (3/32)	.750 (8x)	.027	.006	1/8	2-1/2	53560	31.70	53560-C3	36.90

CHAMFER CUTTERS

# CHAMFER CUTTERS

## Back Chamfer Cutters



Left Hand Shear Flute & Right Hand Cut Evacuate Chips Away From Part

- Low profile design and greater radial projection ideal for generating chamfered features on the backside of small holes or slots
- Decrease costs by avoiding time-consuming changes to part set-ups
- Slightly undersized to fit in common hole sizes
- 90° included angle, cutting on angle only
- Left hand shear flute / right hand cut evacuates chip away from part
- Multiple flutes for improved finish • Solid carbide • CNC ground in the USA

CHAMFER CUTTERS

HEAD DIAMETER	AXIAL LOC	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.055	.010	.033	<b>.093</b> (1.5x)	4	1/8	1-1/2	943355	68.50	943355-C3	73.70
.055	.010	.033	<b>.156</b> (3x)	4	1/8	1-1/2	938155	68.50	938155-C3	73.70
.055	.010	.033	<b>.250</b> (4.5x)	4	1/8	1-1/2	910355	67.90	910355-C3	73.10
.080	.014	.047	<b>.070</b> (0.8x)	4	1/8	1-1/2	906080	67.20	906080-C3	72.40
.080	.014	.047	<b>.140</b> (1.5x)	4	1/8	1-1/2	943380	67.20	943380-C3	72.40
.080	.014	.047	<b>.250</b> (4x)	4	1/8	1-1/2	938180	67.20	938180-C3	72.40
.080	.014	.047	<b>.375</b> (4.5x)	4	1/8	1-1/2	910380	66.60	910380-C3	71.80
.115	.020	.068	<b>.109</b> (0.8x)	4	1/8	1-1/2	906015	65.80	906015-C3	71.00
.115	.020	.068	<b>.218</b> (1.5x)	4	1/8	1-1/2	943410	65.80	943410-C3	71.00
.115	.020	.068	<b>.312</b> (2.5x)	4	1/8	1-1/2	772010	65.80	772010-C3	71.00
.115	.020	.068	<b>.375</b> (3x)	4	1/8	1-1/2	938210	65.80	938210-C3	71.00
.115	.020	.068	<b>.562</b> (5x)	4	1/8	2	910410	67.90	910410-C3	73.10

HEAD DIAMETER	AXIAL LOC	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.125	.022	.075	<b>.218</b> (3x)	5	1/8	1-1/2	943415	67.00	943415-C3	72.20
.125	.022	.075	<b>.375</b> (5x)	5	1/8	1-1/2	938215	69.30	938215-C3	74.50
.135	.024	.081	<b>.125</b> (0.8x)	5	3/16	2	906119	76.40	906119-C3	82.00
.135	.024	.081	<b>.250</b> (1.5x)	5	3/16	2	943420	76.40	943420-C3	82.00
.135	.024	.081	<b>.406</b> (3x)	5	3/16	2	938220	76.40	938220-C3	82.00
.135	.024	.081	<b>.625</b> (5x)	5	3/16	2	910420	75.70	910420-C3	81.30
.165	.029	.101	<b>.156</b> (0.8x)	5	3/16	2	906130	76.40	906130-C3	82.00
.165	.029	.101	<b>.312</b> (2x)	5	3/16	2	943430	76.40	943430-C3	82.00
.165	.029	.101	<b>.500</b> (3x)	5	3/16	2	938230	76.40	938230-C3	82.00
.165	.029	.101	<b>.750</b> (4.5x)	5	3/16	2	910430	75.70	910430-C3	81.30
.187	.033	.115	<b>.375</b> (3x)	5	3/16	2	943435	77.60	943435-C3	83.20
.187	.033	.115	<b>.562</b> (5x)	5	3/16	2	938235	77.00	938235-C3	82.60
.210	.037	.130	<b>.187</b> (0.8x)	5	1/4	2-1/2	906140	86.60	906140-C3	94.20
.210	.037	.130	<b>.375</b> (1.5x)	5	1/4	2-1/2	943440	86.60	943440-C3	94.20
.210	.037	.130	<b>.500</b> (2x)	5	1/4	2-1/2	772140	86.60	772140-C3	94.20
.210	.037	.130	<b>.625</b> (3x)	5	1/4	2-1/2	938240	86.60	938240-C3	94.20
.210	.037	.130	<b>1.000</b> (5x)	5	1/4	2-1/2	910440	85.80	910440-C3	93.40
.250	.044	.156	<b>.250</b> (1x)	5	1/4	2-1/2	906116	86.60	906116-C3	94.20
.250	.044	.156	<b>.437</b> (2x)	5	1/4	2-1/2	943416	86.60	943416-C3	94.20
.250	.044	.156	<b>.625</b> (2.5x)	5	1/4	2-1/2	772116	86.60	772116-C3	94.20
.250	.044	.156	<b>.750</b> (3x)	5	1/4	2-1/2	938216	86.60	938216-C3	94.20
.250	.044	.156	<b>1.250</b> (5x)	5	1/4	3	910450	88.70	910450-C3	96.30

continued on next page

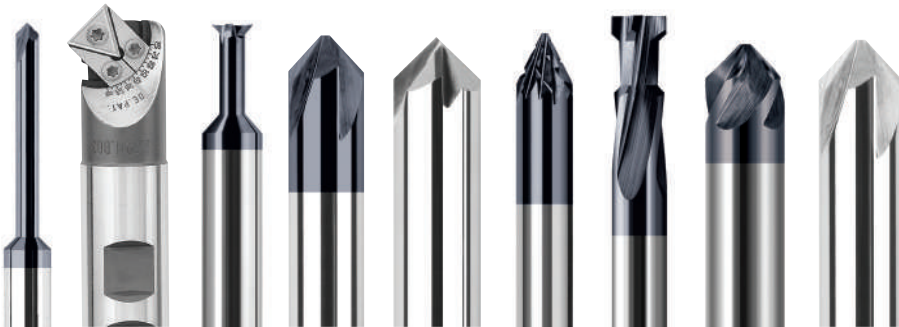
# CHAMFER CUTTERS

## Back Chamfer Cutters (cont.)

continued from previous page

HEAD DIAMETER	AXIAL LOC	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub>	D <sub>3</sub>	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>				
.312	.055	.196	<b>.281</b> (0.8x)	6	5/16	2-1/2	906120	91.50	906120-C3	100.40
.312	.055	.196	<b>.562</b> (2x)	6	5/16	2-1/2	943460	91.50	943460-C3	100.40
.312	.055	.196	<b>1.000</b> (3x)	6	5/16	2-1/2	938260	91.50	938260-C3	100.40
.312	.055	.196	<b>1.500</b> (5x)	6	5/16	3	910460	93.90	910460-C3	102.80
.375	.066	.237	<b>.375</b> (1x)	6	3/8	2-1/2	906124	98.70	906124-C3	108.80
.375	.066	.237	<b>.750</b> (2x)	6	3/8	2-1/2	943470	98.70	943470-C3	108.80
.375	.066	.237	<b>1.125</b> (3x)	6	3/8	2-1/2	938270	98.70	938270-C3	108.80
.375	.066	.237	<b>1.870</b> (5x)	6	3/8	4	910470	103.90	910470-C3	112.30
.500	.088	.317	<b>.500</b> (1x)	6	1/2	3	906132	136.10	906132-C3	151.20
.500	.088	.317	<b>1.000</b> (2x)	6	1/2	3	943480	136.10	943480-C3	151.20
.500	.088	.317	<b>1.500</b> (3x)	6	1/2	3	938280	136.10	938280-C3	151.20
.500	.088	.317	<b>2.500</b> (5x)	6	1/2	4	910480	140.80	910480-C3	155.90

CHAMFER CUTTERS

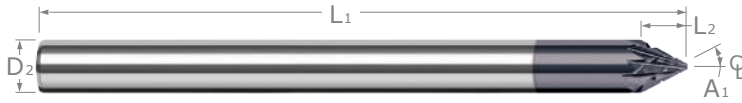


**Check Out All of Our Chamfering Solutions!**

# CHAMFER CUTTERS

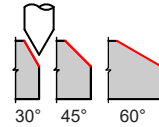
## Deburring Chamfer Cutters

CHAMFER CUTTERS



◀ End Mill Tolerances with Bur-Style Geometry!

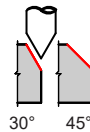
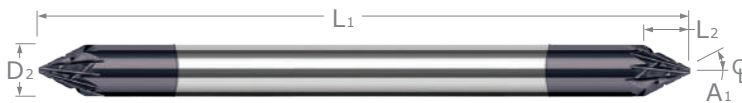
- Deburr in your CNC machine with these high precision burs held to end mill tolerances
- Stop scrapping expensive parts due to handheld operator errors
- High flute count allows for increased feeds which reduces cycle times
- Achieve better finish than with milling type cutters
- Tight end mill tolerances allow use of standard programming and tool paths
- Cone shaped burs are effective in removing burrs and/or adding a small controlled edge break with superior finish
- Double cut style flute pattern
- Solid carbide
- CNC ground in the USA



Stocked in **Three** Angles Per Side!

### Single-Ended

ANGLE PER SIDE A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	LOC L <sub>2</sub>	RIGHT HAND TEETH	LEFT HAND TEETH	MINOR DIA. .012 (Max.)	SHANK DIA. D <sub>2</sub>	OAL L <sub>1</sub>	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
<b>30°</b>	.099	12	6	.012 (Max.)	1/8	2-1/2	58130	26.90	58130-C3	32.10		
	.207	12	6	.012 (Max.)	1/4	2-1/2	994030	38.30	994030-C3	45.90		
<b>45°</b>	.057	12	6	.012 (Max.)	1/8	2-1/2	58145	26.90	58145-C3	32.10	58145-C4	40.00
	.088	12	6	.012 (Max.)	3/16	2-1/2	891145	33.70	891145-C3	39.30	891145-C4	51.80
	.120	12	6	.012 (Max.)	1/4	2-1/2	994045	38.30	994045-C3	45.90	994045-C4	58.90
<b>60°</b>	.181	14	7	.013 (Max.)	3/8	2-1/2	784445	54.20	784445-C3	64.30	784445-C4	79.00
	.033	12	6	.012 (Max.)	1/8	2-1/2	58160	27.20	58160-C3	32.40		



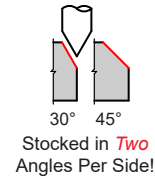
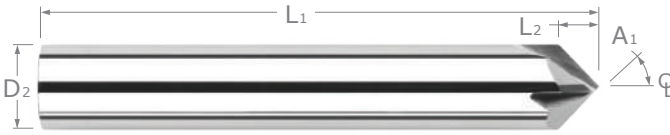
Stocked in **Two** Angles Per Side!

### Double-Ended

ANGLE PER SIDE A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	LENGTH OF CUT L <sub>2</sub>	RIGHT HAND TEETH	LEFT HAND TEETH	MINOR DIAMETER .012 (Max.)	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITIN COATED	
							TOOL #	PRICE	TOOL #	PRICE
<b>30°</b>	.099	12	6	.012 (Max.)	1/8	2-1/2	898330	40.50	898330-C3	46.90
	.057	12	6	.012 (Max.)	1/8	2-1/2	898345	40.50	898345-C3	46.90
<b>45°</b>	.088	12	6	.012 (Max.)	3/16	2-1/2	879745	48.70	879745-C3	56.30
	.120	12	6	.012 (Max.)	1/4	2-1/2	867545	57.60	867545-C3	67.70
	.181	14	7	.013 (Max.)	3/8	2-1/2	788145	74.20	788145-C3	89.30

# CHAMFER CUTTERS

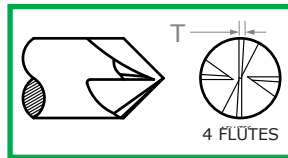
Cobalt – Pointed



- 4 flutes (2 flutes to center)
- M-42 steel (8% cobalt)
- Type I pointed style ground to a point, yielding web thickness at tip (T)
- CNC ground in the USA

CHAMFER CUTTERS

ANGLE PER SIDE	LENGTH OF CUT	TIP	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
					4 FL	PRICE
$A_1 \begin{matrix} +0^\circ30' \\ -0^\circ30' \end{matrix}$	L <sub>2</sub>	T <sub>(MAX.)</sub>	D <sub>2</sub>	L <sub>1</sub>		
<b>30°</b>	.217	.010	1/4	2	18116	42.30
	.325	.010	3/8	2-1/2	18124	51.90
	.433	.010	1/2	3	18132	65.70
<b>45°</b>	.125	.010	1/4	2	18016	42.30
	.188	.010	3/8	2-1/2	18024	50.90
	.250	.010	1/2	3	18032	65.70



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# CHAMFER CUTTERS

## Adjustable Chamfer Cutters

CHAMFER CUTTERS



- Mills any angle from 10° to 80°
- Change chamfer angle with quick adjustment
- TPET-321 carbide insert (TiN coated) and wrench included
- TPET-321-AL carbide insert has polished face and upsharp relief for optimized performance in non-ferrous materials

SHANK DIAMETER	OVERALL LENGTH	TOOL #	PRICE
3/4	3-3/4	81250	376.40
1	3-3/4	81260	376.40

DESCRIPTION	TOOL #	PRICE	
TPET-321 Insert with TiN Coating	60031	14.10	(Box of 10)
TPET-321-AL Insert for Non-Ferrous Materials	60038	15.60	(Box of 10)
Clamp Plate (Replacement)	81245	21.90	(Each)
Screw (Replacement)	81247	8.10	(Each)
Seat Pocket (Replacement)	81249	80.00	(Each)

SPEEDS & FEEDS (Adjustable Chamfer Cutter)				
MATERIAL	SPEED (RPM)	FEED (Inches/Min)	DEPTH (Inches)	
STEEL	600-2000	1" - 4"	1/8" MAX.	
ALUMINUM	1000-6000 MAX.	3" - 8"	1/8" MAX.	

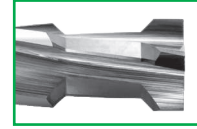
  

Angle Setting on Tool	Minimum Diameter*	Maximum Diameter*	Radial DOC of Insert*	Axial DOC of Insert*
10°	0.0717	1.2466	0.587	0.104
15°	0.1149	1.2672	0.576	0.154
20°	0.1617	1.2828	0.561	0.204
25°	0.2119	1.2931	0.541	0.252
30°	0.2649	1.2981	0.517	0.298
35°	0.3205	1.2977	0.489	0.342
40°	0.3781	1.2920	0.457	0.383
45°	0.4374	1.2810	0.422	0.422
50°	0.4978	1.2647	0.383	0.457
55°	0.5590	1.2433	0.342	0.489
60°	0.6205	1.2170	0.298	0.517
65°	0.6818	1.1860	0.252	0.541
70°	0.7424	1.1504	0.204	0.561
75°	0.8018	1.1106	0.154	0.576
80°	0.8597	1.0669	0.104	0.587



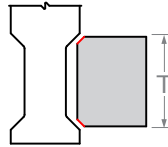
# CHAMFER CUTTERS

## Plate Chamfer Cutters

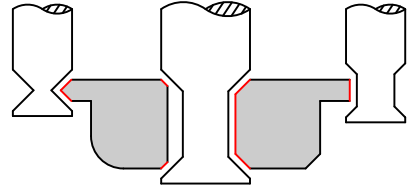


Cutting Along Entirety of Concave Form

- Tool designed to chamfer top and bottom in a single pass
- Cutting along entirety of concave form (L<sub>2</sub>) only
- Minor diameter (D<sub>3</sub>) relieved for light profiling and trimming edges
- 10° helix
- 4 flutes
- Solid carbide
- CNC ground in the USA



Nominal Plate Thickness



Capable of Performing Full Form Engagement, Light Profiling, & Edge Trimming

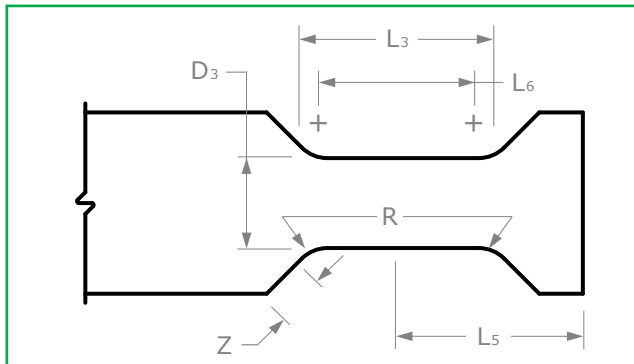
CHAMFER CUTTERS

MAX OPENING WIDTH	MIN OPENING WIDTH	CHAMFER LENGTH	MINOR DIA.	MINOR DIA. LENGTH	END RADIUS	END TO CENTER	NOMINAL PLATE THICKNESS*	SHANK DIA.	OAL	UNCOATED	AITIN COATED	
L <sub>2</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>3</sub>	Z	D <sub>3</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>6</sub>	R (MAX.)	L <sub>4</sub>	L <sub>5</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>	T	D <sub>2</sub>	L <sub>1</sub>	4 FL PRICE	4 FL PRICE
.037	.010	<b>.019</b>	.096	.008	.005	.040	.059	.031	1/8	1-1/2	955202 58.00	955202-C3 63.20
.068	.037	<b>.022</b>	.091	.029	.006	.040	.074	.062	1/8	1-1/2	955204 58.00	955204-C3 63.20
.074	.012	<b>.044</b>	.184	.001	.008	.060	.097	.068	1/4	2-1/2	971104 64.20	971104-C3 71.80
.099	.037	<b>.044</b>	.184	.026	.008	.060	.110	.093	1/4	2-1/2	971106 64.20	971106-C3 71.80
.135	.104	<b>.022</b>	.091	.096	.005	.040	.108	.125	1/8	1-1/2	955208 58.00	955208-C3 63.20
.135	.073	<b>.044</b>	.184	.062	.008	.060	.128	.125	1/4	2-1/2	971108 64.20	971108-C3 71.80
.197	.135	<b>.044</b>	.184	.124	.008	.060	.159	.187	1/4	2-1/2	971112 64.20	971112-C3 71.80
.197	.105	<b>.065</b>	.278	.093	.008	.060	.159	.187	3/8	2-1/2	980812 80.30	980812-C3 90.40
.260	.198	<b>.044</b>	.184	.187	.008	.060	.190	.250	1/4	2-1/2	971116 64.20	971116-C3 71.80
.260	.137	<b>.087</b>	.372	.126	.008	.060	.190	.250	1/2	3	965916 122.40	965916-C3 137.50
.385	.293	<b>.065</b>	.278	.281	.008	.060	.253	.375	3/8	2-1/2	980824 80.30	980824-C3 90.40
.385	.262	<b>.087</b>	.372	.251	.008	.060	.253	.375	1/2	3	965924 122.40	965924-C3 137.50
.510	.387	<b>.087</b>	.372	.376	.008	.060	.315	.500	1/2	3	965932 122.40	965932-C3 137.50

\*Nominal Plate Thickness is ideal thickness of plate for chamfering top and bottom simultaneously.



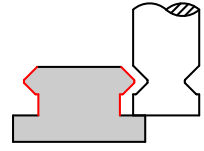
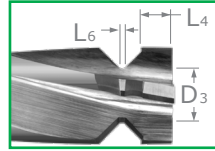
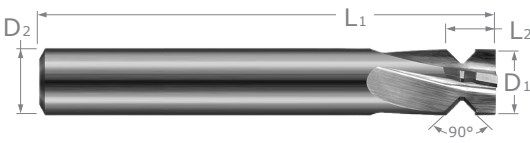
For additional tool dimensions, scan the QR code or visit [harveytool.com/resources](http://harveytool.com/resources)



# PICATINNY FORM CUTTERS

## Picatinny Rail Form Cutters

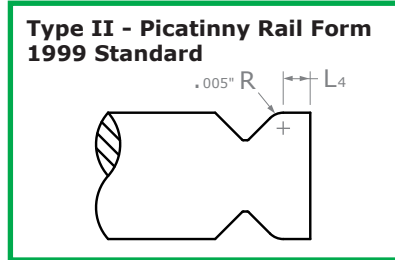
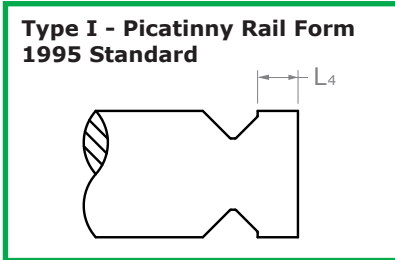
PICATINNY FORM CUTTERS



- Designed to the MIL-STD-1913 specifications
- Mill the entire Picatinny Rail in a single pass without tool changes
- Choose from two types:
  - **Type I:** Slight undercut at end of End Length (L4)
  - **Type II:** .005" radius tangent to angle and End Length (L4)
- Cutting on entirety of concave form and OD flat at end
- 4 helical flutes allow for better cutting action
- .005" max radii for all internal corners
- Solid carbide • CNC ground in the USA

Outstanding in Aluminum!

CUTTER DIAMETER	LENGTH OF CUT	MINOR DIAMETER	MINOR DIA. LENGTH (TSC)	END LENGTH	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TIB2 COATED	
								4 FL	PRICE	4 FL	PRICE
.500 (+.000"/-.002") (1/2)	.377 (+.008"/-.000")	.282 (+.001"/-.001")	L6	L4	I	D2 (1/2)	L1 (3)	875632	156.80	875632-C8	181.60
.500 (+.000"/-.002") (1/2)	.377 (+.008"/-.000")	.282 (+.001"/-.001")	L6	L4	II	D2 (1/2)	L1 (3)	830032	156.80	830032-C8	181.60
.625 (+.000"/-.002") (5/8)	.377 (+.008"/-.000")	.407 (+.001"/-.001")	L6	L4	I	D2 (5/8)	L1 (3-1/2)	875640	179.70	875640-C8	215.80
.625 (+.000"/-.002") (5/8)	.377 (+.008"/-.000")	.407 (+.001"/-.001")	L6	L4	II	D2 (5/8)	L1 (3-1/2)	830040	179.70	830040-C8	215.80



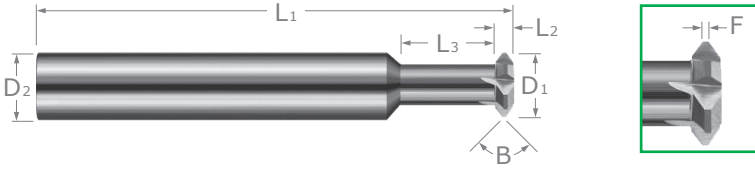
### Multi-Functional Tools Every Shop Should Have

Is your shop trying to become more efficient? Which shop isn't? Learn how these 5 tools can go a long way toward reducing your cycle times and boosting your shop's daily output in our "In the Loupe" blog post **Multi-Functional Tools Every Shop Should Have**.

[Read more on harveyperformance.com/in-the-loupe/](http://harveyperformance.com/in-the-loupe/)

## PICATINNY FORM CUTTERS

### Picatinny Attachment Cutters



- Mill the inverse form for the Picatinny Rail used for attachments
- Cutting on entirety of angle and flat
- Short reaches for maximum strength
- 6 flutes • Solid carbide • CNC ground in the USA

Outstanding in Aluminum!

PICATINNY FORM CUTTERS

INCLUDED ANGLE	CUTTER DIAMETER	TIP FLAT	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
								6 FL	PRICE	6 FL	PRICE
B <sup>+0.5°</sup> / <sub>-0.5°</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	F	L <sub>2</sub> <sup>+0.002"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	6 FL	PRICE	6 FL	PRICE
<b>90°</b>	.500 (1/2)	.021	.2075	1/4	.375	1/2	3	859232	140.80	859232-C8	165.60
	.625 (5/8)	.021	.2075	3/8	.500	5/8	3-1/2	859240	183.30	859240-C8	219.40

## PICATINNY FORM CUTTERS

### Picatinny Recoil Groove End Mills



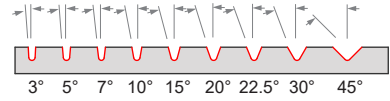
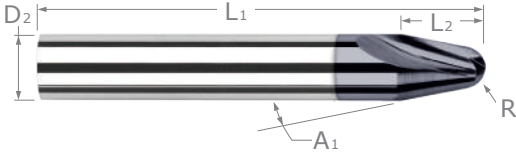
Stocked in sharp corner, .005", or .010" corner radius

- Optimized for the grooves across the Picatinny Rail
- Diameter allows for a single pass to create the groove
- Stub flute length for improved strength
- Cutting on transition to allow for slight edge break at top of groove
- High helix and optimized geometry for improved performance
- 3 flutes • Center cutting
- Solid carbide • CNC ground in the USA

Outstanding in Aluminum!

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE
D <sub>1</sub> <sup>+0.002"</sup> / <sub>-.000"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.008"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
.206	<b>SHARP!</b>	.118	1/4	2-1/2	864806	37.70	864806-C8	45.90
.206	.005	.118	1/4	2-1/2	874406	41.40	874406-C8	49.60
.206	.010	.118	1/4	2-1/2	862606	41.40	862606-C8	49.60
.210	<b>SHARP!</b>	.118	1/4	2-1/2	864810	37.70	864810-C8	45.90
.210	.005	.118	1/4	2-1/2	874410	41.40	874410-C8	49.60
.210	.010	.118	1/4	2-1/2	862610	41.40	862610-C8	49.60

# RUNNER CUTTERS



Stocked in *Nine* Angles Per Side!

- Designed to mill 3°, 5°, 7°, 10°, 15°, 20°, 22.5°, 30°, or 45° channels in molds
- 2 helical flutes (12° helix)
- AlTiN coating for increased performance in ferrous materials
- AlTiN Nano coating for superior performance in ferrous and difficult to machine materials
- Center cutting
- Solid carbide
- CNC ground in the USA

RUNNER CUTTERS

ANGLE PER SIDE	RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITiN COATED		AITiN NANO COATED	
					2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	R <sup>+ .0005"</sup> / <sub>-.0005"</sub>	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
3°	1/64	.921	1/8	1-1/2	843600	47.30	843600-C3	52.50		
	1/32	.631	1/8	1-1/2	843602	47.30	843602-C3	52.50		
	1/16	.666	3/16	2	843604	52.10	843604-C3	57.70		
5°	1/64	.557	1/8	1-1/2	936300	47.30	936300-C3	52.50		
	1/32	.390	1/8	1-1/2	936302	47.30	936302-C3	52.50		
	3/64	.579	3/16	2	936303	52.10	936303-C3	57.70		
	1/16	.422	3/16	2	936304	52.10	936304-C3	57.70		
	3/32	.812	5/16	2-1/2	936306	66.90	936306-C3	75.80		
	1/8	.834	3/8	2-1/2	936308	75.10	936308-C3	85.20		
7°	1/64	.401	1/8	1-1/2	764600	47.80	764600-C3	53.00		
	1/32	.286	1/8	1-1/2	764602	47.80	764602-C3	53.00		
	1/16	.571	1/4	2-1/2	764604	52.10	764604-C3	59.70		
10°	.005	.331	1/8	1-1/2	75050	41.50	75050-C3	46.70		
	.010	.307	1/8	1-1/2	75052	41.50	75052-C3	46.70	75052-C6	49.10
	1/64	.283	1/8	1-1/2	75000	41.50	75000-C3	46.70	75000-C6	49.10
	.020	.259	1/8	1-1/2	75001	41.50	75001-C3	46.70	75001-C6	49.10
	.025	.235	1/8	1-1/2	75054	41.50	75054-C3	46.70		
	1/32	.384	3/16	2	75002	47.30	75002-C3	52.90	75002-C6	55.50
	.040	.341	3/16	2	75062	52.10	75062-C3	57.70		
	3/64	.308	3/16	2	75003	52.10	75003-C3	57.70		
	1/16	.414	1/4	2-1/2	75004	58.40	75004-C3	66.00	75004-C6	69.60
	5/64	.338	1/4	2-1/2	75005	59.90	75005-C3	67.50		
	3/32	.444	5/16	2-1/2	75006	66.90	75006-C3	75.80		
	7/64	.367	5/16	2-1/2	75007	67.20	75007-C3	76.10		
	1/8	.469	3/8	2-1/2	75008	75.10	75008-C3	85.20		
	5/32	.675	1/2	3	75010	88.40	75010-C3	103.50		

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**RUNNER CUTTERS**

(cont.)

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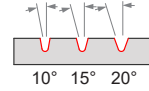
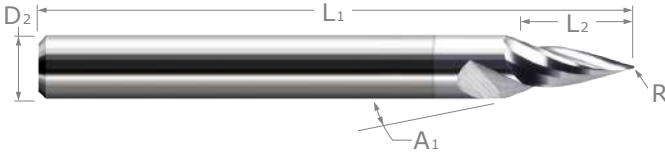
ANGLE PER SIDE	RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AITIN NANO COATED		
					2 FL	PRICE	2 FL	PRICE	2 FL	PRICE	
<b>15°</b>	A <sub>1</sub> <sup>+0°30'</sup> <sub>-0°30'</sub>	R <sup>+.0005"</sup> <sub>-.0005"</sub>	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	75150	42.30	75150-C3	47.50		
		.005	.219	1/8	1-1/2	75150	42.30	75150-C3	47.50		
		.010	.205	1/8	1-1/2	75152	41.50	75152-C3	46.70	75152-C6	49.10
		1/64	.190	1/8	1-1/2	75100	41.50	75100-C3	46.70	75100-C6	49.10
		.020	.176	1/8	1-1/2	75101	41.50	75101-C3	46.70	75101-C6	49.10
		.025	.162	1/8	1-1/2	75154	41.50	75154-C3	46.70	75154-C6	49.10
		1/32	.261	3/16	2	75102	47.30	75102-C3	52.90	75102-C6	55.50
		.039	.238	3/16	2	75160	52.10	75160-C3	57.70		
		.040	.235	3/16	2	75162	52.10	75162-C3	57.70		
		3/64	.215	3/16	2	75103	52.10	75103-C3	57.70		
		1/16	.289	1/4	2-1/2	75104	58.40	75104-C3	66.00	75104-C6	69.60
		5/64	.243	1/4	2-1/2	75105	59.90	75105-C3	67.50		
		3/32	.317	5/16	2-1/2	75106	66.90	75106-C3	75.80		
		7/64	.271	5/16	2-1/2	75107	67.20	75107-C3	76.10		
	1/8	.342	3/8	2-1/2	75108	75.10	75108-C3	85.20			
	5/32	.486	1/2	3	75110	88.40	75110-C3	103.50			
<b>20°</b>		.005	.162	1/8	1-1/2	979950	43.40	979950-C3	48.60		
		.010	.152	1/8	1-1/2	979952	43.40	979952-C3	48.60		
		1/64	.143	1/8	1-1/2	979900	41.50	979900-C3	46.70	979900-C6	49.10
		.020	.133	1/8	1-1/2	979901	44.70	979901-C3	49.90	979901-C6	52.30
		.025	.124	1/8	1-1/2	979954	44.70	979954-C3	49.90		
		1/32	.198	3/16	2	979902	47.30	979902-C3	52.90	979902-C6	55.50
		3/64	.167	3/16	2	979903	52.10	979903-C3	57.70		
		1/16	.224	1/4	2-1/2	979904	58.40	979904-C3	66.00		
		5/64	.193	1/4	2-1/2	979905	60.50	979905-C3	68.10		
		3/32	.250	5/16	2-1/2	979906	66.90	979906-C3	75.80		
	1/8	.275	3/8	2-1/2	979908	75.10	979908-C3	85.20			
<b>22.5°</b>		.010	.135	1/8	1-1/2	867852	43.40	867852-C3	48.60		
		1/64	.127	1/8	1-1/2	867800	41.50	867800-C3	46.70		
		.020	.194	3/16	2	867801	47.30	867801-C3	52.90		
		1/32	.176	3/16	2	867802	47.30	867802-C3	52.90		
		1/16	.277	5/16	2-1/2	867804	66.90	867804-C3	75.80		
<b>30°</b>		.005	.157	3/16	2	934550	61.80	934550-C3	67.40		
		.010	.152	3/16	2	934552	61.80	934552-C3	67.40		
		1/64	.147	3/16	2	934500	59.90	934500-C3	65.50	934500-C6	68.10
		.020	.142	3/16	2	934501	59.90	934501-C3	65.50		
		1/32	.186	1/4	2-1/2	934502	59.90	934502-C3	67.50	934502-C6	71.10
		3/64	.224	5/16	2-1/2	934503	66.90	934503-C3	75.80		
		1/16	.263	3/8	2-1/2	934504	75.10	934504-C3	85.20		
<b>45°</b>		.010	.121	1/4	2-1/2	856552	63.00	856552-C3	70.60		
		1/64	.119	1/4	2-1/2	856500	61.10	856500-C3	68.70		
		.020	.148	5/16	2-1/2	856501	61.10	856501-C3	70.00		
		1/32	.143	5/16	2-1/2	856502	68.00	856502-C3	76.90		
		3/64	.168	3/8	2-1/2	856503	76.50	856503-C3	86.60		
		1/16	.224	1/2	3	856504	92.40	856504-C3	107.50		

NEW

RUNNER CUTTERS

# RUNNER CUTTERS

For Non-Ferrous Materials



Stocked in **Three** Angles Per Side!

- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Designed to mill 10°, 15°, and 20° channels in molds
- 2 helical flutes (approx. 25° helix)
- Offered with TiB<sub>2</sub> coating to minimize galling
- Center cutting
- Solid carbide
- CNC ground in the USA

RUNNER CUTTERS

ANGLE PER SIDE	RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
					2 FL	PRICE	2 FL	PRICE
A <sub>1</sub> <sup>+0°30'</sup> -0°30'	R <sup>+0.0005"</sup> -0.0005"	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>				
<b>10°</b>	.010	.307	1/8	1-1/2	773452	42.50	773452-C8	50.10
	.015	.283	1/8	1-1/2	773400	42.50	773400-C8	50.10
	.031	.384	3/16	2	773402	48.30	773402-C8	55.90
<b>15°</b>	.010	.205	1/8	1-1/2	772252	42.50	772252-C8	50.10
	.015	.190	1/8	1-1/2	772200	42.90	772200-C8	50.50
	.031	.261	3/16	2	772202	48.30	772202-C8	55.90
<b>20°</b>	.010	.152	1/8	1-1/2	771252	42.50	771252-C8	50.10
	.015	.143	1/8	1-1/2	771200	42.50	771200-C8	50.10
	.031	.198	3/16	2	771202	48.30	771202-C8	55.90

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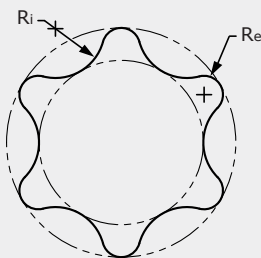
## HEXALOBE CUTTERS



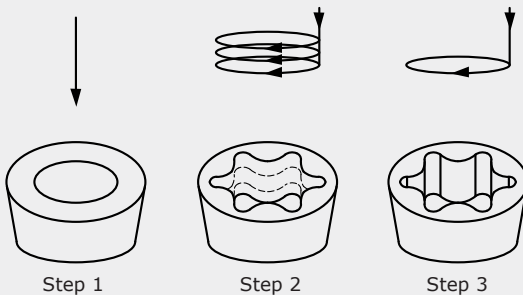
- Optimized for titanium alloys, Inconel, nickel alloys and other high temperature materials with outstanding performance in difficult-to-machine steels, stainless steels and tool steels
- Cutter diameters are slightly undersized common hexalobe sizes, created to contour the radii with ease and maximize the strength of the tool
- h6 shank tolerance for high precision tool holders
- Center cutting
- Solid carbide
- CNC ground in the USA

HEXALOBULAR SOCKET NUMBER	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
					4 FL	PRICE
	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
T6 / T8	.010	<b>.060</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	793310-C6	48.50
T8 / T10	.014	<b>.084</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	793314-C6	48.50
T10 / T15	.017	<b>.102</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	793317-C6	48.50
T15 / T20	.020	<b>.120</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	793320-C6	48.50
T20 / T25	.022	<b>.132</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	793322-C6	48.50
T25 / T30	.028	<b>.168</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	793328-C6	48.50
T30 / T40	.032	<b>.192</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	793332-C6	48.50

### Hexalobe Order of Operations



There are a few different approaches when machining a hexalobe pattern. In terms of milling, miniature tooling is required to properly contour the multiple radii surfaces to achieve the desired pattern and finish. Harvey Tool supplies multiple sizes to help create the shape and depth for the desired specification.



1. Pre-drill minor diameter with a drill and countersink top of the hole with appropriate angle chamfer
2. Select a **Long Reach Hexalobe Cutter** for either traditional roughing step downs or helical interpolation (Diameters have undersized radii ( $R_e$ ) to allow for contouring)
3. Finish with a Hexalobe Cutter to remove any witness marks and achieve required finish

# HEXALOBE CUTTERS

## Long Reach

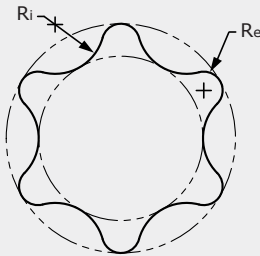


- Optimized for titanium alloys, Inconel, nickel alloys and other high temperature materials with outstanding performance in difficult-to-machine steels, stainless steels and tool steels
- Cutter diameters are slightly undersized common hexalobe sizes, created to contour the radii with ease and maximize the strength of the tool
- Reduced neck diameter to avoid heeling
- h6 shank tolerance for high precision tool holders
- Center Cutting
- Solid carbide
- CNC ground in the USA

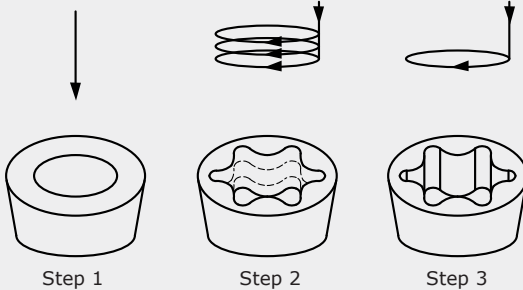
HEXALOBE CUTTERS

HEXALOBULAR SOCKET NUMBER	CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
						4 FL	PRICE
	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
T8 / T10	<b>.014</b>	.023	<b>.045</b> (3x)	.1575 (4 mm)	1.575 (40 mm)	792714-C6	51.00
T8 / T10	<b>.014</b>	.023	<b>.084</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	791814-C6	54.40
T15 / T20	<b>.020</b>	.030	<b>.060</b> (3x)	.1575 (4 mm)	1.575 (40 mm)	792720-C6	51.00
T15 / T20	<b>.020</b>	.030	<b>.120</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	791820-C6	54.40
T25 / T30	<b>.028</b>	.042	<b>.084</b> (3x)	.1575 (4 mm)	1.575 (40 mm)	792728-C6	51.00
T25 / T30	<b>.028</b>	.042	<b>.168</b> (6x)	.1575 (4 mm)	1.575 (40 mm)	791828-C6	54.40

### Hexalobe Order of Operations



There are a few different approaches when machining a hexalobe pattern. In terms of milling, miniature tooling is required to properly contour the multiple radii surfaces to achieve the desired pattern and finish. Harvey Tool supplies multiple sizes to help create the shape and depth for the desired specification.

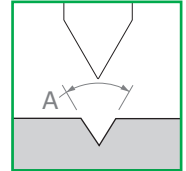
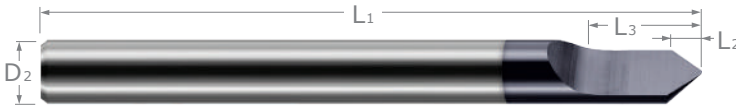


1. Pre-drill minor diameter with a drill and countersink top of the hole with appropriate angle chamfer
2. Select a **Long Reach Hexalobe Cutter** for either traditional roughing step downs or helical interpolation (Diameters have undersized radii (Re) to allow for contouring)
3. Finish with a Hexalobe Cutter to remove any witness marks and achieve required finish

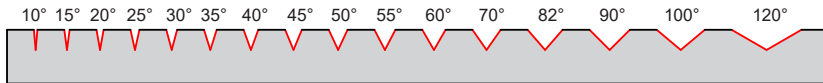


# ENGRAVING CUTTERS

Pointed



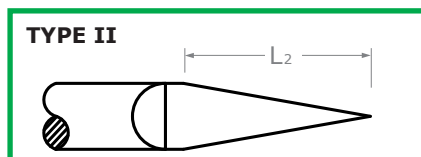
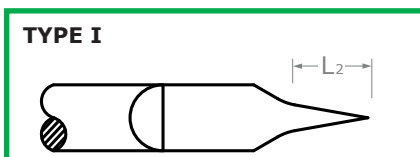
- Ground to a point • Half-round drill style
- Relieved for right hand milling • Solid carbide • CNC ground in the USA



Stocked in *Sixteen* Included Angles!

INCL. ANGLE	DIA.	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>						
10°	1/8	.080	I	.200	1-1/2	996508	23.70	996508-C3	28.90		
	3/16	.080	I	1/4	2	996512	23.90	996512-C3	29.50		
	1/4	.080	I	5/16	2-1/2	996516	29.00	996516-C3	36.60		
15°	1/8	.080	I	.200	1-1/2	998108	23.70	998108-C3	28.90		
	3/16	.080	I	1/4	2	998112	23.90	998112-C3	29.50		
	1/4	.080	I	5/16	2-1/2	998116	29.00	998116-C3	36.60		
20°	1/8	.080	I	.200	1-1/2	999708	23.70	999708-C3	28.90	999708-C4	36.80
	3/16	.080	I	1/4	2	999712	23.90	999712-C3	29.50		
	1/4	.080	I	5/16	2-1/2	999716	29.00	999716-C3	36.60		
25°	1/8	.080	I	.200	1-1/2	983808	23.70	983808-C3	28.90		
	3/16	.080	I	1/4	2	983812	23.90	983812-C3	29.50		
	1/4	.080	I	5/16	2-1/2	983816	29.00	983816-C3	36.60		
30°	1/8	.080	I	.200	1-1/2	981508	20.60	981508-C3	25.80		
	1/8	.233	II	3/8	1-1/2	25010	15.80	25010-C3	21.00	25010-C4	28.90
	1/8	.233	II	3/8	4 <b>LONG!</b>	941708	26.20	941708-C3	31.80		
	3/16	.350	II	3/8	2	25020	20.40	25020-C3	26.00		
	1/4	.466	II	1/2	2-1/2	25030	25.30	25030-C3	32.90	25030-C4	45.90
35°	1/8	.198	II	3/8	1-1/2	853508	19.10	853508-C3	24.30		
40°	1/8	.080	I	.200	1-1/2	978608	21.60	978608-C3	26.80		
	1/8	.171	II	3/8	1-1/2	25110	16.40	25110-C3	21.60	25110-C4	29.50
	1/8	.171	II	3/8	4 <b>LONG!</b>	937808	27.60	937808-C3	33.20		
	3/16	.257	II	3/8	2	25120	22.30	25120-C3	27.90		
	1/4	.343	II	3/8	2-1/2	25130	26.60	25130-C3	34.20		
45°	1/8	.151	II	3/8	1-1/2	997308	17.70	997308-C3	22.90	997308-C4	30.80
	3/16	.226	II	3/8	2	997312	22.70	997312-C3	28.30		
	1/4	.302	II	3/8	2-1/2	997316	28.40	997316-C3	36.00		
50°	1/8	.134	II	3/8	1-1/2	998408	17.80	998408-C3	23.00		
	3/16	.201	II	3/8	2	998412	23.20	998412-C3	28.50		
	1/4	.268	II	3/8	2-1/2	998416	29.00	998416-C3	36.60		

continued on next page



ENGRAVING CUTTERS

# ENGRAVING CUTTERS

Pointed (cont.)

continued from previous page

INCL. ANGLE	DIA.	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND		
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
<b>55°</b>	D <sub>2</sub>	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>							
	1/8	.120	II	3/8	1-1/2	855508	19.10	855508-C3	24.30			
<b>60°</b>	3 mm	2.60 mm	II	10 mm	38 mm	898657	18.00	898657-C3	23.20			
	1/8	.108	II	3/8	1-1/2	30010	15.80	30010-C3	21.00	30010-C4	28.90	
	1/8	.108	II	3/8	4	<b>LONG!</b>	30410	26.20	30410-C3	31.80	30410-C4	39.30
	3/16	.162	II	3/8	2		30020	20.40	30020-C3	26.00	30020-C4	38.50
	3/16	.162	II	3/8	4	<b>LONG!</b>	30420	34.60	30420-C3	42.20		
	6 mm	5.20 mm	II	10 mm	63 mm		898666	29.30	898666-C3	36.90		
	1/4	.216	II	3/8	2-1/2		30030	25.30	30030-C3	32.90	30030-C4	45.90
	1/4	.216	II	3/8	6	<b>LONG!</b>	30430	49.70	30430-C3	59.80		
	3/8	.325	II	3/8	2-1/2		30040	36.40	30040-C3	46.50		
<b>70°</b>	1/8	.089	II	3/8	1-1/2	937208	17.80	937208-C3	23.00			
	3/16	.134	II	3/8	2	937212	23.20	937212-C3	28.50			
	1/4	.179	II	3/8	2-1/2	937216	29.00	937216-C3	36.60			
<b>82°</b>	1/8	.072	II	3/8	1-1/2	971708	17.80	971708-C3	23.00			
	3/16	.108	II	3/8	2	971712	23.20	971712-C3	28.50			
	1/4	.144	II	3/8	2-1/2	971716	29.00	971716-C3	36.60			
<b>90°</b>	3 mm	1.50 mm	II	10 mm	38 mm	884157	18.00	884157-C3	23.20			
	1/8	.062	II	3/8	1-1/2	30110	15.80	30110-C3	21.00	30110-C4	28.90	
	1/8	.062	II	3/8	4	<b>LONG!</b>	30510	26.20	30510-C3	31.80		
	3/16	.093	II	3/8	2		30120	20.40	30120-C3	26.00	30120-C4	38.50
	3/16	.093	II	3/8	4	<b>LONG!</b>	30520	34.60	30520-C3	42.20		
	6 mm	3.00 mm	II	10 mm	63 mm		884166	29.30	884166-C3	36.90		
	1/4	.125	II	3/8	2-1/2		30130	25.30	30130-C3	32.90	30130-C4	45.90
	1/4	.125	II	3/8	6	<b>LONG!</b>	30530	49.70	30530-C3	59.80		
	3/8	.187	II	3/8	2-1/2		30140	36.40	30140-C3	46.50		
<b>100°</b>	1/8	.052	II	3/8	1-1/2	983508	17.80	983508-C3	23.00			
	3/16	.079	II	3/8	2	983512	23.20	983512-C3	28.80			
	1/4	.105	II	3/8	2-1/2	983516	29.00	983516-C3	36.60			
<b>120°</b>	1/8	.036	II	3/8	1-1/2	990508	15.80	990508-C3	21.00			
	3/16	.054	II	3/8	2	990512	20.40	990512-C3	26.00			
	1/4	.072	II	3/8	2-1/2	990516	25.30	990516-C3	32.90			

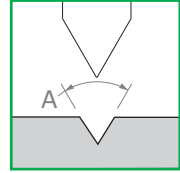
ENGRAVING CUTTERS



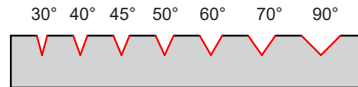
**Check Out All of Our Engraving Solutions!**

## ENGRAVING CUTTERS

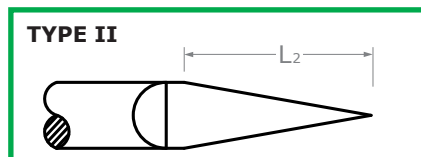
Pointed - Double-Ended



- Double-ended
- 180° opposing split lengths for improved balance at higher RPMs
- Ground to a point
- Half-round drill style
- Relieved for right hand milling
- Solid carbide
- CNC ground in the USA

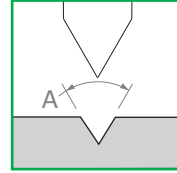
Stocked in **Seven** Included Angles!

INCLUDED ANGLE	DIA.	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>						
30°	1/8	.233	II	3/8	2	938408	27.20	938408-C3	33.60		
	3/16	.350	II	3/8	2	938410	33.80	938410-C3	41.40		
	1/4	.466	II	1/2	2-1/2	938412	40.20	938412-C3	50.30		
40°	1/8	.172	II	3/8	2	854008	29.80	854008-C3	36.20		
	3/16	.258	II	3/8	2	854010	36.80	854010-C3	44.40		
	1/4	.343	II	3/8	2-1/2	854012	43.70	854012-C3	53.80		
45°	1/8	.151	II	3/8	2	854508	29.80	854508-C3	36.20		
	3/16	.226	II	3/8	2	854510	36.50	854510-C3	44.10		
	1/4	.302	II	3/8	2-1/2	854512	43.70	854512-C3	53.80		
50°	1/8	.134	II	3/8	2	855008	30.10	855008-C3	36.50		
	3/16	.201	II	3/8	2	855010	36.50	855010-C3	44.10		
	1/4	.268	II	3/8	2-1/2	855012	43.70	855012-C3	53.80		
60°	1/8	.108	II	3/8	2	954608	27.20	954608-C3	33.60	954608-C4	50.70
	3/16	.162	II	3/8	2	954610	33.80	954610-C3	41.40		
	1/4	.216	II	3/8	2-1/2	954612	40.20	954612-C3	50.30		
70°	1/8	.089	II	3/8	2	857008	29.80	857008-C3	36.20		
	3/16	.134	II	3/8	2	857010	36.80	857010-C3	44.40		
	1/4	.179	II	3/8	2-1/2	857012	43.70	857012-C3	53.80		
90°	1/8	.062	II	3/8	2	975108	27.20	975108-C3	33.60	975108-C4	50.70
	3/16	.093	II	3/8	2	975110	33.80	975110-C3	41.40		
	1/4	.125	II	3/8	2-1/2	975112	40.20	975112-C3	50.30		

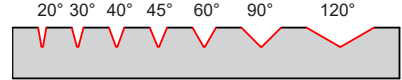


# ENGRAVING CUTTERS

## Pointed – Pyramid Point



- 3 facet design increases tip strength
- Ground to a point
- Solid carbide
- CNC ground in the USA



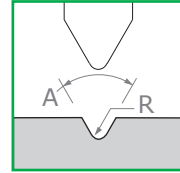
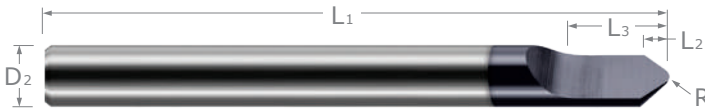
Stocked in **Seven** Included Angles!

ENGRAVING CUTTERS

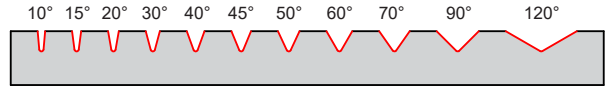
INCLUDED ANGLE	DIAMETER	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		A1TiN COATED	
				TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	L <sub>2</sub>	L <sub>1</sub>				
20°	1/8	.354	1-1/2	842810	27.10	842810-C3	32.30
	3/16	.532	2	822010	29.60	822010-C3	35.20
	1/4	.709	2-1/2	834010	42.20	834010-C3	49.80
30°	1/8	.233	1-1/2	842815	27.10	842815-C3	32.30
	3/16	.350	2	822015	29.60	822015-C3	35.20
	1/4	.467	2-1/2	834015	42.20	834015-C3	49.80
40°	1/8	.172	1-1/2	842820	27.10	842820-C3	32.30
	1/4	.343	2-1/2	834020	42.60	834020-C3	50.20
45°	1/8	.151	1-1/2	842823	27.10	842823-C3	32.30
	1/4	.302	2-1/2	834023	29.60	834023-C3	37.20
60°	1/8	.108	1-1/2	842830	27.10	842830-C3	32.30
	3/16	.162	2	822030	29.60	822030-C3	35.20
	1/4	.217	2-1/2	834030	42.20	834030-C3	49.80
90°	1/8	.063	1-1/2	842845	27.10	842845-C3	32.30
	3/16	.094	2	822045	29.60	822045-C3	35.20
	1/4	.125	2-1/2	834045	42.20	834045-C3	49.80
120°	1/8	.036	1-1/2	842860	27.40	842860-C3	32.60

# ENGRAVING CUTTERS

## Tip Radius



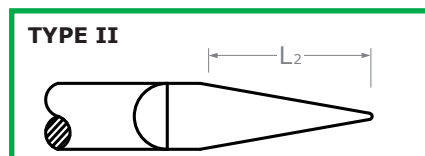
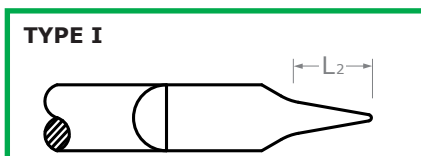
- Radius on tip creates radius in bottom of groove and improves strength
- Half-round drill style
- Relieved for right-hand milling
- Solid carbide • CNC ground in the USA



Stocked in *Eleven* Included Angles!

INCL. ANGLE	DIA.	RADIUS	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	R	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>						
10°	1/8	.0050	.080	I	.200	1-1/2	940410	25.70	940410-C3	30.90		
	1/8	.0100	.080	I	.200	1-1/2	948010	25.70	948010-C3	30.90		
15°	1/8	.0050	.080	I	.200	1-1/2	952910	25.70	952910-C3	30.90		
	1/8	.0100	.080	I	.200	1-1/2	963510	25.70	963510-C3	30.90		
20°	1/8	.0050	.080	I	.200	1-1/2	989310	25.70	989310-C3	30.90		
	1/8	.0100	.080	I	.200	1-1/2	956010	25.70	956010-C3	30.90		
30°	1/8	.0025	.226	II	3/8	1-1/2	72715	23.40	72715-C3	28.60	72715-C4	36.50
	1/8	.0050	.219	II	3/8	1-1/2	47510	23.40	47510-C3	28.60	47510-C4	36.50
	1/8	.0100	.207	II	3/8	1-1/2	48810	23.40	48810-C3	28.60	48810-C4	36.50
	1/8	.0150	.190	II	3/8	1-1/2	49710	23.40	49710-C3	28.60		
	1/8	.0200	.176	II	3/8	1-1/2	58610	23.40	58610-C3	28.60		
	1/8	.0300	.147	II	3/8	1-1/2	868910	23.40	868910-C3	28.60		
	3/16	.0050	.336	II	3/8	2	47520	28.60	47520-C3	34.20		
	3/16	.0100	.321	II	3/8	2	48820	28.60	48820-C3	34.20		
	1/4	.0050	.452	II	1/2	2-1/2	47530	40.20	47530-C3	47.80		
1/4	.0100	.438	II	1/2	2-1/2	48830	40.20	48830-C3	47.80			
40°	1/8	.0025	.167	II	3/8	1-1/2	72720	24.50	72720-C3	29.70		
	1/8	.0050	.162	II	3/8	1-1/2	57610	24.50	57610-C3	29.70		
	1/8	.0100	.152	II	3/8	1-1/2	58210	24.50	58210-C3	29.70		
	1/8	.0150	.143	II	3/8	1-1/2	59310	24.50	59310-C3	29.70		
	1/8	.0200	.133	II	3/8	1-1/2	60510	24.50	60510-C3	29.70		
45°	1/8	.0050	.143	II	3/8	1-1/2	946502	25.30	946502-C3	30.50		
	1/8	.0100	.135	II	3/8	1-1/2	957910	25.30	957910-C3	30.50		
50°	1/8	.0050	.127	II	3/8	1-1/2	845010	25.50	845010-C3	30.70		
	1/8	.0100	.120	II	3/8	1-1/2	847210	25.50	847210-C3	30.70		
60°	1/8	.0025	.106	II	3/8	1-1/2	72730	23.40	72730-C3	28.60	72730-C4	36.50
	1/8	.0050	.103	II	3/8	1-1/2	48110	23.40	48110-C3	28.60	48110-C4	36.50
	1/8	.0050	.103	II	3/8	4 <b>LONG!</b>	974910	42.10	974910-C3	47.70		
	1/8	.0075	.101	II	3/8	1-1/2	967310	23.40	967310-C3	28.60		
	1/8	.0100	.098	II	3/8	1-1/2	49410	23.40	49410-C3	28.60	49410-C4	36.50
	1/8	.0125	.096	II	3/8	1-1/2	817110	23.40	817110-C3	28.60		
	1/8	.0150	.093	II	3/8	1-1/2	51710	23.40	51710-C3	28.60		
	1/8	.0200	.088	II	3/8	1-1/2	58910	23.40	58910-C3	28.60		
	1/8	.0300	.078	II	3/8	1-1/2	877010	23.40	877010-C3	28.60		

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ENGRAVING CUTTERS

# ENGRAVING CUTTERS

## Tip Radius (cont.)

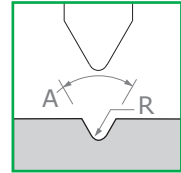
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INCL. ANGLE	DIA.	RADIUS	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND		
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
A	D <sub>2</sub>	R	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>							
60°	3/16	.0025	.160	II	3/8	2	964830	28.60	964830-C3	34.20			
	3/16	.0050	.157	II	3/8	2	48120	28.60	48120-C3	34.20			
	3/16	.0075	.155	II	3/8	2	967320	28.60	967320-C3	34.20			
	3/16	.0100	.152	II	3/8	2	49420	28.60	49420-C3	34.20			
	3/16	.0150	.147	II	3/8	2	51720	28.60	51720-C3	34.20			
	3/16	.0200	.142	II	3/8	2	58920	28.60	58920-C3	34.20			
	1/4	.0025	.214	II	3/8	2-1/2	943730	31.40	943730-C3	39.00			
	1/4	.0050	.212	II	3/8	2-1/2	48130	31.40	48130-C3	39.00			
	1/4	.0075	.209	II	3/8	2-1/2	967330	31.40	967330-C3	39.00			
	1/4	.0100	.207	II	3/8	2-1/2	49430	31.40	49430-C3	39.00			
	1/4	.0150	.202	II	3/8	2-1/2	51730	31.40	51730-C3	39.00			
	1/4	.0200	.196	II	3/8	2-1/2	58930	31.40	58930-C3	39.00			
70°	1/8	.0050	.086	II	3/8	1-1/2	843810	25.30	843810-C3	30.50			
	1/8	.0100	.082	II	3/8	1-1/2	844710	25.50	844710-C3	30.70			
90°	1/8	.0025	.061	II	3/8	1-1/2	72745	23.40	72745-C3	28.60	72745-C4	36.50	
	1/8	.0050	.060	II	3/8	1-1/2	48410	23.40	48410-C3	28.60	48410-C4	36.50	
	1/8	.0050	.060	II	3/8	4	LONG!	986810	42.10	986810-C3	47.70		
	1/8	.0075	.059	II	3/8	1-1/2	959810	23.40	959810-C3	28.60			
	1/8	.0100	.058	II	3/8	1-1/2	49110	23.40	49110-C3	28.60	49110-C4	36.50	
	1/8	.0125	.057	II	3/8	1-1/2	817010	23.80	817010-C3	29.00			
	1/8	.0150	.056	II	3/8	1-1/2	50810	23.40	50810-C3	28.60			
	1/8	.0200	.054	II	3/8	1-1/2	59910	23.40	59910-C3	28.60			
	1/8	.0300	.050	II	3/8	1-1/2	891410	23.40	891410-C3	28.60			
	3/16	.0025	.093	II	3/8	2	964845	28.60	964845-C3	34.20			
	3/16	.0050	.092	II	3/8	2	48420	28.60	48420-C3	34.20			
	3/16	.0100	.090	II	3/8	2	49120	28.60	49120-C3	34.20			
	3/16	.0150	.088	II	3/8	2	50820	28.60	50820-C3	34.20			
	3/16	.0200	.085	II	3/8	2	59920	28.60	59920-C3	34.20			
	1/4	.0025	.124	II	3/8	2-1/2	943745	31.40	943745-C3	39.00			
	1/4	.0050	.123	II	3/8	2-1/2	48430	31.40	48430-C3	39.00			
	1/4	.0100	.121	II	3/8	2-1/2	49130	31.40	49130-C3	39.00			
	1/4	.0150	.119	II	3/8	2-1/2	50830	31.40	50830-C3	39.00			
1/4	.0200	.116	II	3/8	2-1/2	59930	31.40	59930-C3	39.00				
120°	1/8	.0050	.035	II	3/8	1-1/2	947310	23.80	947310-C3	29.00			
	1/8	.0100	.035	II	3/8	1-1/2	939110	23.40	939110-C3	28.60			

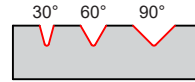
ENGRAVING CUTTERS

# ENGRAVING CUTTERS

## Tip Radius - Double-Ended

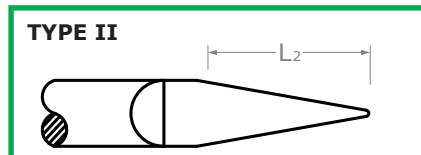


- Double-ended
- 180° opposing split lengths for improved balance at higher RPMs
- Radius on tip creates radius in bottom of groove and improves strength
- Half-round drill style
- Relieved for right-hand milling
- Solid carbide
- CNC ground in the USA



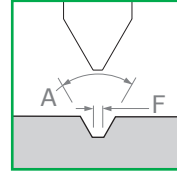
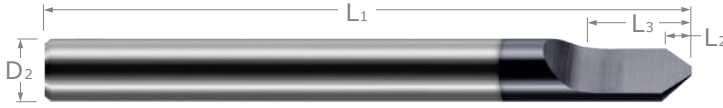
Stocked in *Three* Included Angles!

INCLUDED ANGLE	DIAMETER	RADIUS	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	R	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>				
30°	1/8	.0025	.226	II	3/8	2	842008	36.40	842008-C3	42.80
	1/8	.0050	.219	II	3/8	2	834408	36.40	834408-C3	42.80
	1/8	.0100	.205	II	3/8	2	835008	36.40	835008-C3	42.80
	1/8	.0150	.190	II	3/8	2	744508	36.70	744508-C3	43.10
	1/8	.0200	.176	II	3/8	2	836108	36.40	836108-C3	42.80
	1/4	.0050	.452	II	1/2	2-1/2	834416	48.30	834416-C3	58.40
	1/4	.0100	.438	II	1/2	2-1/2	835016	47.80	835016-C3	57.90
60°	1/8	.0025	.106	II	3/8	2	834708	36.40	834708-C3	42.80
	1/8	.0050	.103	II	3/8	2	828208	36.40	828208-C3	42.80
	1/8	.0100	.098	II	3/8	2	828808	36.40	828808-C3	42.80
	1/8	.0150	.093	II	3/8	2	743808	36.70	743808-C3	43.10
	1/8	.0200	.088	II	3/8	2	829908	36.40	829908-C3	42.80
	1/4	.0050	.212	II	3/8	2-1/2	828216	48.30	828216-C3	58.40
	1/4	.0100	.207	II	3/8	2-1/2	828816	47.80	828816-C3	57.90
90°	1/8	.0025	.061	II	3/8	2	828908	36.40	828908-C3	42.80
	1/8	.0050	.060	II	3/8	2	818308	36.40	818308-C3	42.80
	1/8	.0100	.058	II	3/8	2	818908	36.40	818908-C3	42.80
	1/8	.0150	.056	II	3/8	2	743208	36.70	743208-C3	43.10
	1/8	.0200	.054	II	3/8	2	820108	36.40	820108-C3	42.80
	1/4	.0050	.123	II	3/8	2-1/2	818316	47.80	818316-C3	57.90
	1/4	.0100	.121	II	3/8	2-1/2	818916	47.80	818916-C3	57.90

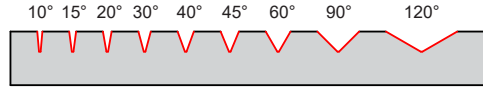


# ENGRAVING CUTTERS

## Tipped Off



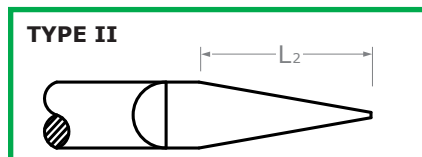
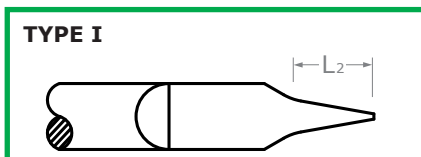
- Tipped off end diameter for improved cutting
- Flat (F) represents flat generated in workpiece
- Half-round drill style
- Relieved for right hand milling
- Solid carbide
- CNC ground in the USA



Stocked in *Nine* Included Angles!

INCL. ANGLE	DIA.	FLAT ON PART	LENGTH OF CUT	TYPE	SPLIT LENGTH	OAL	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	F	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>						
10°	1/8	.005	.080	I	.200	1-1/2	993002	24.90	993002-C3	30.10		
	1/8	.010	.080	I	.200	1-1/2	993010	24.90	993010-C3	30.10		
	1/8	.020	.080	I	.200	1-1/2	993052	24.90	993052-C3	30.10		
15°	1/8	.005	.080	I	.200	1-1/2	990002	24.90	990002-C3	30.10		
	1/8	.010	.080	I	.200	1-1/2	990010	24.90	990010-C3	30.10		
	1/8	.020	.080	I	.200	1-1/2	990052	25.20	990052-C3	30.40		
20°	1/8	.005	.080	I	.200	1-1/2	987002	24.90	987002-C3	30.10		
	1/8	.010	.080	I	.200	1-1/2	987010	24.90	987010-C3	30.10		
	1/8	.020	.080	I	.200	1-1/2	987052	24.90	987052-C3	30.10		
30°	1/8	.005	.224	II	3/8	1-1/2	25202	17.90	25202-C3	23.10	25202-C4	31.00
	1/8	.010	.215	II	3/8	1-1/2	25210	17.90	25210-C3	23.10	25210-C4	31.00
	1/8	.015	.205	II	3/8	1-1/2	25242	17.90	25242-C3	23.10		
	1/8	.020	.196	II	3/8	1-1/2	25252	17.90	25252-C3	23.10		
	1/8	.030	.177	II	3/8	1-1/2	25256	17.90	25256-C3	23.10		
	3/16	.010	.331	II	3/8	2	25220	23.40	25220-C3	29.00		
	3/16	.020	.313	II	3/8	2	25226	23.40	25226-C3	29.00		
	3/16	.030	.294	II	3/8	2	25224	23.40	25224-C3	29.00		
	1/4	.005	.457	II	1/2	2-1/2	25228	27.10	25228-C3	34.70		
	1/4	.010	.448	II	1/2	2-1/2	25230	27.10	25230-C3	34.70		
	1/4	.020	.429	II	1/2	2-1/2	25234	27.10	25234-C3	34.70		
40°	1/8	.005	.165	II	3/8	1-1/2	25302	18.70	25302-C3	23.90		
	1/8	.010	.158	II	3/8	1-1/2	25310	18.70	25310-C3	23.90	25310-C4	31.80
	1/8	.015	.151	II	3/8	1-1/2	25342	18.70	25342-C3	23.90		
	1/8	.020	.144	II	3/8	1-1/2	25352	18.70	25352-C3	23.90		
	3/16	.010	.244	II	3/8	2	25320	25.00	25320-C3	30.60		
	1/4	.005	.337	II	3/8	2-1/2	25328	28.60	25328-C3	36.20		
	1/4	.010	.330	II	3/8	2-1/2	25330	28.60	25330-C3	36.20		

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## ENGRAVING CUTTERS

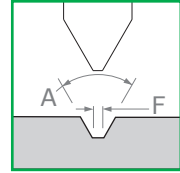
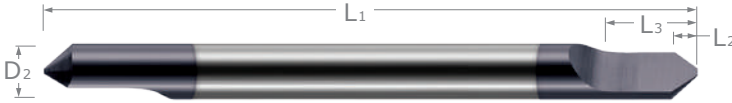
Tipped Off (cont.)

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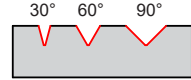
INCL. ANGLE	DIA.	FLAT ON PART	LENGTH OF CUT	TYPE	SPLIT LENGTH	OAL	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND		
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
A	D <sub>2</sub>	F	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>							
45°	1/8	.005	.145	II	3/8	1-1/2	955002	19.20	955002-C3	24.40			
	1/8	.010	.139	II	3/8	1-1/2	955010	19.20	955010-C3	24.40			
	3/16	.010	.214	II	3/8	2	955020	25.50	955020-C3	31.10			
	1/4	.010	.290	II	3/8	2-1/2	955030	29.60	955030-C3	37.20			
60°	1/8	.005	.104	II	3/8	1-1/2	50710	17.90	50710-C3	23.10	50710-C4	31.00	
	1/8	.005	.104	II	3/8	4	LONG!	823602	17.90	823602-C3	31.40		
	1/8	.010	.099	II	3/8	1-1/2	30210	17.90	30210-C3	23.10	30210-C4	31.00	
	1/8	.015	.095	II	3/8	1-1/2	18242	17.90	18242-C3	23.10			
	1/8	.020	.091	II	3/8	1-1/2	26910	17.90	26910-C3	23.10	26910-C4	31.00	
	1/8	.025	.087	II	3/8	1-1/2	793055	18.30	793055-C3	23.50			
	1/8	.030	.082	II	3/8	1-1/2	27610	17.90	27610-C3	23.10	27610-C4	31.00	
	3/16	.005	.158	II	3/8	2	50720	23.40	50720-C3	29.00			
	3/16	.005	.158	II	3/8	4	LONG!	823618	23.40	823618-C3	28.90		
	3/16	.010	.153	II	3/8	2	30220	23.40	30220-C3	29.00			
	3/16	.020	.145	II	3/8	2	26920	23.40	26920-C3	29.00			
	3/16	.030	.136	II	3/8	2	27620	23.40	27620-C3	29.00			
	1/4	.005	.212	II	3/8	2-1/2	50730	27.10	50730-C3	34.70			
	1/4	.005	.212	II	3/8	6	LONG!	823628	27.10	823628-C3	37.20		
	1/4	.010	.207	II	3/8	2-1/2	30230	27.10	30230-C3	34.70			
	1/4	.015	.204	II	3/8	2-1/2	18232	27.10	18232-C3	34.70			
1/4	.020	.199	II	3/8	2-1/2	26930	27.10	26930-C3	34.70				
1/4	.030	.191	II	3/8	2-1/2	27630	27.10	27630-C3	34.70				
90°	1/8	.005	.060	II	3/8	1-1/2	30302	17.90	30302-C3	23.10			
	1/8	.010	.057	II	3/8	1-1/2	30310	17.90	30310-C3	23.10	30310-C4	31.00	
	1/8	.015	.055	II	3/8	1-1/2	30342	17.90	30342-C3	23.10			
	1/8	.020	.053	II	3/8	1-1/2	30352	17.90	30352-C3	23.10			
	1/8	.030	.048	II	3/8	1-1/2	30356	17.90	30356-C3	23.10			
	3/16	.010	.088	II	3/8	2	30320	23.40	30320-C3	29.00			
	3/16	.020	.084	II	3/8	2	30324	23.40	30324-C3	29.00			
	3/16	.030	.079	II	3/8	2	30326	23.40	30326-C3	29.00			
	1/4	.005	.123	II	3/8	2-1/2	30328	27.10	30328-C3	34.70			
	1/4	.010	.120	II	3/8	2-1/2	30330	27.10	30330-C3	34.70			
	1/4	.020	.115	II	3/8	2-1/2	30334	27.60	30334-C3	35.20			
1/4	.030	.110	II	3/8	2-1/2	30336	27.10	30336-C3	32.20				
120°	1/8	.005	.035	II	3/8	1-1/2	954102	17.90	954102-C3	23.10			
	1/8	.010	.033	II	3/8	1-1/2	954110	17.90	954110-C3	23.10			

# ENGRAVING CUTTERS

## Tipped Off – Double-Ended



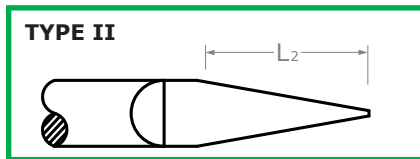
- Double-ended
- 180° opposing split lengths for improved balance at higher RPMs
- Tipped off end diameter for improved cutting
- Flat (F) represents flat generated in workpiece
- Half-round drill style
- Relieved for right hand milling
- Solid carbide
- CNC ground in the USA



Stocked in **Three** Included Angles!

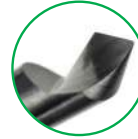
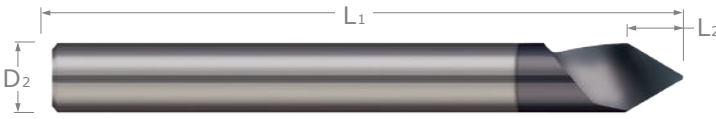
ENGRAVING CUTTERS

INCLUDED ANGLE	DIAMETER	FLAT ON PART	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	F	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>				
30°	1/8	.005	.224	II	3/8	2	834308	30.80	834308-C3	37.20
	1/8	.010	.215	II	3/8	2	834908	30.80	834908-C3	37.20
	1/8	.015	.205	II	3/8	2	835508	30.80	835508-C3	37.20
	1/8	.020	.196	II	3/8	2	836208	30.80	836208-C3	37.20
	1/4	.010	.448	II	1/2	2-1/2	834916	44.00	834916-C3	54.10
	60°	1/8	.005	.104	II	3/8	2	828108	30.80	828108-C3
1/8		.010	.100	II	3/8	2	828708	30.80	828708-C3	37.20
1/8		.015	.095	II	3/8	2	829308	30.80	829308-C3	37.20
1/8		.020	.091	II	3/8	2	829808	31.10	829808-C3	37.50
1/4		.010	.208	II	3/8	2-1/2	828716	43.60	828716-C3	53.70
90°		1/8	.005	.060	II	3/8	2	818208	30.80	818208-C3
	1/8	.010	.058	II	3/8	2	818808	30.80	818808-C3	37.20
	1/8	.015	.055	II	3/8	2	819408	31.10	819408-C3	37.50
	1/8	.020	.053	II	3/8	2	820008	31.10	820008-C3	37.50
	1/4	.010	.120	II	3/8	2-1/2	818816	43.60	818816-C3	53.70

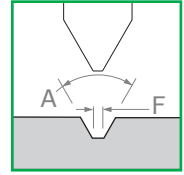


# ENGRAVING CUTTERS

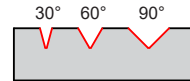
## Tipped Off – Helical Flute



Spiral flute for soft materials



- Optimized geometry for superior engraving in softer materials such as plastics and aluminum
- Also excellent for stainless steel, Inconel, titanium, and other high temp alloys
- Free cutting action provides excellent surface finish and chip evacuation
- Tipped-off end diameter for improved cutting action
- AlTiN coating for increased performance in ferrous materials
- TiB<sub>2</sub> coating for outstanding performance in non-ferrous materials due to its extremely low affinity to aluminum
- Right hand spiral, right hand cut
- Solid carbide
- CNC ground in the USA



Stocked in **Three** Included Angles!

INCLUDED ANGLE	DIAMETER	FLAT ON PART	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		ALTiN COATED		TiB <sub>2</sub> COATED	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
30°	1/8	.010	.215	2	779008	19.10	779008-C3	24.30	779008-C8	26.70
	1/4	.010	.448	2-1/2	779016	29.20	779016-C3	36.80	779016-C8	37.40
60°	1/8	.005	.104	1-1/2	764708	19.10	764708-C3	24.30	764708-C8	26.70
	1/8	.010	.100	1-1/2	824708	19.10	824708-C3	24.30	824708-C8	26.70
	3/16	.010	.154	2	824712	24.80	824712-C3	30.00	824712-C8	32.40
	1/4	.010	.208	2-1/2	824716	29.20	824716-C3	34.30	824716-C8	37.40
90°	1/8	.010	.058	1-1/2	814708	19.10	814708-C3	24.30	814708-C8	26.70
	3/16	.010	.089	2	814712	25.10	814712-C3	30.70	814712-C8	32.70
	1/4	.010	.120	2-1/2	814716	29.20	814716-C3	36.80	814716-C8	37.40

ENGRAVING CUTTERS

**MACHINING ADVISOR PRO**

FREE for desktop, tablet, and mobile



Customizable Running Parameters For Optimized Machining



[machiningadvisorpro.com](http://machiningadvisorpro.com)

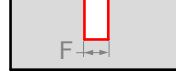


# ENGRAVING CUTTERS

## Parallel – Square



- Engraves a 90° vertical wall
- Flat (F) represents flat generated in workpiece
- Half-round drill style
- Non-cutting transition radius at end of length of cut
- Relieved for right hand milling
- Solid carbide
- CNC ground in the USA



ENGRAVING CUTTERS

DIAMETER	FLAT ON PART	LENGTH OF CUT	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AITIN COATED	
					TOOL #	PRICE	TOOL #	PRICE
D <sub>2</sub>	F	L <sub>2</sub>	L <sub>3</sub>	L <sub>1</sub>				
1/8	.030	.044	3/8	1-1/2	844230	19.80	844230-C3	25.00
1/8	.060	.090	3/8	1-1/2	844260	20.00	844260-C3	25.20
1/8	.090	.135	3/8	1-1/2	844290	20.00	844290-C3	25.20
3/16	.060	.090	3/8	2	827260	25.70	827260-C3	31.30
3/16	.090	.135	3/8	2	827290	25.70	827290-C3	31.30
3/16	.125	.190	1/2	2	827308	25.70	827308-C3	31.30
1/4	.060	.090	3/8	2-1/2	838960	29.90	838960-C3	37.50
1/4	.090	.135	3/8	2-1/2	838990	29.90	838990-C3	37.50
1/4	.125	.190	1/2	2-1/2	839008	29.90	839008-C3	37.50



Access Simulation Files in DXF Format  
for Every Harvey Tool Product

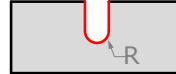
[harveytool.com/resources/simulation-files](http://harveytool.com/resources/simulation-files)

## ENGRAVING CUTTERS

Parallel - Ball



- Engraves a 90° vertical wall
- Radius on tip creates radius in the bottom of groove and improves strength
- Half-round drill style
- Non-cutting transition radius at end of length of cut
- Relieved for right hand milling
- Solid carbide
- CNC ground in the USA



DIAMETER	RADIUS	LENGTH OF CUT	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AITIN COATED	
					TOOL #	PRICE	TOOL #	PRICE
D <sub>2</sub>	R	L <sub>2</sub>	L <sub>3</sub>	L <sub>1</sub>				
1/8	<b>.0150</b>	.044	3/8	1-1/2	828530	22.20	828530-C3	27.40
1/8	<b>.0300</b>	.090	3/8	1-1/2	828560	22.20	828560-C3	27.40
1/8	<b>.0450</b>	.135	3/8	1-1/2	828590	22.40	828590-C3	27.60
3/16	<b>.0300</b>	.090	3/8	2	832660	28.10	832660-C3	33.70
3/16	<b>.0450</b>	.135	3/8	2	832690	28.10	832690-C3	33.70
3/16	<b>.0625</b>	.190	1/2	2	832708	28.10	832708-C3	33.70
1/4	<b>.0300</b>	.090	3/8	2-1/2	841360	32.40	841360-C3	40.00
1/4	<b>.0450</b>	.135	3/8	2-1/2	841390	32.40	841390-C3	40.00
1/4	<b>.0625</b>	.190	1/2	2-1/2	841408	32.40	841408-C3	40.00

ENGRAVING CUTTERS



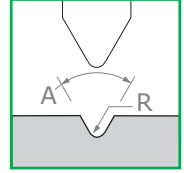
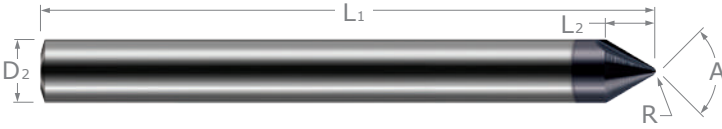
"Harvey Tool always has the perfect tool in stock, never needing to be modified. So many unique tools in stock for almost all applications without having to wait for custom made tools. Amazing company and products."

— @fro\_fab

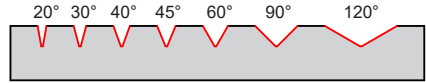
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# ENGRAVING CUTTERS

## Tip Radius – 2 Flute – For Hardened Steels



- **Strong 2 flute design for engraving hardened steels 46–68Rc**
- Eccentric relief increases durability and tool life
- Tip radius end diameter and shallow flute design for improved cutting and strength
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Solid carbide
- CNC ground in the USA

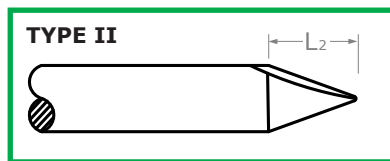
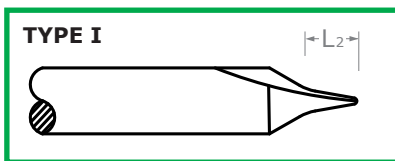


Stocked in *Seven* Included Angles!

INCLUDED ANGLE	DIAMETER	RADIUS	LENGTH OF CUT	TYPE	OVERALL LENGTH	AlTiN NANO COATED	
						2 FL	PRICE
A <sup>+0°30'</sup> <sub>-0°30'</sub>	D <sub>2</sub>	R	L <sub>2</sub>		L <sub>1</sub>		
20°	1/8	.0050	.080	I	1-1/2	873308-C6	32.20
	1/8	.0100	.080	I	1-1/2	857508-C6	32.20
	1/8	.0150	.080	I	1-1/2	763308-C6	32.20
	1/4	.0100	.080	I	2-1/2	857516-C6	49.70
30°	1/8	.0050	.218	II	1-1/2	858308-C6	31.00
	1/8	.0075	.211	II	1-1/2	825508-C6	31.00
	1/8	.0100	.204	II	1-1/2	851208-C6	31.00
	1/8	.0150	.190	II	1-1/2	821208-C6	31.00
	1/8	.0200	.175	II	1-1/2	843708-C6	31.00
	1/8	.0250	.161	II	1-1/2	821008-C6	31.00
	3/16	.0050	.335	II	2	858312-C6	37.90
	3/16	.0100	.331	II	2	851212-C6	37.90
	1/4	.0050	.452	II	2-1/2	858316-C6	47.60
	1/4	.0100	.437	II	2-1/2	851216-C6	47.60
40°	1/8	.0050	.162	II	1-1/2	837508-C6	32.20
	1/8	.0100	.152	II	1-1/2	859308-C6	32.20
	1/4	.0100	.324	II	2-1/2	859316-C6	49.70
45°	1/8	.0050	.142	II	1-1/2	825808-C6	32.20
	1/8	.0100	.152	II	1-1/2	825708-C6	32.20
	1/8	.0150	.126	II	1-1/2	756608-C6	32.50
	1/4	.0100	.285	II	2-1/2	825716-C6	50.20

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ENGRAVING CUTTERS



## ENGRAVING CUTTERS

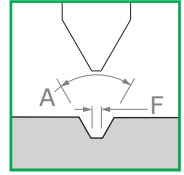
## Tip Radius – 2 Flute – For Hardened Steels (cont.)

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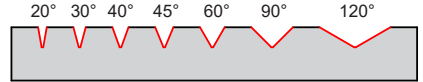
INCLUDED ANGLE	DIAMETER	RADIUS	LENGTH OF CUT	TYPE	OVERALL LENGTH	AITiN NANO COATED	
						2 FL	PRICE
A $^{+0^{\circ}30'}$ $^{-0^{\circ}30'}$	D <sub>2</sub>	R	L <sub>2</sub>		L <sub>1</sub>		
60°	1/8	.0050	.103	II	1-1/2	860008-C6	31.00
	1/8	.0075	.100	II	1-1/2	838108-C6	31.00
	1/8	.0100	.098	II	1-1/2	877308-C6	31.00
	1/8	.0150	.093	II	1-1/2	849008-C6	31.00
	1/8	.0200	.088	II	1-1/2	845808-C6	31.30
	1/8	.0250	.083	II	1-1/2	820908-C6	31.30
	3/16	.0050	.157	II	2	860012-C6	37.90
	3/16	.0100	.152	II	2	877312-C6	38.20
	3/16	.0150	.147	II	2	849012-C6	38.20
	1/4	.0050	.211	II	2-1/2	860016-C6	47.60
	1/4	.0075	.209	II	2-1/2	838116-C6	48.10
	1/4	.0100	.206	II	2-1/2	877316-C6	47.60
	1/4	.0150	.201	II	2-1/2	849016-C6	47.60
	1/4	.0200	.196	II	2-1/2	845816-C6	47.60
90°	1/8	.0050	.060	II	1-1/2	853108-C6	31.00
	1/8	.0075	.058	II	1-1/2	825908-C6	31.00
	1/8	.0100	.058	II	1-1/2	869408-C6	31.00
	1/8	.0150	.056	II	1-1/2	821108-C6	31.00
	1/8	.0200	.054	II	1-1/2	837108-C6	31.30
	1/8	.0250	.052	II	1-1/2	820808-C6	31.00
	3/16	.0050	.091	II	2	853112-C6	37.90
	3/16	.0100	.089	II	2	869412-C6	37.90
	1/4	.0050	.122	II	2-1/2	853116-C6	47.60
	1/4	.0100	.120	II	2-1/2	869416-C6	47.60
	1/4	.0200	.116	II	2-1/2	837116-C6	47.60
120°	1/8	.0050	.035	II	1-1/2	762908-C6	31.30
	1/8	.0100	.034	II	1-1/2	762408-C6	31.00

# ENGRAVING CUTTERS

## Tipped Off - 2 Flute - For Hardened Steels



- **Strong 2 flute design for engraving hardened steels 46-68Rc**
- Eccentric relief increases durability and tool life
- Tipped off end diameter and shallow flute design for improved cutting and strength
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Solid carbide
- CNC ground in the USA

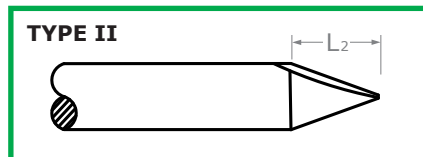
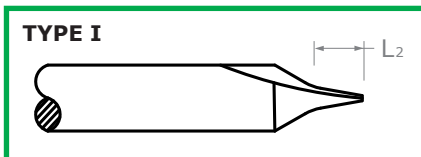


Stocked in **Seven** Included Angles!

ENGRAVING CUTTERS

INCLUDED ANGLE	DIAMETER	TIP FLAT	LENGTH OF CUT	TYPE	OVERALL LENGTH	AlTiN NANO COATED	
						2 FL	PRICE
A <sup>+0°30'</sup> <sub>-0°30'</sub>	D <sub>2</sub>	F	L <sub>2</sub>		L <sub>1</sub>		
20°	1/8	.005	.080	I	1-1/2	775008-C6	26.20
	1/8	.010	.080	I	1-1/2	892508-C6	26.20
	1/4	.010	.080	I	2-1/2	892516-C6	42.20
30°	1/8	.005	.223	II	1-1/2	896708-C6	24.90
	1/8	.008	.218	II	1-1/2	763908-C6	25.20
	1/8	.010	.214	II	1-1/2	882008-C6	24.90
	1/8	.015	.205	II	1-1/2	817908-C6	24.90
	1/8	.020	.195	II	1-1/2	879608-C6	24.90
	1/8	.030	.177	II	1-1/2	817608-C6	24.90
	3/16	.010	.331	II	2	882012-C6	30.20
40°	1/4	.010	.447	II	2-1/2	882016-C6	40.20
	1/8	.005	.164	I	1-1/2	811708-C6	26.50
	1/8	.010	.157	II	1-1/2	875108-C6	26.20
45°	1/4	.010	.329	II	2-1/2	875116-C6	42.20
	1/8	.005	.144	II	1-1/2	811608-C6	26.50
	1/8	.010	.138	II	1-1/2	811508-C6	26.50
60°	1/8	.005	.103	II	1-1/2	866708-C6	24.90
	1/8	.008	.101	II	1-1/2	762508-C6	25.20
	1/8	.010	.099	II	1-1/2	889608-C6	24.90
	1/8	.015	.095	II	1-1/2	868108-C6	24.90
	1/8	.020	.090	II	1-1/2	892308-C6	24.90
	1/8	.030	.082	II	1-1/2	817508-C6	24.90
	3/16	.005	.158	II	2	866712-C6	30.50
	3/16	.010	.153	II	2	889612-C6	30.50
	1/4	.005	.212	II	2-1/2	866716-C6	40.20
	1/4	.010	.207	II	2-1/2	889616-C6	40.20
	1/4	.020	.199	II	2-1/2	892316-C6	40.20
1/4	.030	.190	II	2-1/2	817516-C6	40.20	

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## ENGRAVING CUTTERS

### Tipped Off – 2 Flute – For Hardened Steels (cont.)

continued from previous page

INCLUDED ANGLE	DIAMETER	TIP FLAT	LENGTH OF CUT	TYPE	OVERALL LENGTH	AITIN NANO COATED	
						2 FL	PRICE
A $+0^{\circ}30'$ $-0^{\circ}30'$	D <sub>2</sub>	F	L <sub>2</sub>		L <sub>1</sub>		
90°	1/8	.005	.060	II	1-1/2	880908-C6	24.90
	1/8	.010	.057	II	1-1/2	876508-C6	24.90
	1/8	.015	.055	II	1-1/2	817708-C6	24.90
	1/8	.020	.052	II	1-1/2	868408-C6	24.90
	1/8	.030	.047	II	1-1/2	817408-C6	25.20
	3/16	.005	.091	II	2	880912-C6	30.50
	3/16	.010	.088	II	2	876512-C6	30.20
	1/4	.005	.122	II	2-1/2	880916-C6	40.50
	1/4	.010	.120	II	2-1/2	876516-C6	40.20
120°	1/8	.010	.033	II	1-1/2	865308-C6	24.90
	1/4	.010	.069	II	2-1/2	865316-C6	40.50

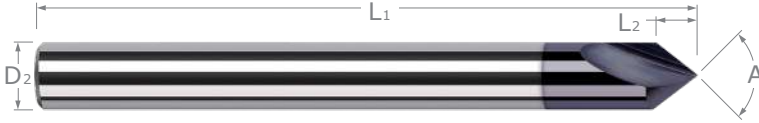


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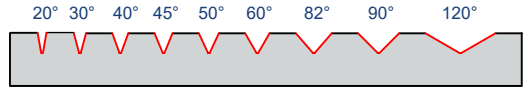
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# ENGRAVING CUTTERS

## Marking Cutters for Ferrous Materials



- Designed for milling legible part numbers in difficult-to-machine materials
- Burr-free, two flute cutting design has improved strength over single point engravers
- Produces flat in bottom of groove
- Eccentric relief improves durability over half-round style engravers
- Requires less RPM than half-round engravers
- Solid carbide
- CNC ground in the USA

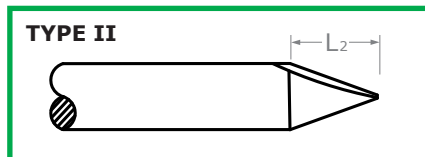
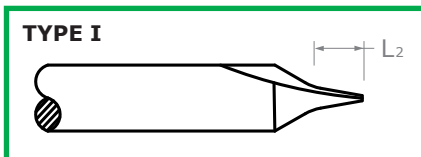


Stocked in *Nine* Included Angles!

INCLUDED ANGLE	DIAMETER	WEB THICKNESS	LENGTH OF CUT	TYPE	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
$A_{-1^{\circ}}^{+1^{\circ}}$	D <sub>2</sub>	W	L <sub>2</sub>		L <sub>1</sub>						
20°	1/8	.005	.171	I	1-1/2	744608	21.40	744608-C3	26.60		
	1/8	.010	.171	I	1-1/2	743308	21.40	743308-C3	26.60		
30°	1/8	.003	.228	II	1-1/2	923908	19.60	923908-C3	24.80		
	1/8	.005	.224	II	1-1/2	47708	19.60	47708-C3	24.80	47708-C4	32.70
	1/8	.010	.215	II	1-1/2	996108	19.60	996108-C3	24.80		
	1/8	.015	.205	II	1-1/2	954008	19.60	954008-C3	24.80		
	3/16	.003	.344	II	2	923912	24.40	923912-C3	30.00		
	3/16	.005	.341	II	2	47712	24.40	47712-C3	30.00		
	3/16	.010	.331	II	2	996112	24.40	996112-C3	30.00		
	1/4	.003	.461	II	2-1/2	923916	34.20	923916-C3	41.80		
	1/4	.005	.457	II	2-1/2	47716	34.20	47716-C3	41.80		
	1/4	.010	.448	II	2-1/2	996116	34.20	996116-C3	41.80		
40°	1/8	.005	.165	II	1-1/2	995508	21.20	995508-C3	26.40	995508-C4	34.30
	1/8	.010	.158	II	1-1/2	996708	21.20	996708-C3	26.40		
	3/16	.005	.251	II	2	995512	26.80	995512-C3	32.40		
	3/16	.010	.244	II	2	996712	26.80	996712-C3	32.40		
	1/4	.005	.337	II	2-1/2	995516	37.50	995516-C3	45.10		
	1/4	.010	.330	II	2-1/2	996716	37.90	996716-C3	45.50		
45°	1/8	.005	.145	II	1-1/2	987408	20.80	987408-C3	26.00		
	3/16	.005	.220	II	2	987412	26.80	987412-C3	32.40		
	1/4	.005	.296	II	2-1/2	987416	37.50	987416-C3	45.10		
50°	1/8	.005	.129	II	1-1/2	976608	21.20	976608-C3	26.40		
	3/16	.005	.196	II	2	976612	26.90	976612-C3	32.50		
	1/4	.005	.263	II	2-1/2	976616	37.40	976616-C3	45.00		

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ENGRAVING CUTTERS



## ENGRAVING CUTTERS

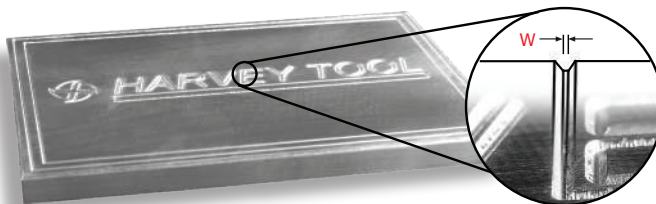
## Marking Cutters for Ferrous Materials (cont.)

continued from previous page

INCLUDED ANGLE	DIAMETER	WEB THICKNESS	LENGTH OF CUT	TYPE	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
60°	1/8	.003	.106	II	1-1/2	905708	19.60	905708-C3	24.80		
	1/8	.005	.104	II	1-1/2	29608	19.60	29608-C3	24.80	29608-C4	32.70
	1/8	.005	.104	II	3	LONG!	957808	24.00	957808-C3	29.20	
	1/8	.010	.100	II	1-1/2	48308	19.60	48308-C3	24.80	48308-C4	32.70
	1/8	.015	.095	II	1-1/2	948108	19.60	948108-C3	24.80		
	3/16	.003	.160	II	2	905712	24.40	905712-C3	30.00		
	3/16	.005	.158	II	2	29612	24.40	29612-C3	30.00	29612-C4	42.50
	3/16	.010	.154	II	2	48312	24.40	48312-C3	30.00		
60°	1/4	.003	.214	II	2-1/2	905716	34.20	905716-C3	41.80		
	1/4	.005	.212	II	2-1/2	29616	34.20	29616-C3	41.80	29616-C4	54.80
	1/4	.010	.208	II	2-1/2	48316	34.20	48316-C3	41.80		
	1/4	.015	.204	II	2-1/2	948116	34.20	948116-C3	41.80		
	3/8	.005	.320	II	2-1/2	29624	43.30	29624-C3	53.40		
82°	1/8	.005	.069	II	1-1/2	974108	21.20	974108-C3	26.40		
90°	1/8	.003	.061	II	1-1/2	914608	19.60	914608-C3	24.80		
	1/8	.005	.060	II	1-1/2	23608	19.60	23608-C3	24.80	23608-C4	32.70
	1/8	.005	.060	II	3	LONG!	968108	24.00	968108-C3	29.20	
	1/8	.010	.058	II	1-1/2	50408	19.60	50408-C3	24.80	50408-C4	32.70
	1/8	.015	.055	II	1-1/2	939708	19.60	939708-C3	24.80		
	3/16	.003	.092	II	2	914612	24.40	914612-C3	30.00		
	3/16	.005	.091	II	2	23612	24.40	23612-C3	30.00	23612-C4	42.50
	3/16	.010	.089	II	2	50412	24.40	50412-C3	30.00		
	3/16	.015	.086	II	2	939712	24.40	939712-C3	30.00		
	1/4	.003	.124	II	2-1/2	914616	34.20	914616-C3	41.80		
	1/4	.005	.123	II	2-1/2	23616	34.20	23616-C3	41.80	23616-C4	54.80
	1/4	.010	.120	II	2-1/2	50416	34.20	50416-C3	41.80		
	1/4	.015	.118	II	2-1/2	939716	34.20	939716-C3	41.80		
3/8	.005	.185	II	2-1/2	23600	43.30	23600-C3	53.40			
120°	1/8	.003	.035	II	1-1/2	844808	19.60	844808-C3	24.80		
	1/8	.005	.035	II	1-1/2	23708	19.60	23708-C3	24.80	23708-C4	32.70
	1/8	.010	.033	II	1-1/2	998808	20.00	998808-C3	25.20		
	3/16	.005	.053	II	2	23712	24.40	23712-C3	30.00		
	3/16	.010	.051	II	2	998812	24.40	998812-C3	30.00		
	1/4	.005	.071	II	2-1/2	23716	34.20	23716-C3	41.80		
1/4	.010	.069	II	2-1/2	998816	34.20	998816-C3	41.80			

ENGRAVING CUTTERS

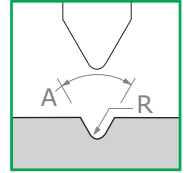
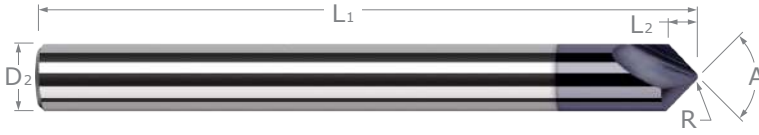
For Marking Cutters for Non-Ferrous Materials, please see page 341.



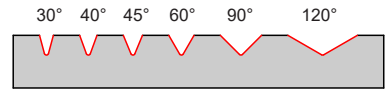
**Produces Flat  
in Bottom  
of Groove**

# ENGRAVING CUTTERS

## Marking Cutters – Tip Radius



- Designed for milling legible part numbers in difficult-to-machine materials
- Radiused tip design for improved strength
- 2 flute cutting design has improved strength over single point engravers
- Produces radius in bottom of groove
- Solid carbide • CNC ground in the USA



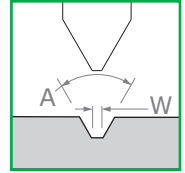
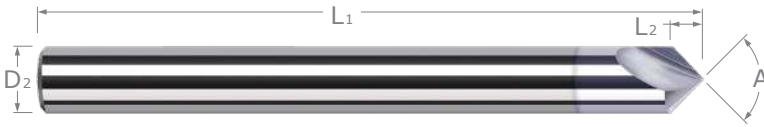
Stocked in **Six** Included Angles!

INCLUDED ANGLE	DIAMETER	RADIUS	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		A1TIN COATED		
					2 FL	PRICE	2 FL	PRICE	
A <sup>+1°</sup> <sub>-1°</sub>	D <sub>2</sub>	R	L <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	
30°	1/8	.0050	.218	1-1/2	987615	24.20	987615-C3	29.40	
	1/8	.0100	.204	1-1/2	961915	24.20	961915-C3	29.40	
	1/8	.0150	.190	1-1/2	981815	24.20	981815-C3	29.40	
	3/16	.0050	.335	2	958715	30.10	958715-C3	35.70	
	3/16	.0100	.321	2	947215	29.50	947215-C3	35.10	
	1/4	.0050	.452	2-1/2	966815	39.60	966815-C3	47.20	
40°	1/4	.0100	.437	2-1/2	954915	39.60	954915-C3	47.20	
	1/8	.0050	.162	1-1/2	987640	26.60	987640-C3	31.80	
40°	1/8	.0100	.152	1-1/2	961940	26.60	961940-C3	31.80	
	1/8	.0150	.142	1-1/2	981820	26.60	981820-C3	31.80	
	1/8	.0050	.143	1-1/2	987622	26.60	987622-C3	31.80	
45°	1/8	.0100	.135	1-1/2	961922	26.60	961922-C3	31.80	
	1/8	.0050	.103	1-1/2	987630	24.20	987630-C3	29.40	
60°	1/8	.0075	.100	1-1/2	926330	24.20	926330-C3	29.40	
	1/8	.0100	.098	1-1/2	961930	24.20	961930-C3	29.40	
	1/8	.0150	.093	1-1/2	981830	24.20	981830-C3	29.40	
	1/8	.0200	.088	1-1/2	918430	24.20	918430-C3	29.40	
	3/16	.0050	.157	2	958730	29.50	958730-C3	35.10	
	3/16	.0100	.152	2	947230	29.50	947230-C3	35.10	
	3/16	.0150	.147	2	914330	29.50	914330-C3	35.10	
	1/4	.0050	.211	2-1/2	966830	39.60	966830-C3	47.20	
	1/4	.0100	.206	2-1/2	954930	39.60	954930-C3	47.20	
	1/4	.0150	.201	2-1/2	909730	39.60	909730-C3	47.20	
	1/4	.0200	.197	2-1/2	831430	39.60	831430-C3	47.20	
	90°	1/8	.0050	.060	1-1/2	987645	24.20	987645-C3	29.40
		1/8	.0075	.059	1-1/2	926345	24.20	926345-C3	29.40
1/8		.0100	.058	1-1/2	961945	24.20	961945-C3	29.40	
1/8		.0150	.056	1-1/2	981845	24.20	981845-C3	29.40	
1/8		.0200	.054	1-1/2	918445	24.20	918445-C3	29.40	
3/16		.0050	.091	2	958745	29.50	958745-C3	35.10	
3/16		.0100	.089	2	947245	29.50	947245-C3	35.10	
3/16		.0150	.087	2	914345	29.50	914345-C3	35.10	
1/4		.0050	.122	2-1/2	966845	39.60	966845-C3	47.20	
1/4		.0075	.122	2-1/2	830745	40.30	830745-C3	47.90	
1/4		.0100	.120	2-1/2	954945	39.60	954945-C3	47.20	
1/4		.0150	.118	2-1/2	909745	39.60	909745-C3	47.20	
1/4		.0200	.117	2-1/2	831445	39.60	831445-C3	47.20	
120°	1/8	.0050	.035	1-1/2	987660	24.20	987660-C3	29.40	
	1/8	.0100	.034	1-1/2	961960	24.60	961960-C3	29.80	

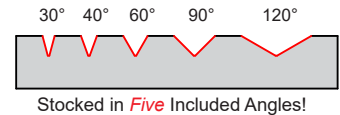
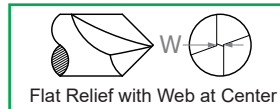
ENGRAVING CUTTERS

# ENGRAVING CUTTERS

## Marking Cutters for Non-Ferrous Materials



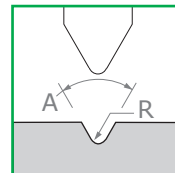
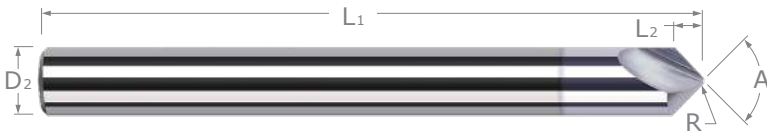
- **Designed for milling legible part numbers in non-ferrous and easy-to-machine materials**
- 2 flute cutting design has improved strength over single point engravers
- Flat relief design for improved results in aluminum and other non-ferrous applications
- Produces flat in bottom of groove
- Solid carbide
- CNC ground in the USA



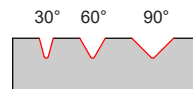
INCLUDED ANGLE	DIAMETER	WEB THICKNESS	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
					2 FL	PRICE	2 FL	PRICE
A <sup>+1°</sup> <sub>-1°</sub>	D <sub>2</sub>	W	L <sub>2</sub>	L <sub>1</sub>				
30°	1/8	.005	.230	1-1/2	993215	19.60	993215-C8	27.20
	1/8	.010	.228	1-1/2	963215	19.60	963215-C8	27.20
	1/8	.015	.225	1-1/2	902915	19.60	902915-C8	27.20
	3/16	.005	.347	2	987815	24.40	987815-C8	32.00
	1/4	.005	.461	2-1/2	967415	34.20	967415-C8	42.40
40°	1/8	.005	.170	1-1/2	993220	21.20	993220-C8	28.80
	1/8	.010	.168	1-1/2	963220	21.20	963220-C8	28.80
	3/16	.005	.255	2	987820	24.90	987820-C8	32.50
	1/4	.005	.339	2-1/2	967420	34.60	967420-C8	42.80
	60°	1/8	.005	.107	1-1/2	993230	19.60	993230-C8
1/8		.010	.106	1-1/2	963230	19.60	963230-C8	27.20
1/8		.015	.104	1-1/2	902930	19.60	902930-C8	27.20
3/16		.005	.161	2	987830	24.40	987830-C8	32.00
3/16		.010	.160	2	921230	24.40	921230-C8	32.00
1/4		.005	.215	2-1/2	967430	34.20	967430-C8	42.40
1/4		.010	.214	2-1/2	918630	34.20	918630-C8	42.40
90°	1/8	.005	.062	1-1/2	993245	19.60	993245-C8	27.20
	1/8	.010	.061	1-1/2	963245	19.60	963245-C8	27.20
	1/8	.015	.060	1-1/2	902945	19.60	902945-C8	27.20
	3/16	.005	.093	2	987845	24.40	987845-C8	32.00
	3/16	.010	.092	2	921245	24.90	921245-C8	32.50
	1/4	.005	.124	2-1/2	967445	34.20	967445-C8	42.40
	1/4	.010	.123	2-1/2	918645	34.20	918645-C8	42.40
120°	1/8	.005	.036	1-1/2	993260	19.60	993260-C8	27.20
	1/8	.010	.035	1-1/2	963260	20.00	963260-C8	27.60

# ENGRAVING CUTTERS

## Marking Cutters – Tip Radius for Non-Ferrous Materials



- Designed for milling legible part numbers in non-ferrous and easy-to-machine materials
- Radiused tip design for improved strength
- Flat relief design for improved results
- Solid carbide
- CNC ground in the USA



Stocked in *Three* Included Angles!

INCLUDED ANGLE	DIAMETER	RADIUS	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
					2 FL	PRICE	2 FL	PRICE
30°	1/8	.005	.219	1-1/2	847115	24.20	847115-C8	31.80
	1/8	.010	.205	1-1/2	854415	24.20	854415-C8	31.80
	1/8	.015	.190	1-1/2	738115	24.20	738115-C8	31.80
	1/4	.005	.452	2-1/2	774915	36.20	774915-C8	44.40
60°	1/8	.005	.103	1-1/2	847130	24.20	847130-C8	31.80
	1/8	.010	.098	1-1/2	854430	24.20	854430-C8	31.80
	1/8	.015	.093	1-1/2	738130	24.20	738130-C8	31.80
	1/4	.005	.212	2-1/2	774930	35.30	774930-C8	43.50
90°	1/8	.005	.060	1-1/2	847145	24.20	847145-C8	31.80
	1/8	.010	.058	1-1/2	854445	24.20	854445-C8	31.80
	1/8	.015	.056	1-1/2	738145	24.20	738145-C8	31.80
	1/4	.005	.123	2-1/2	774945	35.30	774945-C8	43.50

ENGRAVING CUTTERS



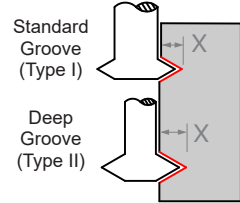
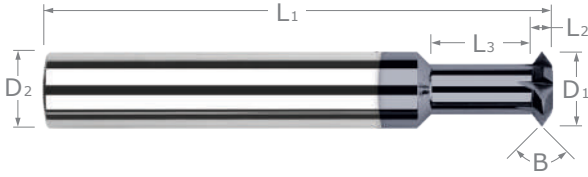
### Main Differences Between Engravers vs. Marking Cutters

Although similar in look, Engravers and Marking Cutters serve different purposes. Do you need assistance deciding between the two? We can help! Our "In the Loupe" blog post **Main Differences Between Engravers & Marking Cutters** helps you decide which tooling option is best for you.

[Read more on harveypformance.com/in-the-loupe/](http://harveypformance.com/in-the-loupe/)

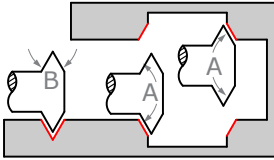
# DOUBLE ANGLE SHANK CUTTERS

Pointed



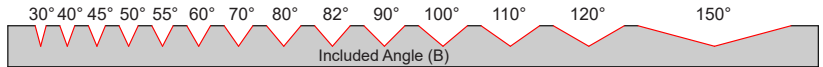
- Ideal for back chamfering, chamfering, deburring, and milling a "V-groove"
- Reduced neck for long reach machining • Tip of included angle ground to a point
- 60° angle can also be used for thread milling • Solid carbide • CNC ground in the USA

Great for Chamfering and Deburring



### Included Angle Conversion

$A = 180 - B$	150°	140°	135°	130°	125°	120°	110°	100°	98°	90°	80°	70°	60°	30°
$B = 180 - A$	30°	40°	45°	50°	55°	60°	70°	80°	82°	90°	100°	110°	120°	150°



Stocked in **Fourteen** Included Angles!

INCL. ANGLE	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AITIN NANO COATED	
									TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
$B \pm 1^\circ$	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2$		$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$						
30°	1/16	.008	1/32	<b>.093</b>	I	2	1/8	1-1/2	66062	52.50	66062-C3	57.70		
	5/64	.010	.039	<b>.118</b>	I	2	1/8	1-1/2	66078	52.50	66078-C3	57.70		
	3/32	.012	3/64	<b>.141</b>	I	2	1/8	1-1/2	66093	52.50	66093-C3	57.70		
	1/8	.017	1/16	<b>.187</b>	I	4	1/8	1-1/2	66108	51.20	66108-C3	56.40		
	1/8	.017	1/16	<b>.500</b>	I	4	1/8	1-1/2	934308	52.50	934308-C3	57.70		
	3/16	.025	3/32	<b>.312</b>	I	4	3/16	2	66112	53.10	66112-C3	58.70		
	1/4	.033	1/8	<b>.312</b>	I	4	1/4	2	66116	67.40	66116-C3	75.00		
	1/4	.033	1/8	<b>.625</b>	I	4	1/4	2	921716	79.50	921716-C3	87.10		
	3/8	.033	1/4	<b>.500</b>	I	6	3/8	2-1/2	66105	90.50	66105-C3	100.60		
	3/8	.033	1/4	<b>1.500</b>	I	6	3/8	3-1/2	934324	105.60	934324-C3	115.70		
1/2	.050	5/16	<b>.500</b>	I	6	1/2	3	66110	122.30	66110-C3	137.40			
1/2	.050	5/16	<b>1.500</b>	I	6	1/2	4	934332	156.00	934332-C3	171.10			
40°	1/4	.045	1/8	<b>.312</b>	I	4	1/4	2	29720	67.90	29720-C3	75.50		
	1/4	.045	1/8	<b>.625</b>	I	4	1/4	2	918116	80.50	918116-C3	88.10		
	3/8	.045	1/4	<b>.500</b>	I	6	3/8	2-1/2	909924	87.50	909924-C3	97.60		
	3/8	.045	1/4	<b>1.500</b>	I	6	3/8	3-1/2	967505	108.70	967505-C3	118.80		
	1/2	.068	5/16	<b>.500</b>	I	6	1/2	3	909932	117.00	909932-C3	132.10		
	1/2	.068	5/16	<b>1.500</b>	I	6	1/2	4	967510	152.10	967510-C3	167.20		
45°	1/8	.026	1/16	<b>.187</b>	I	4	1/8	1-1/2	905608	52.50	905608-C3	57.70		
	3/16	.039	3/32	<b>.312</b>	I	4	3/16	2	905612	53.10	905612-C3	58.70		
	1/4	.052	1/8	<b>.312</b>	I	4	1/4	2	29723	67.40	29723-C3	75.00		
	1/4	.052	1/8	<b>.625</b>	I	4	1/4	2	917016	79.50	917016-C3	87.10		
	1/4	.052	1/8	<b>1.000</b>	I	4	1/4	3	984903	82.60	984903-C3	90.20		
	3/8	.052	1/4	<b>.500</b>	I	6	3/8	2-1/2	905624	85.40	905624-C3	95.50		
	3/8	.052	1/4	<b>1.000</b>	I	6	3/8	2-1/2	917024	97.40	917024-C3	107.50		
	3/8	.052	1/4	<b>1.500</b>	I	6	3/8	3-1/2	984905	106.10	984905-C3	116.20		
	1/2	.078	5/16	<b>.500</b>	I	6	1/2	3	905632	116.40	905632-C3	131.50		
1/2	.078	5/16	<b>1.500</b>	I	6	1/2	4	984910	151.40	984910-C3	166.50			

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DOUBLE ANGLE SHANK CUTTERS

# DOUBLE ANGLE SHANK CUTTERS

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INCL. ANGLE	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AITIN NANO COATED	
									TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
50°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>			D <sub>2</sub>	L <sub>1</sub>						
	1/8	.029	1/16	<b>.187</b>	I	4	1/8	1-1/2	985801	51.70	985801-C3	56.90		
	1/8	.029	1/16	<b>.500</b>	I	4	1/8	1-1/2	974401	61.70	974401-C3	66.90		
	3/16	.044	3/32	<b>.312</b>	I	4	3/16	2	985802	54.10	985802-C3	59.70		
	3/16	.044	3/32	<b>.750</b>	I	4	3/16	2-1/2	974402	62.90	974402-C3	68.50		
	1/4	.058	1/8	<b>.312</b>	I	4	1/4	2	29725	71.70	29725-C3	79.30		
	1/4	.058	1/8	<b>1.000</b>	I	4	1/4	3	974403	84.60	974403-C3	92.20		
	3/8	.058	1/4	<b>.500</b>	I	6	3/8	2-1/2	985805	89.90	985805-C3	100.00		
	3/8	.058	1/4	<b>1.500</b>	I	6	3/8	3-1/2	974405	110.30	974405-C3	120.40		
55°	1/2	.088	5/16	<b>.500</b>	I	6	1/2	3	985810	122.60	985810-C3	137.70		
	1/2	.088	5/16	<b>1.500</b>	I	6	1/2	4	974410	154.30	974410-C3	169.40		
60°	1/4	.065	1/8	<b>.312</b>	I	4	1/4	2	29728	72.10	29728-C3	79.70		
	1/16	.018	1/32	<b>.093</b>	I	2	1/8	1-1/2	47362	50.90	47362-C3	56.10		
	1/16	.018	1/32	<b>.156</b>	I	2	1/8	1-1/2	965562	50.90	965562-C3	56.10		
	5/64	.023	.039	<b>.118</b>	I	2	1/8	1-1/2	47378	50.90	47378-C3	56.10		
	3/32	.027	3/64	<b>.141</b>	I	2	1/8	1-1/2	47393	50.90	47393-C3	56.10		
	3/32	.027	3/64	<b>.250</b>	I	2	1/8	1-1/2	965593	50.90	965593-C3	56.10		
	1/8	.036	1/16	<b>.125</b>	I	4	1/8	1-1/2	937501	47.00	937501-C3	52.20		
	1/8	.036	1/16	<b>.187</b>	I	4	1/8	1-1/2	16201	47.00	16201-C3	52.20		
	1/8	.036	1/16	<b>.312</b>	I	4	1/8	1-1/2	984401	52.80	984401-C3	58.00		
	1/8	.036	1/16	<b>.500</b>	I	4	1/8	2	27501	57.50	27501-C3	62.70		
	1/8	.036	1/16	<b>.875</b>	I	4	1/8	2	981001	62.80	981001-C3	68.00		
	5/32	.045	5/64	<b>.250</b>	I	4	3/16	2	16256	50.90	16256-C3	56.50		
	5/32	.045	5/64	<b>.625</b>	I	4	3/16	2-1/2	27556	57.50	27556-C3	63.10		
	3/16	.055	3/32	<b>.187</b>	I	4	3/16	2	937502	50.00	937502-C3	55.60		
	3/16	.055	3/32	<b>.312</b>	I	4	3/16	2	16202	50.00	16202-C3	55.60		
	3/16	.055	3/32	<b>.500</b>	I	4	3/16	2	984402	57.90	984402-C3	63.50		
	3/16	.055	3/32	<b>.750</b>	I	4	3/16	2-1/2	27502	61.50	27502-C3	67.10		
	3/16	.055	3/32	<b>1.000</b>	I	4	3/16	2-1/2	925502	64.30	925502-C3	69.90		
	1/4	.072	1/8	<b>.187</b>	I	4	1/4	2	937503	67.40	937503-C3	75.00		
	1/4	.072	1/8	<b>.312</b>	I	4	1/4	2	16203	67.40	16203-C3	75.00		
	1/4	.072	1/8	<b>.312</b>	I	6	1/4	2	808016	72.30	808016-C3	79.90		
	1/4	.072	1/8	<b>.625</b>	I	4	1/4	2-1/2	984403	75.70	984403-C3	83.30		
	1/4	.072	1/8	<b>1.000</b>	I	4	1/4	3	27503	80.80	27503-C3	88.40		
	1/4	.072	1/8	<b>1.312</b>	I	4	1/4	3	925503	81.20	925503-C3	88.80		
	1/4	.072	1/8	<b>1.750</b>	I	4	1/4	3	981003	82.30	981003-C3	89.90		
	5/16	.072	3/16	<b>.375</b>	I	6	5/16	2-1/2	16272	81.80	16272-C3	90.70		
	5/16	.072	3/16	<b>.875</b>	I	6	5/16	2-1/2	984472	84.20	984472-C3	93.10		
	3/8	.072	1/4	<b>.312</b>	I	6	3/8	2-1/2	937505	86.10	937505-C3	96.20		
	3/8	.072	1/4	<b>.500</b>	I	6	3/8	2-1/2	16205	86.10	16205-C3	96.20		
	3/8	.072	1/4	<b>.750</b>	I	6	3/8	2-1/2	773305	91.50	773305-C3	101.60		
	3/8	.072	1/4	<b>1.000</b>	I	6	3/8	2-1/2	984405	97.00	984405-C3	107.10		
	3/8	.072	1/4	<b>1.500</b>	I	6	3/8	3-1/2	27505	107.80	27505-C3	117.90		
	3/8	.072	1/4	<b>2.000</b>	I	6	3/8	3-1/2	925505	112.90	925505-C3	123.00		
1/2	.109	5/16	<b>.500</b>	I	6	1/2	3	16210	117.90	16210-C3	133.00			
1/2	.109	5/16	<b>.750</b>	I	6	1/2	3	773310	122.50	773310-C3	137.60			
1/2	.109	5/16	<b>1.000</b>	I	6	1/2	3	984410	128.40	984410-C3	143.50			
1/2	.109	5/16	<b>1.250</b>	I	6	1/2	3-1/2	762310	139.30	762310-C3	154.40			
1/2	.109	5/16	<b>1.500</b>	I	6	1/2	4	27510	150.20	27510-C3	165.30			
1/2	.109	5/16	<b>2.000</b>	I	6	1/2	4	925510	154.10	925510-C3	169.20			
1/2	.109	5/16	<b>2.625</b>	I	6	1/2	4	981010	158.10	981010-C3	173.20			
5/8	.144	3/8	<b>.750</b>	I	6	5/8	3-1/2	16215	212.20	16215-C3	227.30			

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DOUBLE ANGLE SHANK CUTTERS



# DOUBLE ANGLE SHANK CUTTERS

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INCL. ANGLE	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AITIN NANO COATED	
									TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
70°	1/4	.088	1/8	.312	I	4	1/4	2	871903	72.10	871903-C3	79.70		
	3/8	.088	1/4	1.500	I	6	3/8	3-1/2	791005	113.80	791005-C3	123.90		
80°	1/4	.105	1/8	.312	I	4	1/4	2	29740	72.10	29740-C3	79.70		
	3/8	.105	1/4	1.500	I	6	3/8	3-1/2	792005	116.00	792005-C3	126.10		
82°	1/4	.109	1/8	.312	I	4	1/4	2	29741	72.10	29741-C3	79.70		
	3/8	.109	1/4	1.500	I	6	3/8	3-1/2	920805	116.00	920805-C3	126.10		
	1/2	.163	5/16	1.500	I	6	1/2	4	920810	158.60	920810-C3	173.70		
	1/32	.015	.016	.062	I	2	1/8	1-1/2	807002	46.70	807002-C3	51.90		
	1/32	.015	.016	.093	I	2	1/8	1-1/2	45131	45.80	45131-C3	51.00		
	1/32	.015	.016	.125	I	2	1/8	1-1/2	71604	46.70	71604-C3	51.90		
	1/16	.031	1/32	.062	I	2	1/8	1-1/2	946862	45.80	946862-C3	51.00		
	1/16	.031	1/32	.093	I	2	1/8	1-1/2	19162	45.80	19162-C3	51.00		
	1/16	.031	1/32	.093	I	4	1/8	1-1/2	838804	45.80	838804-C3	51.00		
	1/16	.031	1/32	.125	I	2	1/8	1-1/2	807662	45.80	807662-C3	51.00		
	1/16	.031	1/32	.156	I	2	1/8	1-1/2	45162	50.90	45162-C3	56.10		
	1/16	.031	1/32	.156	I	4	1/8	1-1/2	832404	53.50	832404-C3	58.70		
	1/16	.031	1/32	.187	I	2	1/8	1-1/2	822104	55.80	822104-C3	61.00		
	1/16	.031	1/32	.250	I	2	1/8	1-1/2	71662	55.80	71662-C3	61.00		
	1/16	.031	1/32	.250	I	4	1/8	1-1/2	792962	56.90	792962-C3	62.10		
	1/16	.031	1/32	.312	I	2	1/8	1-1/2	857862	55.80	857862-C3	61.00		
	1/16	.031	1/32	.375	I	2	1/8	1-1/2	963662	55.80	963662-C3	61.00		
	1/16	.031	1/32	.437	I	2	1/8	1-1/2	855762	56.90	855762-C3	62.10		
	5/64	.039	.039	.078	I	2	1/8	1-1/2	946878	45.80	946878-C3	51.00		
	5/64	.039	.039	.093	I	2	1/8	1-1/2	807105	45.80	807105-C3	51.00		
	5/64	.039	.039	.118	I	2	1/8	1-1/2	19178	45.80	19178-C3	51.00		
	5/64	.039	.039	.125	I	2	1/8	1-1/2	807005	45.80	807005-C3	51.00		
	5/64	.039	.039	.187	I	2	1/8	1-1/2	45178	50.90	45178-C3	56.10		
	5/64	.039	.039	.187	I	4	1/8	1-1/2	832405	53.50	832405-C3	58.70		
	5/64	.039	.039	.250	I	2	1/8	1-1/2	822178	53.50	822178-C3	63.40		
	5/64	.039	.039	.312	I	2	1/8	1-1/2	71678	55.80	71678-C3	61.00		
	5/64	.039	.039	.312	I	4	1/8	1-1/2	792978	56.90	792978-C3	62.10		
	5/64	.039	.039	.375	I	2	1/8	1-1/2	771978	56.90	771978-C3	62.10		
	5/64	.039	.039	.500	I	2	1/8	1-1/2	963678	55.80	963678-C3	61.00		
	3/32	.047	3/64	.093	I	2	1/8	1-1/2	946893	45.80	946893-C3	51.00		
	3/32	.047	3/64	.125	I	2	1/8	1-1/2	807106	45.80	807106-C3	51.00		
	3/32	.047	3/64	.141	I	2	1/8	1-1/2	19193	45.80	19193-C3	51.00		
	3/32	.047	3/64	.141	I	4	1/8	1-1/2	838806	45.80	838806-C3	51.00		
	3/32	.047	3/64	.187	I	2	1/8	1-1/2	807693	45.80	807693-C3	51.00		
	3/32	.047	3/64	.250	I	2	1/8	1-1/2	45193	50.90	45193-C3	56.10		
	3/32	.047	3/64	.250	I	4	1/8	1-1/2	832406	53.50	832406-C3	58.70		
	3/32	.047	3/64	.312	I	2	1/8	1-1/2	807493	55.80	807493-C3	61.00		
	3/32	.047	3/64	.375	I	2	1/8	1-1/2	71693	55.80	71693-C3	61.00		
	3/32	.047	3/64	.375	I	4	1/8	1-1/2	792906	55.80	792906-C3	61.00		
	3/32	.047	3/64	.500	I	2	1/8	1-1/2	857893	55.80	857893-C3	61.00		
	3/32	.047	3/64	.625	I	2	1/8	2	963693	57.90	963693-C3	63.10		
	3/32	.047	3/64	.750	I	2	1/8	2	855793	60.30	855793-C3	65.50		
	3 mm	.059	.059	.187	I	2	1/8	1-1/2	1913M	46.50	1913M-C3	51.70		
	3 mm	.059	.059	.250	I	2	1/8	1-1/2	80763M	54.50	80763M-C3	59.70		
	3 mm	.059	.059	.312	I	2	1/8	1-1/2	4513M	53.50	4513M-C3	58.70		

DOUBLE ANGLE SHANK CUTTERS

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# DOUBLE ANGLE SHANK CUTTERS

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INCL. ANGLE	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	TYPE	FLUTES	SHANK DIA.		OAL		UNCOATED		AITIN COATED		AITIN NANO COATED	
							D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE		
90°	B <sup>+1°</sup> / <sub>-1°</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub>	L <sub>3</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>			D <sub>2</sub>	L <sub>1</sub>								
	1/8	.062	1/16	.125	I	4	1/8	1-1/2	946901	45.80	946901-C3	51.00				
	1/8	.062	1/16	.125	I	6	1/8	1-1/2	791908	45.80	791908-C3	51.00				
	1/8	.062	1/16	.187	I	4	1/8	1-1/2	19201	45.80	19201-C3	51.00	19201-C6	53.40		
	1/8	.083	.042	.187	II	4	1/8	1-1/2	759908	50.80	759908-C3	56.00				
	1/8	.062	1/16	.187	I	6	1/8	1-1/2	838808	48.00	838808-C3	53.20	838808-C6	55.60		
	1/8	.062	1/16	.250	I	4	1/8	1-1/2	807308	48.60	807308-C3	53.80				
	1/8	.062	1/16	.312	I	4	1/8	1-1/2	72601	51.40	72601-C3	56.60				
	1/8	.062	1/16	.312	I	6	1/8	1-1/2	847408	54.00	847408-C3	59.20				
	1/8	.062	1/16	.375	I	4	1/8	1-1/2	806908	51.40	806908-C3	56.60				
	1/8	.062	1/16	.500	I	4	1/8	2	19501	59.40	19501-C3	64.60				
	1/8	.062	1/16	.500	I	6	1/8	2	807908	62.00	807908-C3	67.20				
	1/8	.062	1/16	.625	I	4	1/8	2	71701	61.50	71701-C3	66.70				
	1/8	.062	1/16	.750	I	4	1/8	2	821808	63.00	821808-C3	68.20				
	1/8	.062	1/16	.875	I	4	1/8	2	26801	64.70	26801-C3	69.90				
	1/8	.062	1/16	1.000	I	4	1/8	2	772301	67.80	772301-C3	73.00				
	1/8	.062	1/16	1.125	I	4	1/8	2-1/2	963701	71.10	963701-C3	76.30				
	5/32	.078	5/64	.125	I	4	3/16	2	771056	46.30	771056-C3	51.90				
	5/32	.078	5/64	.156	I	4	3/16	2	946956	46.30	946956-C3	51.90				
	5/32	.078	5/64	.250	I	4	3/16	2	19256	48.70	19256-C3	54.30				
	5/32	.078	5/64	.250	I	6	3/16	2	838810	50.20	838810-C3	55.80				
	5/32	.078	5/64	.375	I	4	3/16	2	807310	52.20	807310-C3	57.80				
	5/32	.078	5/64	.437	I	4	3/16	2	72656	55.80	72656-C3	61.40				
	5/32	.078	5/64	.500	I	4	3/16	2	807210	55.80	807210-C3	61.40				
	5/32	.078	5/64	.625	I	4	3/16	2-1/2	19556	60.10	19556-C3	65.70				
	5/32	.078	5/64	.875	I	4	3/16	2-1/2	71756	64.80	71756-C3	70.40				
	5/32	.078	5/64	1.125	I	4	3/16	2-1/2	26856	67.10	26856-C3	72.70				
	3/16	.095	3/32	.156	I	4	3/16	2	771002	46.90	771002-C3	52.50				
	3/16	.095	3/32	.187	I	4	3/16	2	946902	46.90	946902-C3	52.50				
	3/16	.095	3/32	.187	I	6	3/16	2	807812	49.40	807812-C3	55.00				
	3/16	.095	3/32	.250	I	4	3/16	2	807112	47.70	807112-C3	53.30				
	3/16	.095	3/32	.312	I	4	3/16	2	19202	47.70	19202-C3	53.30	19202-C6	55.90		
	3/16	.125	1/16	.312	II	4	3/16	2	759912	54.50	759912-C3	60.10				
	3/16	.095	3/32	.312	I	6	3/16	2	838812	50.30	838812-C3	55.90	838812-C6	58.50		
	3/16	.095	3/32	.375	I	4	3/16	2	807312	52.20	807312-C3	57.80				
	3/16	.095	3/32	.500	I	4	3/16	2	72602	56.80	72602-C3	62.40				
	3/16	.095	3/32	.500	I	6	3/16	2	847412	59.50	847412-C3	65.10				
	3/16	.095	3/32	.625	I	4	3/16	2	807212	60.30	807212-C3	65.90				
	3/16	.095	3/32	.750	I	4	3/16	2-1/2	19502	60.30	19502-C3	65.90				
	3/16	.095	3/32	.750	I	6	3/16	2-1/2	822612	61.70	822612-C3	67.30				
	3/16	.095	3/32	1.000	I	4	3/16	2-1/2	71702	65.90	71702-C3	71.50				
	3/16	.095	3/32	1.000	I	6	3/16	2-1/2	755912	72.50	755912-C3	78.10				
	3/16	.095	3/32	1.312	I	4	3/16	2-1/2	26802	67.40	26802-C3	73.00				
	3/16	.095	3/32	1.625	I	4	3/16	3	963702	74.90	963702-C3	80.50				
	6 mm	.118	.118	.312	I	4	1/4	2	19262	74.60	19262-C3	82.20				
6 mm	.118	.118	.625	I	4	1/4	2	72662	77.10	72662-C3	84.70					
6 mm	.118	.118	1.000	I	4	1/4	2-1/2	19562	79.60	19562-C3	87.20					
1/4	.125	1/8	.187	I	4	1/4	2	946903	57.50	946903-C3	65.10					
1/4	.125	1/8	.250	I	4	1/4	2	807116	58.50	807116-C3	66.10					
1/4	.125	1/8	.312	I	4	1/4	2	19203	58.50	19203-C3	66.10	19203-C6	69.70			
1/4	.167	.083	.312	II	4	1/4	2	759916	60.70	759916-C3	68.30					
1/4	.125	1/8	.312	I	6	1/4	2	838816	61.50	838816-C3	69.10	838816-C6	72.70			
1/4	.125	1/8	.375	I	4	1/4	2-1/2	807016	64.70	807016-C3	72.30					

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INCL. ANGLE	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AITIN NANO COATED	
									TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
90°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>			D <sub>2</sub>	L <sub>1</sub>						
	1/4	.125	1/8	.500	I	4	1/4	2	807316	59.20	807316-C3	66.80		
	1/4	.125	1/8	.625	I	4	1/4	2-1/2	72603	65.00	72603-C3	72.60		
	1/4	.125	1/8	.625	I	6	1/4	2-1/2	847416	68.30	847416-C3	75.90		
	1/4	.125	1/8	.750	I	4	1/4	2-1/2	807216	65.00	807216-C3	72.60		
	1/4	.125	1/8	1.000	I	4	1/4	3	19503	71.10	19503-C3	78.70		
	1/4	.125	1/8	1.000	I	6	1/4	3	822616	74.40	822616-C3	79.50		
	1/4	.125	1/8	1.250	I	4	1/4	3	822216	76.00	822216-C3	83.60		
	1/4	.125	1/8	1.312	I	4	1/4	3	71703	76.00	71703-C3	83.60		
	1/4	.125	1/8	1.500	I	4	1/4	3	821816	78.30	821816-C3	85.90		
	1/4	.125	1/8	1.750	I	4	1/4	3	26803	78.30	26803-C3	85.90		
	1/4	.125	1/8	2.125	I	4	1/4	4	963703	84.70	963703-C3	93.60		
	5/16	.125	3/16	.250	I	6	5/16	2-1/2	946904	79.20	946904-C3	88.10		
	5/16	.125	3/16	.375	I	6	5/16	2-1/2	19272	81.80	19272-C3	90.70		
	5/16	.125	3/16	.375	I	8	5/16	2-1/2	838820	90.50	838820-C3	99.40		
	5/16	.125	3/16	.625	I	6	5/16	2-1/2	833572	82.90	833572-C3	91.80		
	5/16	.125	3/16	.625	I	8	5/16	2-1/2	754920	89.60	754920-C3	98.50		
	5/16	.125	3/16	.875	I	6	5/16	2-1/2	72672	82.90	72672-C3	91.80		
	5/16	.125	3/16	.875	I	8	5/16	2-1/2	847420	91.30	847420-C3	100.20		
	5/16	.125	3/16	1.000	I	6	5/16	3	807220	88.80	807220-C3	97.70		
	5/16	.125	3/16	1.250	I	6	5/16	3	19572	88.80	19572-C3	97.70		
	5/16	.125	3/16	1.250	I	8	5/16	3	822620	93.00	822620-C3	101.90		
	5/16	.125	3/16	1.500	I	6	5/16	3	772873	90.30	772873-C3	99.20		
	5/16	.125	3/16	1.625	I	6	5/16	3	71772	92.20	71772-C3	101.10		
	5/16	.125	3/16	2.125	I	6	5/16	3	26872	95.50	26872-C3	104.40		
	3/8	.125	1/4	.312	I	6	3/8	2-1/2	946905	79.50	946905-C3	89.60		
	3/8	.125	1/4	.375	I	6	3/8	2-1/2	807124	82.10	807124-C3	92.20		
	3/8	.125	1/4	.500	I	6	3/8	2-1/2	19205	83.60	19205-C3	92.20	19205-C6	96.20
	3/8	.250	1/8	.500	II	6	3/8	2-1/2	759924	90.80	759924-C3	100.90		
	3/8	.125	1/4	.500	I	8	3/8	2-1/2	838824	87.80	838824-C3	97.90	838824-C6	100.40
	3/8	.125	1/4	.750	I	6	3/8	2-1/2	807324	88.40	807324-C3	98.50		
	3/8	.125	1/4	1.000	I	6	3/8	2-1/2	72605	93.00	72605-C3	103.10		
	3/8	.125	1/4	1.000	I	8	3/8	2-1/2	847424	102.70	847424-C3	112.80		
	3/8	.125	1/4	1.250	I	6	3/8	3	807224	104.00	807224-C3	114.10		
	3/8	.125	1/4	1.500	I	6	3/8	3-1/2	19505	105.20	19505-C3	115.30		
	3/8	.125	1/4	1.500	I	8	3/8	3-1/2	822624	109.40	822624-C3	114.40		
	3/8	.125	1/4	1.750	I	6	3/8	3-1/2	822224	110.30	822224-C3	120.40		
	3/8	.125	1/4	2.000	I	6	3/8	3-1/2	71705	110.30	71705-C3	120.40		
	3/8	.125	1/4	2.312	I	6	3/8	3-1/2	26805	113.20	26805-C3	123.30		
	3/8	.125	1/4	2.625	I	6	3/8	4	963705	119.90	963705-C3	133.70		
.393	.133	.260	.500	I	6	7/16	2-3/4	19279	125.80	19279-C3	138.40			
.393	.133	.260	1.500	I	6	7/16	3-1/2	19579	145.70	19579-C3	160.80			
7/16	.157	9/32	.500	I	6	7/16	2-3/4	19208	123.40	19208-C3	136.00			
7/16	.157	9/32	1.500	I	6	7/16	3-1/2	19508	143.00	19508-C3	158.10			
1/2	.187	5/16	.312	I	6	1/2	3	946910	108.20	946910-C3	123.30			
1/2	.187	5/16	.500	I	6	1/2	3	19210	111.80	19210-C3	126.90	19210-C6	128.10	
1/2	.187	5/16	.500	I	8	1/2	3	838832	117.30	838832-C3	132.40	838832-C6	133.60	
1/2	.187	5/16	.750	I	6	1/2	3	807332	114.90	807332-C3	130.00			
1/2	.187	5/16	1.000	I	6	1/2	3	72610	121.80	72610-C3	136.90			
1/2	.187	5/16	1.000	I	8	1/2	3	847432	123.80	847432-C3	138.90			
1/2	.187	5/16	1.250	I	6	1/2	3-1/2	822432	124.90	822432-C3	133.50			

DOUBLE ANGLE SHANK CUTTERS

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# DOUBLE ANGLE SHANK CUTTERS

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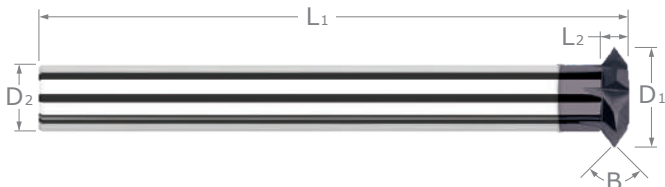
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INCL. ANGLE	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AITIN NANO COATED		
									TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
B $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.000^{\circ}$ $-0.002^{\circ}$	L <sub>2</sub>		L <sub>3</sub> $+0.020^{\circ}$ $-0.000^{\circ}$			D <sub>2</sub>	L <sub>1</sub>							
90°	1/2	.187	5/16	<b>1.500</b>	I	6	1/2	4	19510	143.00	19510-C3	158.10			
	1/2	.187	5/16	<b>1.500</b>	I	8	1/2	4	807932	148.60	807932-C3	163.70			
	1/2	.187	5/16	<b>1.750</b>	I	6	1/2	4	822232	145.70	822232-C3	160.80			
	1/2	.187	5/16	<b>2.000</b>	I	6	1/2	4	71710	148.00	71710-C3	163.10			
	1/2	.187	5/16	<b>2.312</b>	I	6	1/2	4	821810	149.30	821810-C3	164.40			
	1/2	.187	5/16	<b>2.625</b>	I	6	1/2	4	26810	152.00	26810-C3	167.10			
	1/2	.187	5/16	<b>3.125</b>	I	6	1/2	6	963710	159.00	963710-C3	174.10			
	1/2	.333	.167	<b>.500</b>	II	6	1/2	3	759932	115.20	759932-C3	130.30			
100°	5/8	.250	3/8	<b>.750</b>	I	6	5/8	3-1/2	19215	212.70	19215-C3	227.80			
	5/8	.250	3/8	<b>1.250</b>	I	6	5/8	3-1/2	72615	218.60	72615-C3	233.70			
	1/8	.075	1/16	<b>.187</b>	I	4	1/8	1-1/2	983401	50.50	983401-C3	55.70			
	1/8	.075	1/16	<b>.500</b>	I	4	1/8	1-1/2	969901	60.80	969901-C3	66.00			
	3/16	.113	3/32	<b>.312</b>	I	4	3/16	2	983402	52.10	983402-C3	57.70			
	3/16	.113	3/32	<b>.750</b>	I	4	3/16	2-1/2	969902	63.20	969902-C3	68.80			
	1/4	.149	1/8	<b>.312</b>	I	4	1/4	2	29750	72.60	29750-C3	80.20			
	1/4	.149	1/8	<b>1.000</b>	I	4	1/4	3	969903	84.80	969903-C3	92.40			
110°	3/8	.149	1/4	<b>.500</b>	I	6	3/8	2-1/2	983405	85.80	983405-C3	95.90			
	3/8	.149	1/4	<b>1.500</b>	I	6	3/8	3-1/2	969905	110.80	969905-C3	120.90			
	1/2	.224	5/16	<b>.500</b>	I	6	1/2	3	983410	114.10	983410-C3	129.20			
	1/2	.224	5/16	<b>1.500</b>	I	6	1/2	4	969910	147.70	969910-C3	162.80			
	1/4	.179	1/8	<b>.312</b>	I	4	1/4	2	830503	76.10	830503-C3	83.70			
	120°	1/8	.109	1/16	<b>.125</b>	I	4	1/8	1-1/2	903608	47.00	903608-C3	52.20		
		1/8	.109	1/16	<b>.187</b>	I	4	1/8	1-1/2	39108	47.00	39108-C3	52.20		
		1/8	.109	1/16	<b>.500</b>	I	4	1/8	2	989401	55.80	989401-C3	61.00		
3/16		.163	3/32	<b>.187</b>	I	4	3/16	2	903612	50.50	903612-C3	56.10			
3/16		.163	3/32	<b>.312</b>	I	4	3/16	2	39112	51.20	39112-C3	56.80			
3/16		.163	3/32	<b>.750</b>	I	4	3/16	2-1/2	989402	60.10	989402-C3	65.70			
1/4		.216	1/8	<b>.187</b>	I	4	1/4	2	903616	66.70	903616-C3	74.30			
1/4		.216	1/8	<b>.312</b>	I	4	1/4	2	39116	67.40	39116-C3	75.00			
1/4		.216	1/8	<b>.625</b>	I	4	1/4	2-1/2	910716	65.00	910716-C3	72.60			
1/4		.216	1/8	<b>1.000</b>	I	4	1/4	3	989403	76.60	989403-C3	84.20			
3/8		.216	1/4	<b>.500</b>	I	6	3/8	2-1/2	39124	88.20	39124-C3	98.30			
3/8		.216	1/4	<b>1.000</b>	I	6	3/8	2-1/2	910724	97.80	910724-C3	107.90			
3/8		.216	1/4	<b>1.500</b>	I	6	3/8	3-1/2	989405	110.30	989405-C3	120.40			
1/2		.325	5/16	<b>.500</b>	I	6	1/2	3	39132	117.30	39132-C3	132.40			
1/2	.325	5/16	<b>1.000</b>	I	6	1/2	3	910732	127.40	910732-C3	142.50				
1/2	.325	5/16	<b>1.500</b>	I	6	1/2	4	989410	149.70	989410-C3	164.80				
150°	1/4	.467	1/8	<b>.312</b>	I	4	1/4	2	826003	76.10	826003-C3	83.70			
	3/8	.467	1/4	<b>.500</b>	I	6	3/8	2-1/2	826005	98.80	826005-C3	108.90			

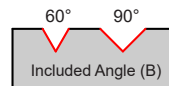
DOUBLE ANGLE SHANK CUTTERS

# DOUBLE ANGLE SHANK CUTTERS

Pointed - Reduced Shank



- Ideal for back chamfering, chamfering, deburring, and milling a "V-groove"
- Reduced straight shank allows any chucking depth
- Tip of included angle ground to a point
- 60° angle can also be used for thread milling
- Solid carbide head brazed onto steel shank
- CNC ground in the USA



Stocked in **Two** Included Angles!

INCL. ANGLE	CUTTER DIAMETER	CUTTER WIDTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
						TOOL #	PRICE	TOOL #	PRICE
B $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	$D_1 \begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L <sub>2</sub>		D <sub>2</sub>	L <sub>1</sub>				
60°	1/4	.072	6	1/8	2.572	866403	95.30	866403-C3	102.50
	3/8	.108	8	3/16	3.108	866405	133.80	866405-C3	143.30
	1/2	.144	8	1/4	3.144	866410	150.80	866410-C3	165.90
	3/4	.144	8	1/2	3.644	16220	159.20	16220-C3	175.50
	3/4	.144	8	1/2	6.144	27520	166.70	27520-C3	190.30
	1	.217	8	5/8	4.217	16230	175.20	16230-C3	200.00
90°	1/4	.125	6	1/8	2.625	875503	95.30	875503-C3	102.90
	3/8	.188	8	3/16	3.188	875505	133.80	875505-C3	150.10
	1/2	.250	8	1/4	3.250	875510	150.80	875510-C3	165.90
	1/2	.250	8	1/4	6.250	777910	158.00	777910-C3	186.90
	5/8	.313	8	5/16	3.313	875515	153.00	875515-C3	169.30
	3/4	.250	8	1/2	3.750	19220	158.70	19220-C3	175.00
	3/4	.250	8	1/2	6.250	19520	166.00	19520-C3	189.60
	1	.375	8	5/8	4.375	19230	175.50	19230-C3	200.30
1-1/4	.500	8	3/4	4.500	875520	217.10	875520-C3	248.80	

DOUBLE ANGLE SHANK CUTTERS

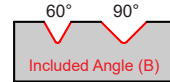
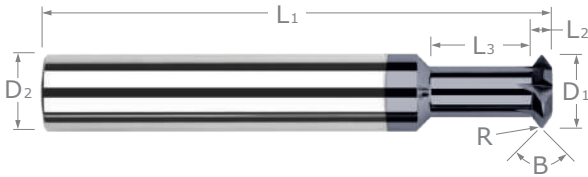


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# DOUBLE ANGLE SHANK CUTTERS

## Tip Radius



- Ideal for back chamfering, chamfering, deburring, and milling a "V-groove"
- Radius on tip for improved strength and wear resistance
- Reduced neck for long reach machining
- Solid carbide
- CNC ground in the USA

Stocked in **Two** Included Angles!

DOUBLE ANGLE SHANK CUTTERS

INCL. ANGLE	CUTTER DIA.	RADIUS	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AIIIN COATED		
									TOOL #	PRICE	TOOL #	PRICE	
60°	B <sup>+1°</sup> / <sub>-1°</sub>	D <sub>1</sub> <sup>+.000"</sup> / <sub>-.002"</sub>	R <sup>+.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub>	L <sub>3</sub> <sup>+.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>					
		1/8	.005	.042	1/16	.187	4	1/8	1-1/2	922508	59.30	922508-C3	64.50
		3/16	.005	.060	3/32	.312	4	3/16	2	922512	62.50	922512-C3	68.10
		1/4	.005	.078	1/8	.312	4	1/4	2	922516	80.00	922516-C3	87.60
		1/4	.010	.084	1/8	.312	4	1/4	2	934716	80.00	934716-C3	87.60
		1/4	.010	.084	1/8	1.000	4	1/4	3	930516	89.80	930516-C3	97.40
		3/8	.010	.084	1/4	.500	6	3/8	2-1/2	934724	107.40	934724-C3	117.50
		3/8	.015	.089	1/4	.500	6	3/8	2-1/2	911224	107.40	911224-C3	117.50
		1/2	.010	.120	5/16	.500	6	1/2	3	934732	133.30	934732-C3	148.40
		1/2	.015	.126	5/16	.500	6	1/2	3	911232	133.30	911232-C3	148.40
90°		1/16	.005	.035	1/32	.093	2	1/8	1-1/2	45804	61.10	45804-C3	66.30
		5/64	.005	.043	.039	.118	2	1/8	1-1/2	45805	61.10	45805-C3	66.30
		3/32	.005	.050	3/64	.141	2	1/8	1-1/2	45806	61.10	45806-C3	66.30
		1/8	.005	.067	1/16	.187	4	1/8	1-1/2	45808	61.10	45808-C3	66.30
		1/8	.005	.067	1/16	.312	4	1/8	1-1/2	898408	68.70	898408-C3	73.90
		1/8	.005	.067	1/16	.500	4	1/8	1-1/2	928708	75.30	928708-C3	80.50
		1/8	.010	.071	1/16	.187	4	1/8	1-1/2	46608	61.60	46608-C3	66.80
		5/32	.005	.082	5/64	.250	4	3/16	2	45810	64.30	45810-C3	69.90
		5/32	.005	.082	5/64	.625	4	3/16	2-1/2	928710	72.00	928710-C3	77.60
		3/16	.005	.099	3/32	.187	4	3/16	2	755212	64.90	755212-C3	70.50
		3/16	.005	.099	3/32	.312	4	3/16	2	45812	64.30	45812-C3	69.90
		3/16	.005	.099	3/32	.500	4	3/16	2	898412	68.20	898412-C3	73.80
		3/16	.005	.099	3/32	.750	4	3/16	2-1/2	928712	72.00	928712-C3	77.60
		3/16	.010	.103	3/32	.312	4	3/16	2	46612	64.30	46612-C3	69.90
		1/4	.005	.129	1/8	.312	4	1/4	2	45816	74.10	45816-C3	81.70
		1/4	.005	.129	1/8	.625	4	1/4	2-1/2	898416	79.40	898416-C3	87.00
		1/4	.005	.129	1/8	1.000	4	1/4	3	928716	86.50	928716-C3	94.10
		1/4	.010	.133	1/8	.312	4	1/4	2	46616	74.10	46616-C3	81.70
		1/4	.010	.133	1/8	.625	4	1/4	2-1/2	890716	79.40	890716-C3	87.00
		1/4	.010	.133	1/8	1.000	4	1/4	3	931916	86.50	931916-C3	94.10
		1/4	.015	.137	1/8	.312	4	1/4	2	988616	74.80	988616-C3	82.40
		1/4	.020	.142	1/8	.312	4	1/4	2	831016	74.10	831016-C3	81.70
		5/16	.005	.130	3/16	1.250	6	5/16	3	928720	91.60	928720-C3	100.50
		5/16	.010	.134	3/16	.375	6	5/16	2-1/2	46620	93.20	46620-C3	102.10
		5/16	.010	.134	3/16	.875	6	5/16	2-1/2	890720	94.50	890720-C3	103.40
	5/16	.010	.134	3/16	1.250	6	5/16	3	931920	94.10	931920-C3	103.00	

continued on next page

## DOUBLE ANGLE SHANK CUTTERS

Tip Radius (cont.)

continued from previous page

INCL. ANGLE	CUTTER DIA.	RADIUS	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AISI IN COATED	
									TOOL #	PRICE	TOOL #	PRICE
B $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.0005^{\circ}$ $-0.002^{\circ}$	R $+0.001^{\circ}$ $-0.001^{\circ}$	L <sub>2</sub>		L <sub>3</sub> $+0.020^{\circ}$ $-0.000^{\circ}$		D <sub>2</sub>	L <sub>1</sub>				
90°	3/8	.010	.133	1/4	.500	6	3/8	2-1/2	46624	100.30	46624-C3	110.40
	3/8	.010	.133	1/4	1.000	6	3/8	2-1/2	890724	102.00	890724-C3	112.10
	3/8	.010	.133	1/4	1.500	6	3/8	3-1/2	931924	121.00	931924-C3	131.10
	3/8	.015	.137	1/4	.500	6	3/8	2-1/2	988624	99.40	988624-C3	109.50
	3/8	.015	.137	1/4	1.000	6	3/8	2-1/2	894124	102.00	894124-C3	112.10
	3/8	.015	.137	1/4	1.500	6	3/8	3-1/2	923524	121.00	923524-C3	131.10
	3/8	.020	.142	1/4	.500	6	3/8	2-1/2	831024	99.40	831024-C3	109.50
	1/2	.010	.196	5/16	.500	6	1/2	3	46632	128.70	46632-C3	143.80
	1/2	.010	.196	5/16	1.000	6	1/2	3	890732	131.20	890732-C3	146.30
	1/2	.010	.196	5/16	1.500	6	1/2	4	931932	158.20	931932-C3	173.30
	1/2	.015	.200	5/16	.500	6	1/2	3	988632	128.70	988632-C3	143.80
	1/2	.015	.200	5/16	1.000	6	1/2	3	894132	131.20	894132-C3	146.30
	1/2	.015	.200	5/16	1.500	6	1/2	4	923532	158.20	923532-C3	173.30

DOUBLE ANGLE SHANK CUTTERS

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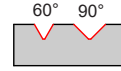
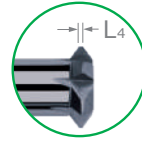
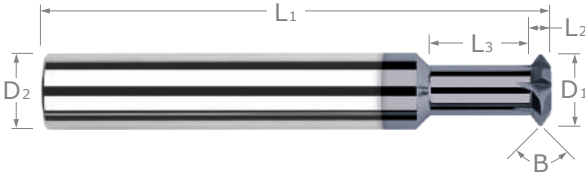


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# DOUBLE ANGLE SHANK CUTTERS

## Tip Flat



Included Angle (B)

Stocked in **Two** Included Angles!

- Ideal for back chamfering, chamfering, deburring, and milling a "V-groove"
- Flat on tip for improved strength and wear resistance
- Reduced neck for long reach machining
- Solid carbide
- CNC ground in the USA

DOUBLE ANGLE SHANK CUTTERS

INCL. ANGLE	CUTTER DIA.	TIP FLAT	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
B $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L4 $\begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	L2		L3 $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		D2	L1				
60°	1/8	.010	.046	1/16	.187	4	1/8	1-1/2	778008	49.10	778008-C3	54.30
	3/16	.010	.065	3/32	.312	4	3/16	2	778012	52.20	778012-C3	57.80
	1/4	.010	.082	1/8	.312	4	1/4	2	778016	69.80	778016-C3	77.40
	3/8	.010	.082	1/4	.500	6	3/8	2-1/2	778024	89.10	778024-C3	99.20
	1/2	.010	.119	5/16	.500	6	1/2	3	778032	122.00	778032-C3	137.10
90°	1/8	.010	.073	1/16	.187	4	1/8	1-1/2	776608	47.30	776608-C3	52.50
	1/8	.010	.073	1/16	.500	4	1/8	1-1/2	775108	61.50	775108-C3	66.70
	3/16	.010	.105	3/32	.312	4	3/16	2	776612	49.40	776612-C3	55.00
	3/16	.010	.105	3/32	.750	4	3/16	2-1/2	775112	62.40	775112-C3	68.00
	1/4	.010	.135	1/8	.312	4	1/4	2	776616	60.50	776616-C3	68.10
	1/4	.010	.135	1/8	1.000	4	1/4	3	775116	73.60	775116-C3	81.20
	3/8	.010	.135	1/4	.500	6	3/8	2-1/2	776624	86.50	776624-C3	96.60
	3/8	.010	.135	1/4	1.500	6	3/8	3-1/2	775124	108.80	775124-C3	118.90
	1/2	.010	.198	5/16	.500	6	1/2	3	776632	115.70	776632-C3	130.80
1/2	.010	.198	5/16	1.500	6	1/2	4	775132	148.00	775132-C3	163.10	

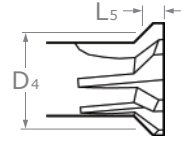
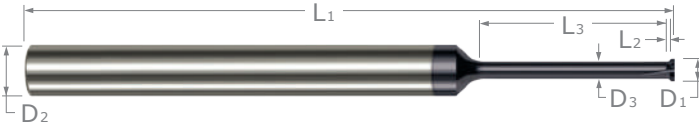


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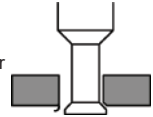


# BACK DEBURRING MILLS



- Ideal for deburring on backside of small holes and tight pockets
- Slightly undersized to fit in common hole sizes
- 90° included angle, cutting on angle only
- Design has smaller radial projection than double angle shank cutters and back chamfer cutters, which results in increased neck diameter and improved strength
- Left hand shear flute / right hand cut evacuates chip away from part
- Multiple flutes for improved finish
- Solid carbide • CNC ground in the USA

Reach Through  
Miniature Holes and  
Slots to Remove Burr  
on Backside of Part



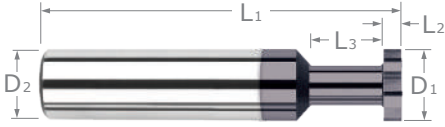
HEAD DIA.	AXIAL LOC	NECK DIA.	NECK LENGTH	CHAMFER CENTER LENGTH	CHAMFER CENTER DIAMETER	FLUTES	SHANK DIA.	OAL	UNCOATED		AISI COATED	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.001"</sub>	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>5</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	D <sub>4</sub> (Max.)		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.028	.0029	.021	<b>.093</b>	.0215	.0261	3	1/8	2	846328	68.70	846328-C3	73.90
.028	.0029	.021	<b>.125</b>	.0215	.0261	3	1/8	2	65728	68.70	65728-C3	73.90
.028	.0029	.021	<b>.250</b>	.0215	.0261	3	1/8	2	57028	68.70	57028-C3	73.90
.040	.0048	.028	<b>.125</b>	.0324	.0362	4	1/8	2	846340	63.90	846340-C3	69.10
.040	.0048	.028	<b>.187</b>	.0324	.0362	4	1/8	2	65740	63.90	65740-C3	69.10
.040	.0048	.028	<b>.312</b>	.0324	.0362	4	1/8	2	57040	63.90	57040-C3	69.10
.055	.0045	.043	<b>.187</b>	.0423	.0515	4	1/8	2	846355	63.90	846355-C3	69.10
.055	.0045	.043	<b>.281</b>	.0423	.0515	4	1/8	2	65755	63.90	65755-C3	69.10
.055	.0045	.043	<b>.437</b>	.0423	.0515	4	1/8	2	57055	63.90	57055-C3	69.10
.080	.0077	.060	<b>.250</b>	.0638	.0733	5	1/8	2	846380	57.80	846380-C3	63.00
.080	.0077	.060	<b>.375</b>	.0638	.0733	5	1/8	2	65780	57.80	65780-C3	63.00
.080	.0077	.060	<b>.625</b>	.0638	.0733	5	1/8	2	57080	57.80	57080-C3	63.00
.115	.0111	.087	<b>.375</b>	.0655	.1049	5	1/8	2	846410	57.80	846410-C3	63.00
.115	.0111	.087	<b>.562</b>	.0655	.1049	5	1/8	2	65810	57.80	65810-C3	63.00
.115	.0111	.087	<b>1.000</b>	.0655	.1049	5	1/8	2	57110	57.80	57110-C3	63.00

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>5</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	D <sub>4</sub> (Max.)		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.125	.0111	.097	<b>.375</b>	.0655	.1139	6	1/8	2	846425	57.80	846425-C3	63.00
.135	.0111	.107	<b>.437</b>	.0655	.1249	5	3/16	2	846420	58.60	846420-C3	64.20
.135	.0111	.107	<b>.625</b>	.0655	.1249	5	3/16	2-1/2	65820	59.50	65820-C3	65.10
.135	.0111	.107	<b>1.125</b>	.0655	.1249	5	3/16	2-1/2	57120	59.50	57120-C3	65.10
.165	.0191	.121	<b>.500</b>	.0695	.1469	6	3/16	2	846430	58.60	846430-C3	64.20
.165	.0191	.121	<b>.750</b>	.0695	.1469	6	3/16	2-1/2	65830	59.50	65830-C3	65.10
.165	.0191	.121	<b>1.375</b>	.0695	.1469	6	3/16	2-1/2	57130	59.50	57130-C3	65.10
.187	.0191	.143	<b>.563</b>	.0695	.1679	6	3/16	2	846435	58.60	846435-C3	64.20
.210	.0191	.166	<b>.625</b>	.0695	.1919	6	1/4	2-1/2	846440	62.60	846440-C3	70.20
.210	.0191	.166	<b>1.000</b>	.0695	.1919	6	1/4	3	65840	63.90	65840-C3	71.50
.210	.0191	.166	<b>1.750</b>	.0695	.1919	6	1/4	3	57140	63.90	57140-C3	71.50
.262	.0251	.206	<b>1.375</b>	.0925	.2379	8	5/16	3	65850	64.90	65850-C3	73.80
.262	.0251	.206	<b>2.125</b>	.0925	.2379	8	5/16	4	57150	74.80	57150-C3	85.50
.315	.0251	.259	<b>1.625</b>	.0925	.2909	8	3/8	3	65860	80.20	65860-C3	90.30
.315	.0251	.259	<b>2.500</b>	.0925	.2909	8	3/8	4	57160	90.30	57160-C3	104.10
.420	.0321	.350	<b>2.125</b>	.1160	.3889	10	7/16	4	65870	101.60	65870-C3	116.70
.420	.0321	.350	<b>3.375</b>	.1160	.3889	10	7/16	6	57170	117.90	57170-C3	134.80

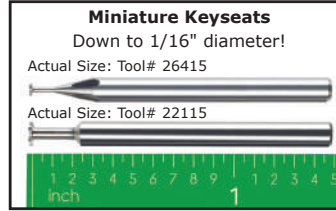
BACK DEBURRING MILLS

# KEYSEAT CUTTERS

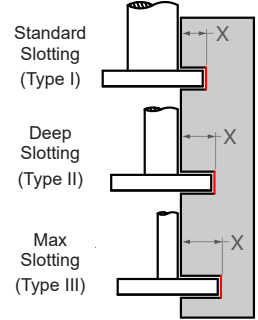
## Square



- Keyseat cutters down to 1/16" diameter
- Both sides of cutter are dished for clearance
- Solid carbide
- CNC ground in the USA



Stocked in Multiple Radial Depths of Cut!



KEYSEAT CUTTERS

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
									TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.0005"</sup> / <sub>-.0005"</sub>		L3 <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D2	L1				
1/16	.010	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26410	51.20	26410-C3	56.40
	.015 (1/64)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26415	48.50	26415-C3	53.70
	.015 (1/64)	1/32	3/16 (3x)	.012	I	4	1/8	1-1/2	955115	56.80	955115-C3	62.00
	.020	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26420	48.50	26420-C3	53.70
	.020	1/32	3/16 (3x)	.012	I	4	1/8	1-1/2	955120	49.50	955120-C3	54.70
	.025	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26425	48.50	26425-C3	53.70
	.030	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26430	48.50	26430-C3	53.70
	.031 (1/32)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26431	48.50	26431-C3	53.70
	.031 (1/32)	1/32	3/16 (3x)	.012	I	4	1/8	1-1/2	955131	56.80	955131-C3	62.00
	.039 (1 mm)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26439	48.50	26439-C3	53.70
	.047 (3/64)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26447	48.50	26447-C3	53.70
	.062 (1/16)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26462	48.50	26462-C3	53.70
.062 (1/16)	1/32	3/16 (3x)	.012	I	4	1/8	1-1/2	955162	56.80	955162-C3	62.00	
5/64	.010	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27310	50.50	27310-C3	55.70
	.015 (1/64)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27315	47.70	27315-C3	52.90
	.020	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27320	47.70	27320-C3	52.90
	.025	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27325	47.70	27325-C3	52.90
	.031 (1/32)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27331	47.70	27331-C3	52.90
	.031 (1/32)	1 mm	6 mm (3x)	.018	I	4	1/8	1-1/2	922031	55.90	922031-C3	61.10
	.039 (1 mm)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27339	47.70	27339-C3	52.90
	.047 (3/64)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27347	47.70	27347-C3	52.90
	.062 (1/16)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27362	47.70	27362-C3	52.90
3/32	.010	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28210	50.00	28210-C3	55.20
	.015 (1/64)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28215	47.00	28215-C3	52.20
	.020	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28220	47.00	28220-C3	52.20
	.020	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967720	47.00	967720-C3	52.20
	.025	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28225	47.00	28225-C3	52.20
	.030	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28230	47.00	28230-C3	52.20
	.031 (1/32)	1/32	3/64 (.5x)	.031	II	4	1/8	1-1/2	901131	50.00	901131-C3	55.20
	.031 (1/32)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28231	47.00	28231-C3	52.20
	.031 (1/32)	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967731	55.20	967731-C3	60.40
	.039 (1 mm)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28239	47.00	28239-C3	52.20
	.040	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28240	47.00	28240-C3	52.20
	.047 (3/64)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28247	47.00	28247-C3	52.20
	.047 (3/64)	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967747	55.20	967747-C3	60.40
	.062 (1/16)	1/32	3/64 (.5x)	.031	II	4	1/8	1-1/2	901162	50.00	901162-C3	55.20
	.062 (1/16)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28262	47.00	28262-C3	52.20
	.062 (1/16)	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967762	55.20	967762-C3	60.40
.093 (3/32)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28293	47.00	28293-C3	52.20	
3 mm	.015 (1/64)	.059	3/16 (1.5x)	.019	I	4	1/8	1-1/2	777415	49.30	777415-C3	54.50
	.031 (1/32)	.059	3/16 (1.5x)	.019	I	4	1/8	1-1/2	777431	48.90	777431-C3	54.10
	.047 (3/64)	.059	3/16 (1.5x)	.019	I	4	1/8	1-1/2	777447	48.90	777447-C3	54.10

\*Radial DOC accounts for max transition radius at neck

continued on next page

## KEYSEAT CUTTERS

Square (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIRTIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
1/8	.010	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22110	48.00	22110-C3	53.20
	.010	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43510	57.00	43510-C3	62.20
	.015 (1/64)	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982515	57.40	982515-C3	62.60
	.015 (1/64)	.040	1/8 (1x)	<b>.032</b>	II	6	1/8	1-1/2	893315	58.50	893315-C3	63.70
	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22115	45.40	22115-C3	50.60
	.015 (1/64)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43515	53.30	43515-C3	58.50
	.020	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982520	57.40	982520-C3	62.60
	.020	.040	1/8 (1x)	<b>.032</b>	II	6	1/8	1-1/2	893320	58.50	893320-C3	63.70
	.020	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22120	45.40	22120-C3	50.60
	.020	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43520	53.30	43520-C3	58.50
	.025	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982525	57.40	982525-C3	62.60
	.025	.040	1/8 (1x)	<b>.032</b>	II	6	1/8	1-1/2	893325	58.50	893325-C3	63.70
	.025	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22125	45.40	22125-C3	50.60
	.025	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43525	53.30	43525-C3	58.50
	.030	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22130	45.40	22130-C3	50.60
	.030	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43530	53.30	43530-C3	58.50
	.031 (1/32)	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982531	57.40	982531-C3	62.60
	.031 (1/32)	.040	1/8 (1x)	<b>.032</b>	II	6	1/8	1-1/2	893331	58.50	893331-C3	63.70
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22131	45.40	22131-C3	50.60
	.031 (1/32)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43531	53.30	43531-C3	58.50
	.035	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22135	45.40	22135-C3	50.60
	.035	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43535	53.30	43535-C3	58.50
	.039 (1 mm)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22139	45.40	22139-C3	50.60
	.039 (1 mm)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43539	54.30	43539-C3	59.50
	.040	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982540	57.40	982540-C3	62.60
	.040	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22140	45.40	22140-C3	50.60
	.040	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43540	53.30	43540-C3	58.50
	.045	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22145	45.40	22145-C3	50.60
	.047 (3/64)	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982547	57.40	982547-C3	62.60
	.047 (3/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22147	45.40	22147-C3	50.60
	.047 (3/64)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43547	53.30	43547-C3	58.50
	.050	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22150	45.40	22150-C3	50.60
	.055	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22155	45.40	22155-C3	50.60
	.060	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22160	45.40	22160-C3	50.60
	.062 (1/16)	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982562	57.40	982562-C3	62.60
	.062 (1/16)	.040	1/8 (1x)	<b>.032</b>	II	6	1/8	1-1/2	893362	58.50	893362-C3	63.70
	.062 (1/16)	1/16	1/8 (1x)	.022	I	6	1/8	1-1/2	806662	45.40	806662-C3	50.60
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22162	45.40	22162-C3	50.60
	.062 (1/16)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43562	53.30	43562-C3	58.50
	.062 (1/16)	1/16	1/2 (4x)	.022	I	6	1/8	1-1/2	749762	56.30	749762-C3	61.50
.078 (5/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22178	45.40	22178-C3	50.60	
.078 (5/64)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43578	53.30	43578-C3	58.50	
.093 (3/32)	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	982593	57.90	982593-C3	63.10	
.093 (3/32)	.040	1/8 (1x)	<b>.032</b>	II	6	1/8	1-1/2	893393	58.50	893393-C3	63.70	
.093 (3/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22193	45.40	22193-C3	50.60	
.093 (3/32)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43593	53.30	43593-C3	58.50	
.100	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22182	45.40	22182-C3	50.60	
.118	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22157	46.30	22157-C3	51.50	
.125 (1/8)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22195	45.40	22195-C3	50.60	
.125 (1/8)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43595	53.30	43595-C3	58.50	

\*Radial DOC accounts for max transition radius at neck

continued on next page

# KEYSEAT CUTTERS

Square (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.		UNCOATED		AIRTIN COATED	
							D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+ .000"</sup> <sub>-.002"</sub>	L <sub>2</sub> <sup>+ .0005"</sup> <sub>-.0005"</sub>		L <sub>3</sub> <sup>+ .020"</sup> <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
5/32	.010	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69410	50.20	69410-C3	55.80
	.015 (1/64)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69415	47.60	69415-C3	53.20
	.015 (1/64)	5/64	1/2 (3x)	.029	I	6	3/16	2	956215	55.40	956215-C3	61.00
	.020	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69420	47.60	69420-C3	53.20
	.020	5/64	1/2 (3x)	.029	I	6	3/16	2	956220	55.40	956220-C3	61.00
	.025	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69425	47.60	69425-C3	53.20
	.025	5/64	1/2 (3x)	.029	I	6	3/16	2	956225	55.40	956225-C3	61.00
	.031 (1/32)	.050	5/64 (.5x)	.043	II	6	3/16	2	900331	59.50	900331-C3	65.10
	.031 (1/32)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69431	47.60	69431-C3	53.20
	.031 (1/32)	5/64	1/2 (3x)	.029	I	6	3/16	2	956231	55.40	956231-C3	61.00
	.039 (1 mm)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69439	47.60	69439-C3	53.20
	.040	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69440	47.60	69440-C3	53.20
	.047 (3/64)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69447	47.60	69447-C3	53.20
	.047 (3/64)	5/64	1/2 (3x)	.029	I	6	3/16	2	956247	55.40	956247-C3	61.00
	.050	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69450	47.60	69450-C3	53.20
	.060	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69460	47.60	69460-C3	53.20
	.062 (1/16)	.050	5/64 (.5x)	.043	II	6	3/16	2	900362	59.50	900362-C3	65.10
	.062 (1/16)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69462	47.60	69462-C3	53.20
	.062 (1/16)	5/64	1/2 (3x)	.029	I	6	3/16	2	956262	55.40	956262-C3	61.00
	.078 (5/64)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69478	47.60	69478-C3	53.20
	.078 (5/64)	5/64	1/2 (3x)	.029	I	6	3/16	2	956278	55.40	956278-C3	61.00
	.093 (3/32)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69493	47.60	69493-C3	53.20
	.093 (3/32)	5/64	1/2 (3x)	.029	I	6	3/16	2	956293	55.40	956293-C3	61.00
	.125 (1/8)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69495	47.60	69495-C3	53.20
.125 (1/8)	5/64	1/2 (3x)	.029	I	6	3/16	2	956295	55.40	956295-C3	61.00	
3/16	.010	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22210	50.00	22210-C3	55.60
	.015 (1/64)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980015	58.60	980015-C3	64.20
	.015 (1/64)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22215	46.90	22215-C3	52.50
	.015 (1/64)	3/32	9/16 (3x)	.037	I	6	3/16	2	43715	58.90	43715-C3	64.50
	.018	Please see page 371 for Retaining Ring sizes.										
	.020	1/16	3/32 (.5x)	.052	II	6	3/16	2	980020	58.60	980020-C3	64.20
	.020	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22220	46.90	22220-C3	52.50
	.020	3/32	9/16 (3x)	.037	I	6	3/16	2	43720	58.90	43720-C3	64.50
	.025	1/16	3/32 (.5x)	.052	II	6	3/16	2	980025	58.60	980025-C3	64.20
	.025	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22225	46.90	22225-C3	52.50
	.025	3/32	9/16 (3x)	.037	I	6	3/16	2	43725	58.90	43725-C3	64.50
	.029	Please see page 371 for Retaining Ring sizes.										
	.030	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22230	46.90	22230-C3	52.50
	.030	3/32	9/16 (3x)	.037	I	6	3/16	2	43730	58.90	43730-C3	64.50
	.031 (1/32)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980031	58.60	980031-C3	64.20
	.031 (1/32)	1/16	3/16 (1x)	.052	II	6	3/16	2	928931	58.60	928931-C3	64.20
	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22231	46.90	22231-C3	52.50
	.031 (1/32)	3/32	9/16 (3x)	.037	I	6	3/16	2	43731	58.90	43731-C3	64.50
	.035	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22235	46.90	22235-C3	52.50
	.035	3/32	9/16 (3x)	.037	I	6	3/16	2	43735	58.90	43735-C3	64.50
	.039 (1 mm)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22239	46.90	22239-C3	52.50
	.039 (1 mm)	3/32	9/16 (3x)	.037	I	6	3/16	2	43739	58.90	43739-C3	64.50

KEYSEAT CUTTERS

\*Radial DOC accounts for max transition radius at neck

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## KEYSEAT CUTTERS

Square (cont.)

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CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIRTIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{matrix} +.000" \\ -.002" \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.0005" \\ -.0005" \end{matrix}$		L <sub>3</sub> $\begin{matrix} +.020" \\ -.000" \end{matrix}$	X			D <sub>2</sub>	L <sub>1</sub>				
3/16	.040	1/16	3/32 (.5x)	.052	II	6	3/16	2	980040	58.60	980040-C3	64.20
	.040	1/16	3/16 (1x)	.052	II	6	3/16	2	928940	58.60	928940-C3	64.20
	.040	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22240	46.90	22240-C3	52.50
	.040	3/32	9/16 (3x)	.037	I	6	3/16	2	43740	58.90	43740-C3	64.50
	.045	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22246	46.90	22246-C3	52.50
	.045	3/32	9/16 (3x)	.037	I	6	3/16	2	43745	58.90	43745-C3	64.50
	.047 (3/64)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980047	58.60	980047-C3	64.20
	.047 (3/64)	1/16	3/16 (1x)	.052	II	6	3/16	2	928947	58.60	928947-C3	64.20
	.047 (3/64)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22247	46.90	22247-C3	52.50
	.047 (3/64)	3/32	9/16 (3x)	.037	I	6	3/16	2	43747	58.90	43747-C3	64.50
	.050	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22250	46.90	22250-C3	52.50
	.050	3/32	9/16 (3x)	.037	I	6	3/16	2	43750	58.90	43750-C3	64.50
	.055	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22255	46.90	22255-C3	52.50
	.055	3/32	9/16 (3x)	.037	I	6	3/16	2	43755	58.90	43755-C3	64.50
	.060	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22261	46.90	22261-C3	52.50
	.060	3/32	9/16 (3x)	.037	I	6	3/16	2	43760	58.90	43760-C3	64.50
	.062 (1/16)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980062	58.60	980062-C3	64.20
	.062 (1/16)	1/16	3/16 (1x)	.052	II	6	3/16	2	928962	58.60	928962-C3	64.20
	.062 (1/16)	3/32	3/16 (1x)	.037	I	6	3/16	2	806562	46.90	806562-C3	52.50
	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22262	46.90	22262-C3	52.50
	.062 (1/16)	3/32	9/16 (3x)	.037	I	6	3/16	2	43762	58.90	43762-C3	64.50
	.078 (5/64)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980078	58.60	980078-C3	64.20
	.078 (5/64)	1/16	3/16 (1x)	.052	II	6	3/16	2	928978	58.60	928978-C3	64.20
	.078 (5/64)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22278	46.90	22278-C3	52.50
	.078 (5/64)	3/32	9/16 (3x)	.037	I	6	3/16	2	43778	58.90	43778-C3	64.50
	.093 (3/32)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980093	58.60	980093-C3	64.20
	.093 (3/32)	1/16	3/16 (1x)	.052	II	6	3/16	2	928993	58.60	928993-C3	64.20
	.093 (3/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22293	46.90	22293-C3	52.50
.093 (3/32)	3/32	9/16 (3x)	.037	I	6	3/16	2	43793	58.90	43793-C3	64.50	
.118	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22257	50.40	22257-C3	56.00	
.125 (1/8)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980095	58.60	980095-C3	64.20	
.125 (1/8)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22295	46.90	22295-C3	52.50	
.125 (1/8)	3/32	9/16 (3x)	.037	I	6	3/16	2	43795	58.90	43795-C3	64.50	
.156 (5/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22297	46.90	22297-C3	52.50	
6 mm	.031 (1/32)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947531	54.60	947531-C3	62.20
	.039 (1 mm)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947539	54.60	947539-C3	62.20
	.062 (1/16)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947562	54.60	947562-C3	62.20
	.093 (3/32)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947593	54.60	947593-C3	62.20
	.118 (3 mm)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947588	54.60	947588-C3	62.20
	.125 (1/8)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947595	54.60	947595-C3	62.20
1/4	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22310	56.30	22310-C3	63.90
	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43910	67.40	43910-C3	75.00
	.015 (1/64)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70815	64.90	70815-C3	72.50
	.015 (1/64)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986115	67.00	986115-C3	74.60
	.015 (1/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22315	53.10	22315-C3	60.70
	.015 (1/64)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43915	64.70	43915-C3	72.30

\*Radial DOC accounts for max transition radius at neck

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KEYSEAT CUTTERS

# KEYSEAT CUTTERS

Square (cont.)

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CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIRTIN COATED		
									TOOL #	PRICE	TOOL #	PRICE	
1/4	D1 <sup>+0.000"</sup> <sub>-.002"</sub>	L2 <sup>+0.005"</sup> <sub>-.0005"</sub>	L3 <sup>+0.020"</sup> <sub>-.000"</sub>	X			D2	L1					
	.020	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70820	56.70	70820-C3	64.30	
	.020	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986120	58.60	986120-C3	66.20	
	.020	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22320	53.10	22320-C3	60.70	
	.020	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43920	64.70	43920-C3	72.30	
	.025	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70825	57.20	70825-C3	64.80	
	.025	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986125	58.60	986125-C3	66.20	
	.025	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22325	53.10	22325-C3	60.70	
	.025	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43925	64.70	43925-C3	72.30	
	.030	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70830	57.20	70830-C3	64.80	
	.030	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22330	53.10	22330-C3	60.70	
	.030	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43930	64.70	43930-C3	72.30	
	.031 (1/32)	.050	5/64 (.3x)	.092	III	8	1/4	2-1/2	964731	95.00	964731-C3	102.60	
	.031 (1/32)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70831	56.70	70831-C3	64.30	
	.031 (1/32)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986131	74.10	986131-C3	81.70	
	.031 (1/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22331	53.10	22331-C3	60.70	
	.031 (1/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43931	64.70	43931-C3	72.30	
	.035	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22335	53.10	22335-C3	60.70	
	.035	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43935	66.00	43935-C3	73.60	
	.039 (1 mm)	Please see page 371 for Retaining Ring sizes.											
	.039 (1 mm)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22339	53.10	22339-C3	60.70	
	.040	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70840	56.70	70840-C3	64.30	
	.040	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22340	53.10	22340-C3	60.70	
	.040	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43940	64.70	43940-C3	72.30	
	.045	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22346	53.10	22346-C3	60.70	
	.046	Please see page 371 for Retaining Ring sizes.											
	.047 (3/64)	.050	5/64 (.3x)	.092	III	8	1/4	2-1/2	964747	93.30	964747-C3	100.90	
	.047 (3/64)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70847	56.70	70847-C3	64.30	
	.047 (3/64)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986147	74.10	986147-C3	81.70	
	.047 (3/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22347	53.10	22347-C3	60.70	
	.047 (3/64)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43947	64.70	43947-C3	72.30	
	.050	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70850	56.70	70850-C3	64.30	
	.050	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22350	53.10	22350-C3	60.70	
	.050	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43950	64.70	43950-C3	72.30	
	.055	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22355	53.10	22355-C3	60.70	
	.055	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43955	64.70	43955-C3	72.30	
	.060	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70860	57.20	70860-C3	64.80	
	.060	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22361	53.10	22361-C3	60.70	
	.060	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43961	64.70	43961-C3	72.30	
	.062 (1/16)	.050	5/64 (.3x)	.092	III	8	1/4	2-1/2	964762	95.00	964762-C3	102.60	
.062 (1/16)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70862	56.70	70862-C3	64.30		
.062 (1/16)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986162	74.10	986162-C3	81.70		
.062 (1/16)	1/8	1/4 (1x)	.053	I	6	1/4	2-1/2	806462	53.10	806462-C3	60.70		
.062 (1/16)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22362	53.10	22362-C3	60.70		
.062 (1/16)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43962	64.70	43962-C3	72.30		
.062 (1/16)	1/8	1 (4x)	.053	I	6	1/4	2-1/2	984262	74.90	984262-C3	82.50		
.078 (5/64)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70878	56.70	70878-C3	64.30		
.078 (5/64)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986178	74.10	986178-C3	81.70		
.078 (5/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22378	53.10	22378-C3	60.70		
.078 (5/64)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43978	64.70	43978-C3	72.30		

\*Radial DOC accounts for max transition radius at neck

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KEYSEAT CUTTERS

## KEYSEAT CUTTERS

Square (cont.)

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CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		
									TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+ .000"</sup> <sub>- .002"</sub>	L <sub>2</sub> <sup>+ .0005"</sup> <sub>- .0005"</sub>		L <sub>3</sub> <sup>+ .020"</sup> <sub>- .000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>					
1/4	.093 (3/32)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70893	56.70	70893-C3	64.30	
	.093 (3/32)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986193	74.10	986193-C3	81.70	
	.093 (3/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22393	53.10	22393-C3	60.70	
	.093 (3/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43993	64.70	43993-C3	72.30	
	.100	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22382	53.10	22382-C3	60.70	
	.100	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43982	64.70	43982-C3	72.30	
	.109 (7/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22384	53.10	22384-C3	60.70	
	.118 (3 mm)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22388	53.10	22388-C3	60.70	
	.125 (1/8)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70895	56.70	70895-C3	64.30	
	.125 (1/8)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986195	74.10	986195-C3	81.70	
	.125 (1/8)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22395	53.10	22395-C3	60.70	
	.125 (1/8)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43995	64.70	43995-C3	72.30	
	.125 (1/8)	1/8	1 (4x)	.053	I	6	1/4	2-1/2	984295	74.90	984295-C3	82.50	
	.156 (5/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22397	53.10	22397-C3	60.70	
	.156 (5/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43997	64.70	43997-C3	72.30	
	.187 (3/16)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22398	53.10	22398-C3	60.70	
.187 (3/16)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43998	64.70	43998-C3	72.30		
.250 (1/4)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22399	53.10	22399-C3	60.70		
5/16	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22401	74.30	22401-C3	83.20	
	.015 (1/64)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22403	71.50	22403-C3	80.40	
	.020	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22405	70.20	22405-C3	79.10	
	.025	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22407	70.20	22407-C3	79.10	
	.030	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22409	70.20	22409-C3	79.10	
	.031 (1/32)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973410	78.90	973410-C3	87.80	
	.031 (1/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22410	70.20	22410-C3	79.10	
	.031 (1/32)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69710	82.90	69710-C3	91.80	
	.039 (1 mm)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22414	70.20	22414-C3	79.10	
	.039 (1 mm)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69714	82.90	69714-C3	91.80	
	.040	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22415	70.20	22415-C3	79.10	
	.047 (3/64)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973420	78.90	973420-C3	87.80	
	.047 (3/64)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22420	70.20	22420-C3	79.10	
	.050	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22422	70.20	22422-C3	79.10	
	.056	Please see page 371 for Retaining Ring sizes.											
	.060	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22428	70.20	22428-C3	79.10	
	.062 (1/16)	.063	3/32 (.3x)	.116	III	10	5/16	2-1/2	959430	107.60	959430-C3	116.50	
	.062 (1/16)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973430	78.90	973430-C3	87.80	
	.062 (1/16)	7/64	3/8 (1x)	.091	II	6	5/16	2-1/2	907930	96.00	907930-C3	104.90	
	.062 (1/16)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22430	70.20	22430-C3	79.10	
	.062 (1/16)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69730	82.90	69730-C3	91.80	
	.078 (5/64)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973440	78.90	973440-C3	87.80	
	.078 (5/64)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22440	70.20	22440-C3	79.10	
	.078 (5/64)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69740	82.90	69740-C3	91.80	
	.093 (3/32)	.063	3/32 (.3x)	.116	III	10	5/16	2-1/2	959450	107.60	959450-C3	116.50	
	.093 (3/32)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973450	78.90	973450-C3	87.80	
	.093 (3/32)	7/64	3/8 (1x)	.091	II	6	5/16	2-1/2	907950	96.00	907950-C3	104.90	
	.093 (3/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22450	70.20	22450-C3	79.10	
	.093 (3/32)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69750	82.90	69750-C3	91.80	
	.100	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22452	70.20	22452-C3	79.10	

\*Radial DOC accounts for max transition radius at neck

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KEYSEAT CUTTERS

# KEYSEAT CUTTERS

Square (cont.)

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CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.		UNCOATED		AISI COATED	
							D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
5/16	.125 (1/8)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973460	78.90	973460-C3	87.80
	.125 (1/8)	7/64	3/8 (1x)	.091	II	6	5/16	2-1/2	907960	96.00	907960-C3	104.90
	.125 (1/8)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22455	70.20	22455-C3	79.10
	.125 (1/8)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69760	82.90	69760-C3	91.80
	.156 (5/32)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973465	78.90	973465-C3	87.80
	.156 (5/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22465	70.20	22465-C3	79.10
	.156 (5/32)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69765	82.90	69765-C3	91.80
	.187 (3/16)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22470	70.20	22470-C3	79.10
	.187 (3/16)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69770	82.90	69770-C3	91.80
	.250 (1/4)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22480	70.20	22480-C3	79.10
3/8	.015 (1/64)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22503	81.90	22503-C3	92.00
	.020	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71105	84.60	71105-C3	94.70
	.020	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22505	81.90	22505-C3	92.00
	.020	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70305	92.60	70305-C3	102.70
	.025	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22507	81.90	22507-C3	92.00
	.025	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70307	92.60	70307-C3	102.70
	.030	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22509	81.90	22509-C3	92.00
	.031 (1/32)	.075	7/64 (.3x)	.142	III	10	3/8	2-1/2	991310	111.50	991310-C3	121.60
	.031 (1/32)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71110	84.60	71110-C3	94.70
	.031 (1/32)	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958910	102.00	958910-C3	112.10
	.031 (1/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22510	79.10	22510-C3	89.20
	.031 (1/32)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70310	92.60	70310-C3	102.70
	.035	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22512	79.10	22512-C3	89.20
	.035	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70312	94.40	70312-C3	104.50
	.039 (1 mm)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71114	84.60	71114-C3	94.70
	.039 (1 mm)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22514	79.10	22514-C3	89.20
	.039 (1 mm)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70314	92.60	70314-C3	102.70
	.040	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71115	83.80	71115-C3	93.90
	.040	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22515	79.10	22515-C3	89.20
	.040	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70315	92.60	70315-C3	102.70
	.045	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22518	79.10	22518-C3	89.20
	.047 (3/64)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71120	84.60	71120-C3	94.70
	.047 (3/64)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22520	79.10	22520-C3	89.20
	.047 (3/64)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70320	92.60	70320-C3	102.70
	.050	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958922	84.60	958922-C3	94.70
	.050	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22522	79.10	22522-C3	89.20
	.055	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958925	84.60	958925-C3	94.70
	.055	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22525	79.10	22525-C3	89.20
	.060	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22528	79.10	22528-C3	89.20
	.060	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70328	92.60	70328-C3	102.70
	.062 (1/16)	.075	7/64 (.3x)	.142	III	10	3/8	2-1/2	991330	111.50	991330-C3	121.60
	.062 (1/16)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71130	84.60	71130-C3	94.70
	.062 (1/16)	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958930	102.00	958930-C3	112.10
	.062 (1/16)	3/16	3/8 (1x)	.084	I	8	3/8	2-1/2	806330	79.10	806330-C3	89.20
.062 (1/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22530	79.10	22530-C3	89.20	
.062 (1/16)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70330	92.60	70330-C3	102.70	
.068	Please see page 371 for Retaining Ring sizes.											
.078 (5/64)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71140	84.60	71140-C3	94.70	

KEYSEAT CUTTERS

\*Radial DOC accounts for max transition radius at neck

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## KEYSEAT CUTTERS

Square (cont.)

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CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIRTIN COATED		
									TOOL #	PRICE	TOOL #	PRICE	
3/8	D <sub>1</sub> $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	L <sub>3</sub> $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$	X			D <sub>2</sub>	L <sub>1</sub>					
	.078 (5/64)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22540	79.10	22540-C3	89.20	
	.078 (5/64)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70340	79.10	70340-C3	89.20	
	.086	Please see page 371 for Retaining Ring sizes.											
	.093 (3/32)	.075	7/64 (.3x)	.142	III	10	3/8	2-1/2	991350	111.50	991350-C3	121.60	
	.093 (3/32)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71150	84.60	71150-C3	94.70	
	.093 (3/32)	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958950	102.00	958950-C3	112.10	
	.093 (3/32)	3/16	3/8 (1x)	.084	I	8	3/8	2-1/2	806350	79.10	806350-C3	89.20	
	.093 (3/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22550	79.10	22550-C3	89.20	
	.093 (3/32)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70350	92.60	70350-C3	102.70	
	.100	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71152	83.00	71152-C3	93.10	
	.100	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22552	79.10	22552-C3	89.20	
	.100	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70352	92.60	70352-C3	102.70	
	.125 (1/8)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71160	84.60	71160-C3	94.70	
	.125 (1/8)	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958960	102.00	958960-C3	112.10	
	.125 (1/8)	3/16	3/8 (1x)	.084	I	8	3/8	2-1/2	806360	79.10	806360-C3	89.20	
	.125 (1/8)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22560	79.10	22560-C3	89.20	
	.125 (1/8)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70360	92.60	70360-C3	102.70	
	.156 (5/32)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71165	84.60	71165-C3	94.70	
	.156 (5/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22565	79.10	22565-C3	89.20	
	.156 (5/32)	3/16	1-1/8 (3x)	.084	I	8	3/8	3	70365	92.60	70365-C3	102.70	
	.187 (3/16)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71170	84.60	71170-C3	94.70	
	.187 (3/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22570	79.10	22570-C3	89.20	
	.187 (3/16)	3/16	1-1/8 (3x)	.084	I	8	3/8	3	70370	92.60	70370-C3	102.70	
	.250 (1/4)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71180	84.60	71180-C3	94.70	
	.250 (1/4)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22580	79.10	22580-C3	89.20	
	.250 (1/4)	3/16	1-1/8 (3x)	.084	I	8	3/8	3	70380	92.60	70380-C3	102.70	
	.312 (5/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22585	79.10	22585-C3	89.20	
	7/16	.031 (1/32)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71810	107.60	71810-C3	120.20
		.047 (3/64)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71820	105.60	71820-C3	118.20
		.062 (1/16)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71830	105.60	71830-C3	118.20
.078 (5/64)		7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71840	105.60	71840-C3	118.20	
.093 (3/32)		7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71850	105.60	71850-C3	118.20	
.125 (1/8)		7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71860	105.60	71860-C3	118.20	
.125 (1/8)		7/32	1-5/16 (3x)	.099	I	8	7/16	2-3/4	892960	119.40	892960-C3	132.00	
.156 (5/32)		7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71865	105.60	71865-C3	118.20	
.187 (3/16)		7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71870	105.60	71870-C3	118.20	
.187 (3/16)		7/32	1-5/16 (3x)	.099	I	8	7/16	2-3/4	892970	119.40	892970-C3	132.00	
.250 (1/4)		7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71880	105.60	71880-C3	118.20	
.250 (1/4)		7/32	1-5/16 (3x)	.099	I	8	7/16	2-3/4	892980	119.40	892980-C3	132.00	
1/2		.015 (1/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22603	107.50	22603-C3	122.60
	.020	5/32	1/4 (.5x)	.162	II	8	1/2	3	71205	113.80	71205-C3	128.90	
	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22605	107.50	22605-C3	122.60	
	.025	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22607	107.50	22607-C3	122.60	
	.025	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71507	120.80	71507-C3	135.90	
	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22609	107.50	22609-C3	122.60	
	.031 (1/32)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71210	110.30	71210-C3	125.40	
	.031 (1/32)	5/32	1/2 (1x)	.162	II	8	1/2	3	975710	111.80	975710-C3	126.90	
	.031 (1/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22610	104.00	22610-C3	119.10	
	.031 (1/32)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71510	117.50	71510-C3	132.60	

\*Radial DOC accounts for max transition radius at neck

continued on next page

# KEYSEAT CUTTERS

Square (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
									TOOL #	PRICE	TOOL #	PRICE
1/2	D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.0005"</sup> / <sub>-.0005"</sub>	L3 <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D2	L1				
	.035	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22612	104.00	22612-C3	119.10
	.039 (1 mm)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22614	104.00	22614-C3	119.10
	.040	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71215	110.30	71215-C3	125.40
	.040	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22615	104.00	22615-C3	119.10
	.040	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71515	117.50	71515-C3	132.60
	.045	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22618	104.00	22618-C3	119.10
	.045	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71518	117.50	71518-C3	132.60
	.047 (3/64)	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71220	110.30	71220-C3	125.40
	.047 (3/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22620	104.00	22620-C3	119.10
	.047 (3/64)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71520	117.50	71520-C3	132.60
	.050	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22622	104.00	22622-C3	119.10
	.050	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71522	117.50	71522-C3	132.60
	.055	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22625	104.00	22625-C3	119.10
	.055	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71525	117.50	71525-C3	132.60
	.060	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71228	110.30	71228-C3	125.40
	.060	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22628	104.00	22628-C3	119.10
	.062 (1/16)	.100	5/32 (.3x)	<b>.192</b>	III	12	1/2	3	985230	139.30	985230-C3	154.40
	.062 (1/16)	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71230	110.30	71230-C3	125.40
	.062 (1/16)	5/32	1/2 (1x)	<b>.162</b>	II	8	1/2	3	975730	130.80	975730-C3	145.90
	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22630	104.00	22630-C3	119.10
	.062 (1/16)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71530	117.50	71530-C3	132.60
	.070	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22635	104.00	22635-C3	119.10
	.078 (5/64)	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71240	110.30	71240-C3	125.40
	.078 (5/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22640	104.00	22640-C3	119.10
	.078 (5/64)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71540	117.50	71540-C3	132.60
	.080	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22642	104.00	22642-C3	119.10
	.090	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22647	104.00	22647-C3	119.10
	.093 (3/32)	.100	5/32 (.3x)	<b>.192</b>	III	12	1/2	3	985250	139.30	985250-C3	154.40
	.093 (3/32)	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71250	110.30	71250-C3	125.40
	.093 (3/32)	5/32	1/2 (1x)	<b>.162</b>	II	8	1/2	3	975750	130.80	975750-C3	145.90
	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22650	104.00	22650-C3	119.10
	.093 (3/32)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71550	117.50	71550-C3	132.60
	.100	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71252	110.30	71252-C3	125.40
	.100	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22652	104.00	22652-C3	119.10
	.100	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71552	117.50	71552-C3	132.60
	.103	Please see page 371 for Retaining Ring sizes.										
	.109 (7/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22654	104.00	22654-C3	119.10
	.118 (3 mm)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22657	104.00	22657-C3	119.10
	.118 (3 mm)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71557	117.50	71557-C3	132.60
	.120	Please see page 371 for Retaining Ring sizes.										
	.125 (1/8)	.100	5/32 (.3x)	<b>.192</b>	III	12	1/2	3	985260	139.30	985260-C3	154.40
	.125 (1/8)	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	71260	110.30	71260-C3	125.40
	.125 (1/8)	5/32	1/2 (1x)	<b>.162</b>	II	8	1/2	3	975760	130.80	975760-C3	145.90
	.125 (1/8)	1/4	1/2 (1x)	.115	I	8	1/2	3	806260	104.00	806260-C3	119.10
.125 (1/8)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22660	104.00	22660-C3	119.10	
.125 (1/8)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71560	117.50	71560-C3	132.60	
.125 (1/8)	1/4	2 (4x)	.115	I	8	1/2	4	933160	175.50	933160-C3	190.60	
.140 (9/64)	5/32	1/2 (1x)	<b>.162</b>	II	8	1/2	3	975762	130.80	975762-C3	145.90	
.140 (9/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22662	104.00	22662-C3	119.10	

KEYSEAT CUTTERS

\*Radial DOC accounts for max transition radius at neck

continued on next page

## KEYSEAT CUTTERS

Square (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.		UNCOATED		A1TiN COATED		
							D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+0.001"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X									
1/2	.156 (5/32)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71265	110.30	71265-C3	125.40	
	.156 (5/32)	5/32	1/2 (1x)	.162	II	8	1/2	3	975765	130.80	975765-C3	145.90	
	.156 (5/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22665	104.00	22665-C3	119.10	
	.156 (5/32)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71565	117.50	71565-C3	132.60	
	.187 (3/16)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71270	110.30	71270-C3	125.40	
	.187 (3/16)	5/32	1/2 (1x)	.162	II	8	1/2	3	975770	130.80	975770-C3	145.90	
	.187 (3/16)	1/4	1/2 (1x)	.115	I	8	1/2	3	806270	106.00	806270-C3	121.10	
	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22670	104.00	22670-C3	119.10	
	.187 (3/16)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71570	117.50	71570-C3	132.60	
	.250 (1/4)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71280	110.30	71280-C3	125.40	
	.250 (1/4)	5/32	1/2 (1x)	.162	II	8	1/2	3	975780	130.80	975780-C3	145.90	
	.250 (1/4)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22680	104.00	22680-C3	119.10	
	.250 (1/4)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71580	117.50	71580-C3	132.60	
	.312 (5/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22685	104.00	22685-C3	119.10	
	.312 (5/16)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71585	117.50	71585-C3	132.60	
.375 (3/8)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22687	104.00	22687-C3	119.10		
5/8	.031 (1/32)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70910	162.90	70910-C3	178.00	
	.031 (1/32)	5/16	2 (3x)	.146	I	8	5/8	3-1/2	972910	210.80	972910-C3	225.90	
	.047 (3/64)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70920	162.90	70920-C3	178.00	
	.062 (1/16)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70930	162.90	70930-C3	178.00	
	.078 (5/64)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70940	162.90	70940-C3	178.00	
	.093 (3/32)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950650	221.50	950650-C3	236.60	
	.093 (3/32)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70950	162.90	70950-C3	178.00	
	.093 (3/32)	5/16	2 (3x)	.146	I	8	5/8	4	972950	210.80	972950-C3	227.10	
	.120	Please see page 371 for Retaining Ring sizes.											
	.125 (1/8)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950660	221.50	950660-C3	236.60	
	.125 (1/8)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70960	162.90	70960-C3	178.00	
	.125 (1/8)	5/16	2 (3x)	.146	I	8	5/8	4	972960	210.80	972960-C3	227.10	
	.139	Please see page 371 for Retaining Ring sizes.											
	.156 (5/32)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950665	221.50	950665-C3	236.60	
	.156 (5/32)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70965	162.90	70965-C3	178.00	
	.156 (5/32)	5/16	2 (3x)	.146	I	8	5/8	4	972965	210.80	972965-C3	227.10	
	.187 (3/16)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950670	221.50	950670-C3	236.60	
	.187 (3/16)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70970	162.90	70970-C3	178.00	
	.187 (3/16)	5/16	2 (3x)	.146	I	8	5/8	4	972970	210.80	972970-C3	227.10	
	.250 (1/4)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950680	221.50	950680-C3	236.60	
.250 (1/4)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70980	162.90	70980-C3	178.00		
.250 (1/4)	5/16	2 (3x)	.146	I	8	5/8	4	972980	210.80	972980-C3	227.10		
.312 (5/16)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70985	162.90	70985-C3	178.00		
.375 (3/8)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70987	162.90	70987-C3	178.00		

\*Radial DOC accounts for max transition radius at neck

KEYSEAT CUTTERS

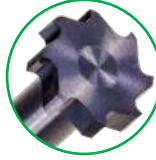
For reduced shank and greater radial depths of cut, please see  
 Reduced Shank Keyseat Cutters on pages 368, 376, 379, 384.

# KEYSEAT CUTTERS

## Square for Hardened Steels

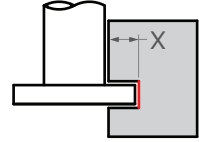


- Optimized for hardened steels 45-68Rc with high flute count and specialized internal geometry
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Both sides of cutter are dished for clearance
- Solid carbide
- CNC ground in the USA



High Flute Count and Specialized Internal Geometry

Standard Slotting (Type I)



CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	AlTiN NANO COATED	
									TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>		
<b>1/8</b>	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867415-C6	58.40
	.020	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867420-C6	58.40
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867431-C6	58.40
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867462-C6	58.40
	.093 (3/32)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867493-C6	58.40
<b>5/32</b>	.031 (1/32)	5/64	1/4 (1.5x)	.029	I	8	3/16	2	746631-C6	60.60
	.062 (1/16)	5/64	1/4 (1.5x)	.029	I	8	3/16	2	746662-C6	60.60
<b>3/16</b>	.020	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875920-C6	60.60
	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875931-C6	60.60
	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875962-C6	60.60
	.093 (3/32)	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875993-C6	60.60
	.125 (1/8)	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875995-C6	60.60 <span style="color: red;">NEW</span>
<b>1/4</b>	.015 (1/64)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860115-C6	68.40
	.020	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860120-C6	68.40
	.031 (1/32)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860131-C6	68.40
	.040	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860140-C6	68.40
	.047 (3/64)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860147-C6	68.40
	.062 (1/16)	1/8	1/4 (1x)	.048	I	8	1/4	2-1/2	743962-C6	68.40
	.062 (1/16)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860162-C6	68.40
	.062 (1/16)	1/8	3/4 (3x)	.048	I	8	1/4	2-1/2	742830-C6	71.50
	.078 (5/64)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860178-C6	68.40
	.093 (3/32)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860193-C6	68.40
	.125 (1/8)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860195-C6	68.40
<b>5/16</b>	.031 (1/32)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855610-C6	90.60
	.062 (1/16)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855630-C6	90.60
	.093 (3/32)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855650-C6	90.60
	.125 (1/8)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855660-C6	90.60
	.156 (5/32)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855665-C6	90.60
<b>3/8</b>	.031 (1/32)	3/16	9/16 (1.5x)	.074	I	10	3/8	3	894710-C6	102.00
	.062 (1/16)	3/16	9/16 (1.5x)	.074	I	10	3/8	3	894730-C6	102.00
	.093 (3/32)	3/16	9/16 (1.5x)	.074	I	10	3/8	3	894750-C6	102.00
	.100	3/16	9/16 (1.5x)	.074	I	10	3/8	3	894752-C6	102.00
	.125 (1/8)	3/16	9/16 (1.5x)	.074	I	10	3/8	3	894760-C6	102.00
	.187 (3/16)	3/16	9/16 (1.5x)	.074	I	10	3/8	3	894770-C6	102.00
	.250 (1/4)	3/16	9/16 (1.5x)	.074	I	10	3/8	3	894780-C6	102.00

\*Radial DOC accounts for max transition radius at neck

continued on next page

KEYSEAT CUTTERS

## KEYSEAT CUTTERS

Square for Hardened Steels (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	AITIN NANO COATED	
									TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>		
1/2	.031 (1/32)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891310-C6	138.60
	.047 (3/64)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891320-C6	138.60
	.062 (1/16)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891330-C6	138.60
	.078 (5/64)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891340-C6	138.60
	.093 (3/32)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891350-C6	138.60
	.125 (1/8)	1/4	1/2 (1x)	.105	I	10	1/2	3	744760-C6	138.60
	.125 (1/8)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891360-C6	138.60
	.125 (1/8)	1/4	1-1/2 (3x)	.105	I	10	1/2	3	748260-C6	141.70
	.156 (5/32)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891365-C6	138.60
	.187 (3/16)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891370-C6	138.60
	.250 (1/4)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891380-C6	138.60
NEW NEW NEW 5/8	.125 (1/8)	5/16	1 (1.5x)	.137	I	10	5/8	3-1/2	744360-C6	210.50
	.187 (3/16)	5/16	1 (1.5x)	.137	I	10	5/8	3-1/2	744370-C6	210.50
	.250 (1/4)	5/16	1 (1.5x)	.137	I	10	5/8	3-1/2	744380-C6	210.50

\*Radial DOC accounts for max transition radius at neck

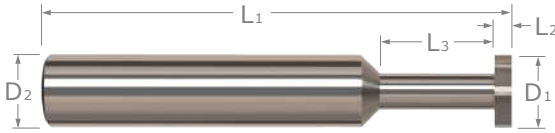


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# KEYSEAT CUTTERS

## Square for Non-Ferrous Materials

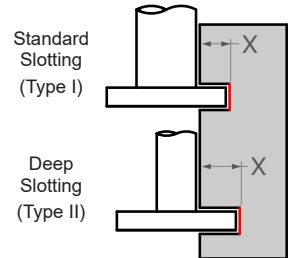


- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Large flute opening and sharper cutting edge
- Offered with TiB<sub>2</sub> coating to minimize galling
- Both sides of cutter are dished for clearance
- Solid carbide
- CNC ground in the USA



Large Flute Opening & Sharper Cutting Edge

Stocked in Multiple Radial Depths of Cut!



KEYSEAT CUTTERS

CUTTER DIA. D <sub>1</sub>	CUTTER WIDTH L <sub>2</sub>	NECK DIA. L <sub>3</sub>	NECK LENGTH L <sub>1</sub>	RADIAL DOC* X	TYPE	FLUTES	SHANK		UNCOATED		TiB <sub>2</sub> COATED	
							DIA. D <sub>2</sub>	OAL L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
3/32	.015 (1/64)	3/64	9/64 (1.5x)	.021	I	3	1/8	1-1/2	849815	51.20	849815-C8	58.80
	.031 (1/32)	3/64	9/64 (1.5x)	.021	I	3	1/8	1-1/2	849831	51.20	849831-C8	58.80
	.062 (1/16)	3/64	9/64 (1.5x)	.021	I	3	1/8	1-1/2	849862	52.20	849862-C8	59.80
1/8	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962915	51.20	962915-C8	58.80
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962931	51.20	962931-C8	58.80
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962962	51.20	962962-C8	58.80
	.093 (3/32)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962993	51.20	962993-C8	58.80
5/32	.031 (1/32)	5/64	1/4 (1.5x)	.029	I	4	3/16	2	744031	54.10	744031-C8	61.70
	.062 (1/16)	5/64	1/4 (1.5x)	.029	I	4	3/16	2	744062	54.10	744062-C8	61.70
3/16	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998031	53.10	998031-C8	60.70
	.047 (3/64)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998047	53.10	998047-C8	60.70
	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998062	53.10	998062-C8	60.70
	.125 (1/8)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998095	53.10	998095-C8	60.70
1/4	.015 (1/64)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970315	58.90	970315-C8	67.10
	.020	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970320	58.90	970320-C8	67.10
	.025	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970325	58.90	970325-C8	67.10
	.031 (1/32)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970331	58.90	970331-C8	67.10
	.040	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970340	58.90	970340-C8	67.10
	.047 (3/64)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970347	58.90	970347-C8	67.10
	.060	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970360	58.90	970360-C8	67.10
	.062 (1/16)	5/64	1/8 (.5x)	.076	II	4	1/4	2-1/2	909262	62.60	909262-C8	70.80
	.062 (1/16)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970362	58.90	970362-C8	67.10
	.078 (5/64)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970378	58.90	970378-C8	67.10
	.093 (3/32)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970393	58.90	970393-C8	67.10
	.125 (1/8)	5/64	1/8 (.5x)	.076	II	4	1/4	2-1/2	909295	62.60	909295-C8	70.80
.125 (1/8)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970395	58.90	970395-C8	67.10	

\*Radial DOC accounts for max transition radius at neck

continued on next page

## KEYSEAT CUTTERS

Square for Non-Ferrous Materials (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.		UNCOATED		TiB <sub>2</sub> COATED	
							OAL	D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #
D <sub>1</sub> $^{+.000}$ / $_{-.002}$ "	L <sub>2</sub> $^{+.0005}$ / $_{-.0005}$ "		L <sub>3</sub> $^{+.020}$ / $_{-.000}$ "	X			D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
5/16	.031 (1/32)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984310	80.80	984310-C8	98.20
	.062 (1/16)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984330	80.80	984330-C8	98.20
	.093 (3/32)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984350	80.80	984350-C8	98.20
	.125 (1/8)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984360	80.80	984360-C8	98.20
3/8	.031 (1/32)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975210	90.30	975210-C8	111.40
	.047 (3/64)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975220	90.30	975220-C8	111.40
	.062 (1/16)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975230	90.30	975230-C8	111.40
	.078 (5/64)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975240	90.30	975240-C8	111.40
	.093 (3/32)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975250	90.30	975250-C8	111.40
	.125 (1/8)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975260	90.30	975260-C8	111.40
	.187 (3/16)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975270	90.30	975270-C8	111.40
1/2	.031 (1/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988910	119.00	988910-C8	143.80
	.047 (3/64)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988920	119.00	988920-C8	143.80
	.062 (1/16)	5/32	1/4 (.5x)	.162	II	6	1/2	3	917530	124.70	917530-C8	149.50
	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988930	119.00	988930-C8	143.80
	.078 (5/64)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988940	119.00	988940-C8	143.80
	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988950	119.00	988950-C8	143.80
	.125 (1/8)	5/32	1/4 (.5x)	.162	II	6	1/2	3	917560	124.70	917560-C8	149.50
	.125 (1/8)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988960	119.00	988960-C8	143.80
	.156 (5/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988965	119.00	988965-C8	143.80
	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988970	119.00	988970-C8	143.80
	.250 (1/4)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988980	119.00	988980-C8	143.80
5/8	.062 (1/16)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891730	170.60	891730-C8	206.70
	.078 (5/64)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891740	170.60	891740-C8	206.70
	.093 (3/32)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891750	173.90	891750-C8	210.00
	.125 (1/8)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891760	170.60	891760-C8	206.70
	.187 (3/16)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891770	170.60	891770-C8	206.70
	.250 (1/4)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891780	170.60	891780-C8	206.70

\*Radial DOC accounts for max transition radius at neck



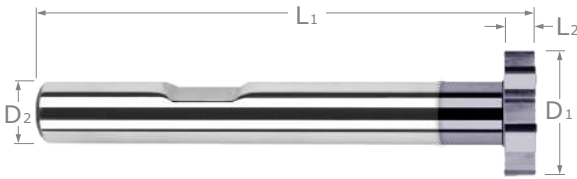
"We didn't have time to have a form tool ground for this job so we did a 3D under cut with a corner radius keyway cutter from @harveytool. Harvey Tool makes some of the best odd size tools out there."

— @hdhmfmg

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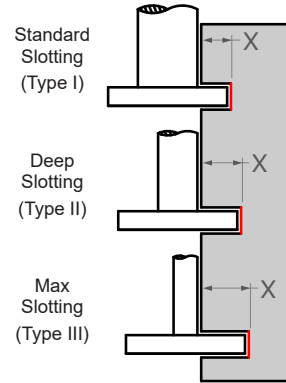
# KEYSEAT CUTTERS

## Square – Reduced Shank



- Solid carbide head brazed onto a steel shank
- Both sides of cutter are dished for clearance
- Weldon flat
- CNC ground in the USA

Stocked in Multiple Radial Depths of Cut!



KEYSEAT CUTTERS

CUTTER DIAMETER	CUTTER WIDTH	RADIAL DOC**	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED		
							TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>	X			D <sub>2</sub>	L <sub>1</sub>					
1/2	.031 (1/32)	.115	I	8	1/4*	3-1/32	849305	92.50	849305-C3	107.20	
	.062 (1/16)	.115	I	8	1/4*	3-1/16	849320	92.50	849320-C3	107.60	
	.093 (3/32)	.115	I	8	1/4*	3-3/32	849340	92.50	849340-C3	107.60	
	.125 (1/8)	.115	I	8	1/4*	3-1/8	849350	92.50	849350-C3	107.60	
	.187 (3/16)	.115	I	8	1/4*	3-3/16	849360	92.50	849360-C3	107.60	
	.250 (1/4)	.115	I	8	1/4*	3-1/4	849370	92.50	849370-C3	107.60	
3/4	.031 (1/32)	<b>.240</b>	III	10	1/4*	3-1/32	899805	124.90	899805-C3	141.20	
	.031 (1/32)	<b>.177</b>	II	10	3/8	3-1/32	984505	115.90	984505-C3	132.20	
	.031 (1/32)	.115	I	10	1/2	3-1/32	52005	111.30	52005-C3	127.60	
	.040	<b>.177</b>	II	10	3/8	3.040	984508	115.90	984508-C3	132.20	
	.040	.115	I	10	1/2	3.040	52008	111.30	52008-C3	127.60	
	.047 (3/64)	<b>.240</b>	III	10	1/4*	3-3/64	899810	124.90	899810-C3	141.20	
	.047 (3/64)	<b>.177</b>	II	10	3/8	3-3/64	984510	115.90	984510-C3	132.20	
	.047 (3/64)	.115	I	10	1/2	3-3/64	52010	111.30	52010-C3	127.60	
	.050	.115	I	10	1/2	3.050	52011	111.30	52011-C3	127.60	
	.060	.115	I	10	1/2	3.060	52019	111.30	52019-C3	127.60	
	.062 (1/16)	<b>.240</b>	III	10	1/4*	3-1/16	899820	124.90	899820-C3	141.20	
	.062 (1/16)	<b>.177</b>	II	10	3/8	3-1/16	984520	115.90	984520-C3	132.20	
	.062 (1/16)	.115	I	10	1/2	3-1/16	52020	111.30	52020-C3	127.60	
	.078 (5/64)	<b>.177</b>	II	10	3/8	3-5/64	984530	115.90	984530-C3	132.20	
	.078 (5/64)	.115	I	10	1/2	3-5/64	52030	111.30	52030-C3	127.60	
	.093 (3/32)	<b>.240</b>	III	10	1/4*	3-3/32	899840	124.90	899840-C3	141.20	
	.093 (3/32)	<b>.177</b>	II	10	3/8	3-3/32	984540	115.90	984540-C3	132.20	
	.093 (3/32)	.115	I	10	1/2	3-3/32	52040	111.30	52040-C3	127.60	
	.100	.115	I	10	1/2	3.100	52045	111.30	52045-C3	127.60	
	.118 (3 mm)	.115	I	10	1/2	3.118	52048	111.30	52048-C3	127.60	
	.125 (1/8)	<b>.177</b>	II	10	3/8	3-1/8	984550	115.90	984550-C3	132.20	
	.125 (1/8)	.115	I	10	1/2	3-1/8	52050	111.30	52050-C3	127.60	
	.156 (5/32)	<b>.177</b>	II	10	3/8	3-5/32	984555	115.90	984555-C3	132.20	
	.156 (5/32)	.115	I	10	1/2	3-5/32	52055	111.30	52055-C3	127.60	
	.174	Please see page 371 for Retaining Ring sizes.									
	.187 (3/16)	<b>.177</b>	II	10	3/8	3-3/16	984560	115.90	984560-C3	132.20	
	.187 (3/16)	.115	I	10	1/2	3-3/16	52060	111.30	52060-C3	127.60	

\*No Weldon Flat \*\*Radial DOC Accounts for max transition radius at neck

continued on next page



# KEYSEAT CUTTERS

Square – Reduced Shank (cont.)

continued from previous page

CUTTER DIAMETER	CUTTER WIDTH	RADIAL DOC**	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED		
							TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.001"</sup> / <sub>-0.001"</sub>	X			D <sub>2</sub>	L <sub>1</sub>					
<b>3/4</b>	.236 (6 mm)	.115	I	10	1/2	3.236	52066	120.80	52066-C3	137.10	
	.250 (1/4)	<b>.177</b>	II	10	3/8	3-1/4	984570	130.00	984570-C3	146.30	
	.250 (1/4)	.115	I	10	1/2	3-1/4	52070	125.60	52070-C3	141.90	
	.312 (5/16)	.115	I	10	1/2	3-5/16	52080	148.00	52080-C3	172.80	
	.375 (3/8)	.115	I	10	1/2	3-3/8	52090	154.30	52090-C3	179.10	
<b>7/8</b>	.062 (1/16)	.177	I	12	1/2	3-1/16	961020	119.00	961020-C3	135.30	
	.093 (3/32)	.177	I	12	1/2	3-3/32	961040	119.00	961040-C3	135.30	
	.125 (1/8)	<b>.240</b>	II	12	3/8	3-1/8	890650	123.10	890650-C3	139.40	
	.125 (1/8)	.177	I	12	1/2	3-1/8	961050	119.00	961050-C3	135.30	
	.187 (3/16)	<b>.240</b>	II	12	3/8	3-3/16	890660	123.10	890660-C3	139.40	
	.187 (3/16)	.177	I	12	1/2	3-3/16	961060	119.00	961060-C3	135.30	
	.250 (1/4)	<b>.240</b>	II	12	3/8	3-1/4	890670	137.00	890670-C3	153.30	
	.250 (1/4)	.177	I	12	1/2	3-1/4	961070	132.40	961070-C3	148.70	
	.312 (5/16)	.177	I	12	1/2	3-5/16	961080	148.00	961080-C3	164.30	
.375 (3/8)	.177	I	12	1/2	3-3/8	961090	154.30	961090-C3	170.60		
<b>1</b>	.031 (1/32)	<b>.365</b>	III	12	1/4*	3-1/32	914905	145.60	914905-C3	170.40	
	.031 (1/32)	<b>.302</b>	II	12	3/8	3-1/32	982005	129.50	982005-C3	154.30	
	.031 (1/32)	.240	I	12	1/2	3-1/32	55905	125.20	55905-C3	150.00	
	.040	.240	I	12	1/2	3.040	55908	125.20	55908-C3	150.00	
	.047 (3/64)	<b>.365</b>	III	12	1/4*	3-3/64	914910	145.60	914910-C3	170.40	
	.047 (3/64)	<b>.302</b>	II	12	3/8	3-3/64	982010	129.50	982010-C3	154.30	
	.047 (3/64)	.240	I	12	1/2	3-3/64	55910	125.20	55910-C3	150.00	
	.062 (1/16)	<b>.365</b>	III	12	1/4*	3-1/16	914920	145.60	914920-C3	170.40	
	.062 (1/16)	<b>.302</b>	II	12	3/8	3-1/16	982020	129.50	982020-C3	154.30	
	.062 (1/16)	.240	I	12	1/2	3-1/16	55920	125.20	55920-C3	150.00	
	.078 (5/64)	<b>.365</b>	III	12	1/4*	3-5/64	914930	145.60	914930-C3	170.40	
	.078 (5/64)	<b>.302</b>	II	12	3/8	3-5/64	982030	129.50	982030-C3	154.30	
	.078 (5/64)	.240	I	12	1/2	3-5/64	55930	125.20	55930-C3	150.00	
	.093 (3/32)	<b>.365</b>	III	12	1/4*	3-3/32	914940	145.60	914940-C3	170.40	
	.093 (3/32)	<b>.302</b>	II	12	3/8	3-3/32	982040	129.50	982040-C3	154.30	
	.093 (3/32)	.240	I	12	1/2	3-3/32	55940	125.20	55940-C3	150.00	
	.125 (1/8)	<b>.365</b>	III	12	1/4*	3-1/8	914950	145.60	914950-C3	170.40	
	.125 (1/8)	<b>.302</b>	II	12	3/8	3-1/8	982050	129.50	982050-C3	154.30	
	.125 (1/8)	.240	I	12	1/2	3-1/8	55950	125.20	55950-C3	150.00	
	.156 (5/32)	<b>.302</b>	II	12	3/8	3-5/32	982055	129.50	982055-C3	154.30	
	.156 (5/32)	.240	I	12	1/2	3-5/32	55955	125.20	55955-C3	150.00	
	.187 (3/16)	<b>.302</b>	II	12	3/8	3-3/16	982060	129.50	982060-C3	154.30	
	.187 (3/16)	.240	I	12	1/2	3-3/16	55960	125.20	55960-C3	150.00	
	.209	Please see page 371 for Retaining Ring sizes.									
	.250 (1/4)	<b>.302</b>	II	12	3/8	3-1/4	982070	143.70	982070-C3	168.50	
	.250 (1/4)	.240	I	12	1/2	3-1/4	55970	138.90	55970-C3	163.70	
	.312 (5/16)	<b>.302</b>	II	12	3/8	3-5/16	982080	153.30	982080-C3	178.10	
	.312 (5/16)	.240	I	12	1/2	3-5/16	55980	148.00	55980-C3	172.80	
	.375 (3/8)	<b>.302</b>	II	12	3/8	3-3/8	982090	145.10	982090-C3	169.90	
	.375 (3/8)	.240	I	12	1/2	3-3/8	55990	154.30	55990-C3	179.10	
	.500 (1/2)	.240	I	12	1/2	3-1/2	55995	160.50	55995-C3	185.30	

KEYSEAT CUTTERS

\*No Weldon Flat \*\*Radial DOC Accounts for max transition radius at neck

continued on next page

## KEYSEAT CUTTERS

## Square – Reduced Shank (cont.)

continued from previous page

CUTTER DIAMETER	CUTTER WIDTH	RADIAL DOC**	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
<b>1-1/8</b>	.125 (1/8)	.177	I	14	3/4	3-3/8	741750	146.20	741750-C3	175.50
	.250 (1/4)	.177	I	14	3/4	3-1/2	741770	163.60	741770-C3	194.70
<b>1-1/4</b>	.093 (3/32)	.240	I	14	3/4	3-11/32	973940	158.50	973940-C3	189.60
	.125 (1/8)	<b>.365</b>	II	14	1/2	3-1/8	879950	160.90	879950-C3	187.10
	.125 (1/8)	.240	I	14	3/4	3-3/8	973950	155.50	973950-C3	179.70
	.250 (1/4)	<b>.365</b>	II	14	1/2	3-1/4	879970	162.40	879970-C3	187.10
	.250 (1/4)	.240	I	14	3/4	3-1/2	973970	173.00	973970-C3	189.00
	.375 (3/8)	.240	I	14	3/4	3-5/8	973990	186.50	973990-C3	217.60
	.500 (1/2)	.240	I	14	3/4	3-3/4	973995	186.50	973995-C3	217.60
<b>1-1/2</b>	.062 (1/16)	<b>.490</b>	II	16	1/2	3-1/16	887020	171.20	887020-C3	202.30
	.062 (1/16)	.365	I	16	3/4	3-5/16	962020	165.60	962020-C3	196.70
	.093 (3/32)	.365	I	16	3/4	3-11/32	962040	165.60	962040-C3	196.70
	.125 (1/8)	<b>.552</b>	III	16	3/8	3-1/8	868750	179.70	868750-C3	210.80
	.125 (1/8)	<b>.490</b>	II	16	1/2	3-1/8	887050	171.20	887050-C3	202.30
	.125 (1/8)	.365	I	16	3/4	3-3/8	962050	165.60	962050-C3	196.70
	.187 (3/16)	<b>.552</b>	III	16	3/8	3-3/16	868760	179.70	868760-C3	210.80
	.187 (3/16)	<b>.490</b>	II	16	1/2	3-3/16	887060	171.20	887060-C3	202.30
	.187 (3/16)	.365	I	16	3/4	3-7/16	962060	165.60	962060-C3	196.70
	.250 (1/4)	<b>.490</b>	II	16	1/2	3-1/4	887070	184.20	887070-C3	215.30
	.250 (1/4)	.365	I	16	3/4	3-1/2	962070	178.10	962070-C3	209.20
	.312 (5/16)	.365	I	16	3/4	3-9/16	962080	204.80	962080-C3	235.90
	.375 (3/8)	.365	I	16	3/4	3-5/8	962090	230.00	962090-C3	261.10
	.437 (7/16)	.365	I	16	3/4	3-11/16	962093	253.70	962093-C3	284.80
	.500 (1/2)	.365	I	16	3/4	3-3/4	962095	267.40	962095-C3	298.50

NEW

NEW

\*No Weldon Flat \*\*Radial DOC Accounts for max transition radius at neck

## Check Out Our New CNC Show!

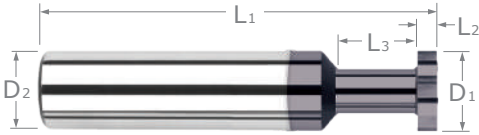


Join Harvey Performance Company National Applications Engineer Don Grandt as he dives into specific cutting tool topics, answering the questions machinists ask most, to help you accomplish more at the spindle.

[YOUTUBE.COM/INTHELOUPETV](https://www.youtube.com/intheloupetv)

## KEYSEAT CUTTERS

## Retaining Ring Keyseats



Designed for  
Milling Retaining /  
Snap Ring Grooves

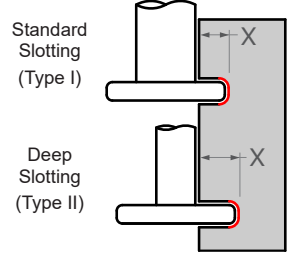
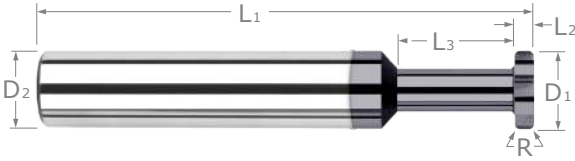
- Designed to mill proper slot widths for common retaining ring sizes
- Cutter diameter, neck length, radial, and axial depths of cut optimized for internal retaining ring grooves per ANSI standards
- Both sides of cutter are dished for clearance
- Solid carbide
- CNC ground in the USA

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC**	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D1 $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L2 $\begin{smallmatrix} +.002" \\ -.000" \end{smallmatrix}$		L3 $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$			D2	L1				
<b>3/16</b>	.018 .029	1/8 1/8	1/8 1/8	.021 .021	6 6	3/16 3/16	2 2	23504 23508	50.20 50.20	23504-C3 23508-C3	55.80 55.80
<b>1/4</b>	.039 .046	5/32 5/32	5/32 5/32	.037 .037	6 6	1/4 1/4	2-1/2 2-1/2	23512 23516	59.40 59.40	23512-C3 23516-C3	67.00 67.00
<b>5/16</b>	.056	3/16	3/16	.052	6	5/16	2-1/2	23520	71.10	23520-C3	80.00
<b>3/8</b>	.068 .086	3/16 3/16	1/4 1/4	.084 .084	8 8	3/8 3/8	2-1/2 2-1/2	23524 23528	82.90 82.90	23524-C3 23528-C3	93.00 93.00
<b>1/2</b>	.103 .120	1/4 1/4	5/16 3/8	.115 .115	8 8	1/2 1/2	3 3	23532 23536	91.30 91.30	23532-C3 23536-C3	106.40 106.40
<b>5/8</b>	.120 .139	5/16 5/16	1/2 1/2	.146 .146	8 8	5/8 5/8	3-1/2 3-1/2	23540 23544	169.90 169.90	23540-C3 23544-C3	185.00 185.00
<b>3/4</b>	.174	-	-	.177	10	3/8	3.174	23548*	122.70	23548-C3*	139.00
<b>1</b>	.209	-	-	.240	12	1/2	3.209	23564*	146.90	23564-C3*	171.70

\*Carbide head with reduced steel shank \*\*Radial DOC accounts for max transition at neck

# KEYSEAT CUTTERS

## Corner Radius



- Both sides of cutter are dished for clearance
- Corner radius for improved strength
- Solid carbide
- CNC ground in the USA

CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK		UNCOATED		AIRTIN COATED	
								DIA.	OAL	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
<b>1/16</b>	.015 (1/64)	<b>.005</b>	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	910615	59.40	910615-C3	64.60
	.020	<b>.005</b>	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	910620	59.40	910620-C3	64.60
	.031 (1/32)	<b>.005</b>	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	910631	59.40	910631-C3	64.60
<b>3/32</b>	.031 (1/32)	<b>.005</b>	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	902531	57.90	902531-C3	63.10
	.031 (1/32)	<b>.010</b>	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	909131	57.90	909131-C3	63.10
	.062 (1/16)	<b>.005</b>	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	902562	57.90	902562-C3	63.10
	.062 (1/16)	<b>.010</b>	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	909162	57.90	909162-C3	63.10
<b>1/8</b>	.015 (1/64)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965115	56.30	965115-C3	61.50
	.020	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965120	56.30	965120-C3	61.50
	.025	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965125	56.30	965125-C3	61.50
	.031 (1/32)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965131	56.30	965131-C3	61.50
	.031 (1/32)	<b>.010</b>	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	837631	66.90	837631-C3	72.10
	.040	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965140	56.30	965140-C3	61.50
	.047 (3/64)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965147	56.30	965147-C3	61.50
	.062 (1/16)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965162	56.30	965162-C3	61.50
	.062 (1/16)	<b>.010</b>	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	837662	66.90	837662-C3	72.10
	.062 (1/16)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	985962	56.30	985962-C3	61.50
	.078 (5/64)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	985978	57.40	985978-C3	62.60
	.093 (3/32)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	985993	56.30	985993-C3	61.50
.093 (3/32)	<b>.015</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	960793	57.40	960793-C3	62.60	
<b>3/16</b>	.015 (1/64)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954715	58.20	954715-C3	63.80
	.020	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954720	58.20	954720-C3	63.80
	.025	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954725	58.20	954725-C3	63.80
	.031 (1/32)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954731	58.20	954731-C3	63.80
	.040	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954740	58.20	954740-C3	63.80
	.047 (3/64)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954747	58.20	954747-C3	63.80
	.062 (1/16)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954762	58.20	954762-C3	63.80
	.062 (1/16)	<b>.010</b>	1/16	3/32 (.5x)	<b>.052</b>	II	6	3/16	2	837262	69.40	837262-C3	75.00
	.062 (1/16)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949962	58.20	949962-C3	63.80
	.062 (1/16)	<b>.015</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	937762	58.20	937762-C3	63.80
	.078 (5/64)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949978	58.20	949978-C3	63.80
	.093 (3/32)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949993	58.20	949993-C3	63.80
	.093 (3/32)	<b>.015</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	937793	58.20	937793-C3	63.80
	.125 (1/8)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949995	58.20	949995-C3	63.80
.125 (1/8)	<b>.015</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	937795	58.20	937795-C3	63.80	

\*Radial DOC accounts for max transition radius at neck

continued on next page

KEYSEAT CUTTERS

## KEYSEAT CUTTERS

Corner Radius (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK		UNCOATED		AITIN COATED	
								DIA.	OAL	TOOL #	PRICE	TOOL #	PRICE
1/4	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
	.015 (1/64)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981115	64.30	981115-C3	71.90
	.020	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981120	64.30	981120-C3	71.90
	.025	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981125	64.30	981125-C3	71.90
	.031 (1/32)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981131	64.30	981131-C3	71.90
	.031 (1/32)	.005	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	916631	76.00	916631-C3	83.60
	.031 (1/32)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972631	64.30	972631-C3	71.90
	.040	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981140	64.30	981140-C3	71.90
	.047 (3/64)	.005	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	777147	75.30	777147-C3	82.90
	.047 (3/64)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981147	64.30	981147-C3	71.90
	.047 (3/64)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972647	64.30	972647-C3	71.90
	.047 (3/64)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968447	64.30	968447-C3	71.90
	.050	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981150	64.30	981150-C3	71.90
	.060	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972660	64.30	972660-C3	71.90
	.062 (1/16)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981162	63.10	981162-C3	70.70
	.062 (1/16)	.010	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	911762	75.30	911762-C3	82.90
	.062 (1/16)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972662	63.10	972662-C3	70.70
	.062 (1/16)	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	900062	74.80	900062-C3	82.40
	.062 (1/16)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968462	63.10	968462-C3	70.70
	.078 (5/64)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972678	64.30	972678-C3	71.90
	.093 (3/32)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981193	63.10	981193-C3	70.70
	.093 (3/32)	.010	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	911793	75.30	911793-C3	82.90
	.093 (3/32)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972693	63.10	972693-C3	70.70
	.093 (3/32)	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	900093	74.80	900093-C3	82.40
	.093 (3/32)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968493	63.10	968493-C3	70.70
	.093 (3/32)	.030	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	904593	63.10	904593-C3	70.70
	.125 (1/8)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981195	63.10	981195-C3	70.70
	.125 (1/8)	.010	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	911795	75.30	911795-C3	82.90
	.125 (1/8)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972695	63.10	972695-C3	70.70
	.125 (1/8)	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	900095	74.80	900095-C3	82.40
	.125 (1/8)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968495	63.10	968495-C3	70.70
	.125 (1/8)	.020	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	776795	63.10	776795-C3	70.70
	.125 (1/8)	.030	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	904595	63.10	904595-C3	70.70
.187 (3/16)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972697	63.10	972697-C3	70.70	
.187 (3/16)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968497	63.10	968497-C3	70.70	
5/16	.031 (1/32)	.005	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	931610	92.60	931610-C3	101.50
	.031 (1/32)	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	921110	92.60	921110-C3	101.50
	.062 (1/16)	.005	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	931630	92.60	931630-C3	101.50
	.062 (1/16)	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	921130	92.60	921130-C3	101.50
	.093 (3/32)	.010	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	776850	95.90	776850-C3	104.80
	.093 (3/32)	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	921150	92.60	921150-C3	101.50
	.093 (3/32)	.015	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	927750	92.60	927750-C3	101.50
	.093 (3/32)	.020	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	776550	92.60	776550-C3	101.50

\*Radial DOC accounts for max transition radius at neck

continued on next page

KEYSEAT CUTTERS

# KEYSEAT CUTTERS

## Corner Radius (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
										TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+ .000"</sup> / <sub>-.002"</sub>	L2 <sup>+ .0005"</sup> / <sub>-.0005"</sub>	R <sup>+ .001"</sup> / <sub>-.001"</sub>		L3 <sup>+ .020"</sup> / <sub>-.000"</sub>	X			D2	L1				
3/8	.031 (1/32)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987210	95.20	987210-C3	105.30
	.047 (3/64)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987220	95.20	987220-C3	105.30
	.062 (1/16)	.005	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	836830	98.70	836830-C3	108.80
	.062 (1/16)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987230	93.30	987230-C3	103.40
	.062 (1/16)	.010	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	916830	99.60	916830-C3	109.70
	.062 (1/16)	.010	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981630	93.30	981630-C3	103.40
	.062 (1/16)	.010	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	793730	94.70	793730-C3	104.80
	.062 (1/16)	.015	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	903330	99.60	903330-C3	109.70
	.062 (1/16)	.015	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970030	93.30	970030-C3	103.40
	.078 (5/64)	.010	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981640	95.20	981640-C3	105.30
	.093 (3/32)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987250	93.30	987250-C3	103.40
	.093 (3/32)	.010	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	916850	99.60	916850-C3	109.70
	.093 (3/32)	.010	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981650	93.30	981650-C3	103.40
	.093 (3/32)	.010	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	793750	94.70	793750-C3	104.80
	.093 (3/32)	.015	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	903350	99.60	903350-C3	109.70
	.093 (3/32)	.015	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970050	93.30	970050-C3	103.40
	.093 (3/32)	.030	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905950	93.30	905950-C3	103.40
	.125 (1/8)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987260	93.30	987260-C3	103.40
	.125 (1/8)	.010	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	916860	99.60	916860-C3	109.70
	.125 (1/8)	.010	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981660	93.30	981660-C3	103.40
	.125 (1/8)	.015	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	903360	99.60	903360-C3	109.70
	.125 (1/8)	.015	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970060	93.30	970060-C3	103.40
	.125 (1/8)	.020	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	776460	93.30	776460-C3	103.40
	.125 (1/8)	.030	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	857960	99.60	857960-C3	109.70
	.125 (1/8)	.030	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905960	93.30	905960-C3	103.40
	.156 (5/32)	.015	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970065	97.00	970065-C3	107.10
	.156 (5/32)	.030	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905965	97.00	905965-C3	107.10
	.187 (3/16)	.010	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981670	95.20	981670-C3	105.30
.187 (3/16)	.015	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970070	95.20	970070-C3	105.30	
.187 (3/16)	.030	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905970	95.20	905970-C3	105.30	
.250 (1/4)	.015	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970080	95.20	970080-C3	105.30	
.250 (1/4)	.030	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905980	95.20	905980-C3	105.30	
1/2	.020	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976005	122.90	976005-C3	138.00
	.025	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976007	120.60	976007-C3	135.70
	.031 (1/32)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976010	120.60	976010-C3	135.70
	.031 (1/32)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987710	120.60	987710-C3	135.70
	.040	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976015	120.60	976015-C3	135.70
	.047 (3/64)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976020	120.60	976020-C3	135.70
	.047 (3/64)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987720	120.60	987720-C3	135.70
	.062 (1/16)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976030	118.50	976030-C3	133.60
	.062 (1/16)	.010	5/32	1/4 (.5x)	.162	II	8	1/2	3	901030	124.20	901030-C3	139.30
	.062 (1/16)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987730	118.50	987730-C3	133.60
	.062 (1/16)	.015	5/32	1/4 (.5x)	.162	II	8	1/2	3	913430	124.20	913430-C3	139.30
	.062 (1/16)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990330	118.50	990330-C3	133.60
	.062 (1/16)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933730	118.50	933730-C3	133.60
	.078 (5/64)	.010	5/32	1/4 (.5x)	.162	II	8	1/2	3	901040	126.50	901040-C3	141.60
	.078 (5/64)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987740	120.60	987740-C3	135.70

KEYSEAT CUTTERS

\*Radial DOC accounts for max transition radius at neck

continued on next page

## KEYSEAT CUTTERS

Corner Radius (cont.)

continued from previous page

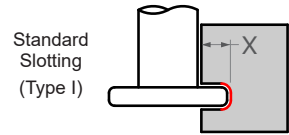
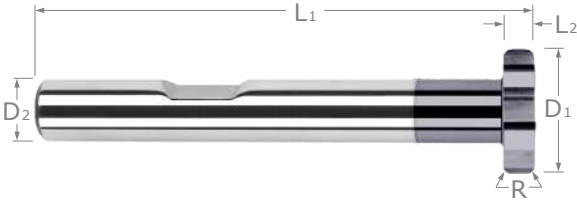
CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK		UNCOATED		AIRTIN COATED	
								DIA.	OAL	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
1/2	.078 (5/64)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990340	120.60	990340-C3	135.70
	.093 (3/32)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976050	118.50	976050-C3	133.60
	.093 (3/32)	.010	5/32	1/4 (.5x)	.162	II	8	1/2	3	901050	124.20	901050-C3	139.30
	.093 (3/32)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987750	118.50	987750-C3	133.60
	.093 (3/32)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990350	118.50	990350-C3	133.60
	.093 (3/32)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933750	118.50	933750-C3	133.60
	.093 (3/32)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969150	120.60	969150-C3	135.70
	.125 (1/8)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976060	118.50	976060-C3	133.60
	.125 (1/8)	.010	5/32	1/4 (.5x)	.162	II	8	1/2	3	901060	124.20	901060-C3	139.30
	.125 (1/8)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987760	118.50	987760-C3	133.60
	.125 (1/8)	.010	1/4	1-1/2 (3x)	.115	I	8	1/2	3	793960	119.80	793960-C3	134.90
	.125 (1/8)	.015	5/32	1/4 (.5x)	.162	II	8	1/2	3	913460	124.20	913460-C3	139.30
	.125 (1/8)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990360	118.50	990360-C3	133.60
	.125 (1/8)	.020	5/32	1/4 (.5x)	.162	II	8	1/2	3	777060	124.20	777060-C3	139.30
	.125 (1/8)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933760	118.50	933760-C3	133.60
	.125 (1/8)	.030	5/32	1/4 (.5x)	.162	II	8	1/2	3	926660	124.20	926660-C3	139.30
	.125 (1/8)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969160	120.60	969160-C3	135.70
	.125 (1/8)	.040	1/4	3/4 (1.5x)	.115	I	8	1/2	3	838060	120.60	838060-C3	135.70
	.156 (5/32)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987765	123.70	987765-C3	138.80
	.156 (5/32)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990365	123.70	990365-C3	138.80
	.187 (3/16)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987770	120.60	987770-C3	135.70
	.187 (3/16)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990370	120.60	990370-C3	135.70
	.187 (3/16)	.015	1/4	1-1/2 (3x)	.115	I	8	1/2	3	792870	121.80	792870-C3	136.90
	.187 (3/16)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933770	120.60	933770-C3	135.70
	.187 (3/16)	.030	5/32	1/4 (.5x)	.162	II	8	1/2	3	926670	143.80	926670-C3	158.90
	.187 (3/16)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969170	120.60	969170-C3	135.70
	.187 (3/16)	.060	1/4	3/4 (1.5x)	.115	I	8	1/2	3	926170	122.80	926170-C3	137.90
	.250 (1/4)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987780	118.50	987780-C3	133.60
.250 (1/4)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990380	118.50	990380-C3	133.60	
.250 (1/4)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933780	118.50	933780-C3	133.60	
.250 (1/4)	.030	5/32	1/4 (.5x)	.162	II	8	1/2	3	926680	124.20	926680-C3	139.30	
.250 (1/4)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969180	118.50	969180-C3	133.60	
.250 (1/4)	.045	1/4	3/4 (1.5x)	.115	I	8	1/2	3	929580	118.50	929580-C3	133.60	
.250 (1/4)	.060	1/4	3/4 (1.5x)	.115	I	8	1/2	3	926180	118.50	926180-C3	133.60	
5/8	.125 (1/8)	.010	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	903960	177.40	903960-C3	192.50
	.125 (1/8)	.015	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	911160	177.40	911160-C3	192.50
	.125 (1/8)	.030	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	908560	177.40	908560-C3	192.50
	.187 (3/16)	.010	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	903970	177.40	903970-C3	192.50
	.187 (3/16)	.015	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	911170	177.40	911170-C3	192.50
	.187 (3/16)	.030	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	908570	177.40	908570-C3	192.50
	.250 (1/4)	.010	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	903980	177.40	903980-C3	192.50
	.250 (1/4)	.015	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	911180	177.40	911180-C3	192.50
.250 (1/4)	.030	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	908580	177.40	908580-C3	192.50	

\*Radial DOC accounts for max transition radius at neck

For reduced shank and greater radial depths of cut, please see  
 Reduced Shank Keyseat Cutters on pages 368, 376, 379, 385.

# KEYSEAT CUTTERS

## Corner Radius – Reduced Shank



- Solid carbide head brazed onto a steel shank
- Both sides of cutter are dished for clearance
- Corner radius for improved strength
- Weldon flat
- CNC ground in the USA

CUTTER DIAMETER	CUTTER WIDTH	CORNER RADIUS	RADIAL DOC*	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	X			$D_2$	$L_1$				
3/4	.031 (1/32)	.005	.177	I	10	3/8	3-1/32	841505	126.10	841505-C3	142.40
	.062 (1/16)	.005	.177	I	10	3/8	3-1/16	841520	126.10	841520-C3	142.40
	.062 (1/16)	.010	.177	I	10	3/8	3-1/16	923820	126.10	923820-C3	142.40
	.078 (5/64)	.005	.177	I	10	3/8	3-5/64	841530	128.50	841530-C3	144.80
	.078 (5/64)	.010	.177	I	10	3/8	3-5/64	923830	126.10	923830-C3	142.40
	.093 (3/32)	.005	.177	I	10	3/8	3-3/32	841540	126.10	841540-C3	142.40
	.093 (3/32)	.010	.177	I	10	3/8	3-3/32	923840	126.10	923840-C3	142.40
	.093 (3/32)	.030	.177	I	10	3/8	3-3/32	905240	126.10	905240-C3	142.40
	.125 (1/8)	.005	.177	I	10	3/8	3-1/8	841550	126.10	841550-C3	142.40
	.125 (1/8)	.010	.177	I	10	3/8	3-1/8	923850	126.10	923850-C3	142.40
	.125 (1/8)	.015	.177	I	10	3/8	3-1/8	840950	126.10	840950-C3	142.40
	.125 (1/8)	.030	.177	I	10	3/8	3-1/8	905250	126.10	905250-C3	142.40
	.187 (3/16)	.010	.177	I	10	3/8	3-3/16	923860	133.60	923860-C3	149.90
	.187 (3/16)	.015	.177	I	10	3/8	3-3/16	840960	133.60	840960-C3	149.90
	.187 (3/16)	.030	.177	I	10	3/8	3-3/16	905260	133.60	905260-C3	149.90
	.250 (1/4)	.010	.177	I	10	3/8	3-1/4	923870	140.60	923870-C3	156.90
.250 (1/4)	.015	.177	I	10	3/8	3-1/4	840970	140.60	840970-C3	156.90	
.250 (1/4)	.030	.177	I	10	3/8	3-1/4	905270	140.60	905270-C3	156.90	
.250 (1/4)	.060	.177	I	10	3/8	3-1/4	894070	145.30	894070-C3	161.60	
1	.031 (1/32)	.005	.240	I	12	1/2	3-1/32	840305	142.50	840305-C3	167.30
	.062 (1/16)	.005	.240	I	12	1/2	3-1/16	840320	139.80	840320-C3	164.60
	.062 (1/16)	.010	.240	I	12	1/2	3-1/16	918520	139.80	918520-C3	164.60
	.078 (5/64)	.005	.240	I	12	1/2	3-5/64	840330	142.50	840330-C3	167.30
	.078 (5/64)	.010	.240	I	12	1/2	3-5/64	918530	139.80	918530-C3	164.60
	.093 (3/32)	.005	.240	I	12	1/2	3-3/32	840340	142.50	840340-C3	167.30
	.093 (3/32)	.010	.240	I	12	1/2	3-3/32	918540	139.80	918540-C3	164.60
	.093 (3/32)	.030	.240	I	12	1/2	3-3/32	910040	139.80	910040-C3	164.60
	.125 (1/8)	.005	.240	I	12	1/2	3-1/8	840350	139.80	840350-C3	164.60
	.125 (1/8)	.010	.240	I	12	1/2	3-1/8	918550	139.80	918550-C3	164.60
	.125 (1/8)	.015	.240	I	12	1/2	3-1/8	839750	139.80	839750-C3	164.60
	.125 (1/8)	.030	.240	I	12	1/2	3-1/8	910050	139.80	910050-C3	164.60
	.187 (3/16)	.010	.240	I	12	1/2	3-3/16	918560	147.50	918560-C3	172.30
	.187 (3/16)	.015	.240	I	12	1/2	3-3/16	839760	147.50	839760-C3	172.30
	.187 (3/16)	.030	.240	I	12	1/2	3-3/16	910060	147.50	910060-C3	172.30

\*Radial DOC accounts for max transition radius at neck

continued on next page

KEYSEAT CUTTERS



## KEYSEAT CUTTERS

## Corner Radius – Reduced Shank (cont.)

continued from previous page

CUTTER DIAMETER	CUTTER WIDTH	CORNER RADIUS	RADIAL DOC*	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
<b>1</b>	.250 (1/4)	<b>.010</b>	.240	I	12	1/2	3-1/4	918570	153.50	918570-C3	178.30
	.250 (1/4)	<b>.015</b>	.240	I	12	1/2	3-1/4	839770	153.50	839770-C3	178.30
	.250 (1/4)	<b>.030</b>	.240	I	12	1/2	3-1/4	910070	153.50	910070-C3	178.30
	.250 (1/4)	<b>.060</b>	.240	I	12	1/2	3-1/4	897570	153.50	897570-C3	178.30
	.375 (3/8)	<b>.010</b>	.240	I	12	1/2	3-3/8	918590	160.90	918590-C3	185.70
	.375 (3/8)	<b>.015</b>	.240	I	12	1/2	3-3/8	839790	160.90	839790-C3	185.70
	.375 (3/8)	<b>.030</b>	.240	I	12	1/2	3-3/8	910090	160.90	910090-C3	185.70
<b>1-1/2</b>	.125 (1/8)	<b>.010</b>	.365	I	16	3/4	3-3/8	839150	180.40	839150-C3	211.50
	.125 (1/8)	<b>.030</b>	.365	I	16	3/4	3-3/8	838550	180.40	838550-C3	211.50
	.187 (3/16)	<b>.010</b>	.365	I	16	3/4	3-7/16	839160	180.40	839160-C3	211.50
	.187 (3/16)	<b>.030</b>	.365	I	16	3/4	3-7/16	838560	180.40	838560-C3	211.50
	.250 (1/4)	<b>.010</b>	.365	I	16	3/4	3-1/2	839170	193.20	839170-C3	224.30
	.250 (1/4)	<b>.030</b>	.365	I	16	3/4	3-1/2	838570	193.20	838570-C3	224.30
	.375 (3/8)	<b>.010</b>	.365	I	16	3/4	3-5/8	839190	244.90	839190-C3	276.00
	.375 (3/8)	<b>.030</b>	.365	I	16	3/4	3-5/8	838590	244.90	838590-C3	276.00
	.500 (1/2)	<b>.010</b>	.365	I	16	3/4	3-3/4	839195	282.40	839195-C3	313.50
	.500 (1/2)	<b>.030</b>	.365	I	16	3/4	3-3/4	838595	282.40	838595-C3	313.50

\*Radial DOC accounts for max transition radius at neck

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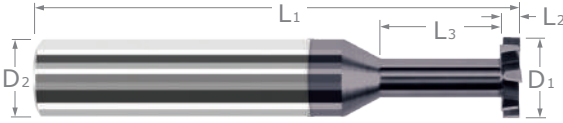
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# KEYSEAT CUTTERS

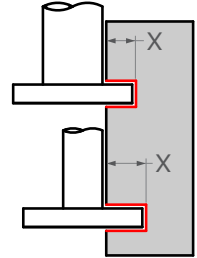
## Staggered Tooth - Square



Stacked in Multiple Radial Depths of Cut!

Standard Slotting (Type I)

Deep Slotting (Type II)



- Staggered tooth design with alternating RH / LH shear flutes, RH cut
- Relieved to allow cutting on both sides of head
- Design improves shearing action and finish while minimizing chip dragging and recutting and decreasing vibration
- Tool can be offset to increase width of groove
- Solid carbide • CNC ground in the USA

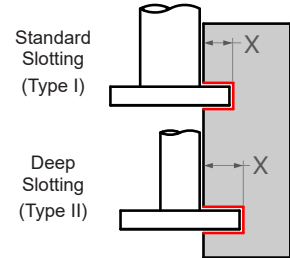
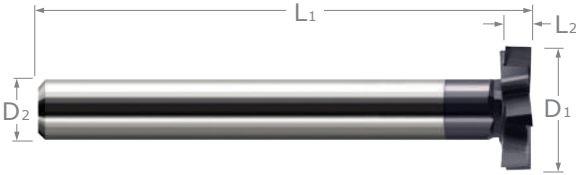
CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIRTIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.009"</sup> <sub>-.002"</sub>	L2 <sup>+0.005"</sup> <sub>-.0005"</sub>		L3 <sup>+0.020"</sup> <sub>-.000"</sub>	X			D2	L1				
<b>1/8</b>	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969815	64.00	969815-C3	69.20
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969831	64.00	969831-C3	69.20
	.047 (3/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969847	64.00	969847-C3	69.20
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969862	64.00	969862-C3	69.20
	.093 (3/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969893	65.20	969893-C3	70.40
<b>5/32</b>	.031 (1/32)	5/64	15/64 (1.5x)	.029	I	6	3/16	2	744831	76.20	744831-C3	81.80
	.062 (1/16)	5/64	15/64 (1.5x)	.029	I	6	3/16	2	744862	76.20	744862-C3	81.80
	.093 (3/32)	5/64	15/64 (1.5x)	.029	I	6	3/16	2	744893	76.20	744893-C3	81.80
<b>3/16</b>	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	907031	77.40	907031-C3	83.00
	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	907062	76.00	907062-C3	81.60
	.093 (3/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	907093	76.00	907093-C3	81.60
	.125 (1/8)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	907095	76.00	907095-C3	81.60
<b>1/4</b>	.031 (1/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972131	88.60	972131-C3	96.20
	.047 (3/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972147	88.60	972147-C3	96.20
	.062 (1/16)	5/64	1/8 (0.5x)	<b>.076</b>	II	6	1/4	2-1/2	878962	97.30	878962-C3	103.80
	.062 (1/16)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972162	88.60	972162-C3	96.20
	.093 (3/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972193	88.60	972193-C3	96.20
	.125 (1/8)	5/64	1/8 (0.5x)	<b>.076</b>	II	6	1/4	2-1/2	878995	99.40	878995-C3	107.00
<b>5/16</b>	.125 (1/8)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972195	88.60	972195-C3	96.20
	.062 (1/16)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	759530	109.40	759530-C3	118.30
	.093 (3/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	759550	111.50	759550-C3	120.40
<b>3/8</b>	.156 (5/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	759565	111.50	759565-C3	120.40
	.062 (1/16)	1/8	3/16 (0.5x)	<b>.115</b>	II	8	3/8	2-1/2	867330	118.60	867330-C3	128.70
	.062 (1/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915830	109.40	915830-C3	119.50
	.093 (3/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915850	109.40	915850-C3	119.50
	.125 (1/8)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915860	109.40	915860-C3	119.50
	.187 (3/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915870	109.40	915870-C3	119.50
<b>1/2</b>	.250 (1/4)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915880	109.40	915880-C3	119.50
	.062 (1/16)	5/32	1/4 (0.5x)	<b>.162</b>	II	8	1/2	3	895030	154.80	895030-C3	169.90
	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955630	142.40	955630-C3	157.50
	.078 (5/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955640	142.40	955640-C3	157.50
	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955650	142.40	955650-C3	157.50
	.125 (1/8)	5/32	1/4 (0.5x)	<b>.162</b>	II	8	1/2	3	895060	154.80	895060-C3	169.90
	.125 (1/8)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955660	142.40	955660-C3	157.50
	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955670	142.40	955670-C3	157.50
	.250 (1/4)	5/32	1/4 (0.5x)	<b>.162</b>	II	8	1/2	3	895080	154.80	895080-C3	169.90
<b>5/8</b>	.250 (1/4)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955680	142.40	955680-C3	157.50
	.125 (1/8)	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	904960	201.40	904960-C3	216.50
	.187 (3/16)	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	904970	201.40	904970-C3	216.50
	.250 (1/4)	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	904980	201.40	904980-C3	216.50

\*Radial DOC accounts for max transition radius at neck

KEYSEAT CUTTERS

## KEYSEAT CUTTERS

## Staggered Tooth – Square – Reduced Shank



- Staggered tooth design with alternating right-hand/left-hand shear flutes, right-hand cut
- Relieved to allow cutting on both sides of head
- Tool can be offset to increase width of groove
- Solid carbide construction for maximum rigidity
- CNC ground in the USA

CUTTER DIAMETER	CUTTER WIDTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	X			D2	L1				
<b>3/4</b>	.062 (1/16)	.178	II	10	3/8	3	773530	326.00	773530-C3	342.30
	.078 (5/64)	.178	II	10	3/8	3	773540	326.00	773540-C3	342.30
	.093 (3/32)	.178	II	10	3/8	3	773550	326.00	773550-C3	342.30
	.125 (1/8)	.178	II	10	3/8	3	773560	326.00	773560-C3	342.30
	.187 (3/16)	.178	II	10	3/8	3	773570	326.00	773570-C3	342.30
	.250 (1/4)	.178	II	10	3/8	3	773580	326.00	773580-C3	342.30
<b>1</b>	.062 (1/16)	.240	I	12	1/2	3-1/2	772430	371.30	772430-C3	396.10
	.078 (5/64)	.240	I	12	1/2	3-1/2	772440	371.30	772440-C3	396.10
	.093 (3/32)	.240	I	12	1/2	3-1/2	772450	371.30	772450-C3	396.10
	.125 (1/8)	.240	I	12	1/2	3-1/2	772460	371.30	772460-C3	396.10
	.187 (3/16)	.240	I	12	1/2	3-1/2	772470	371.30	772470-C3	396.10
	.250 (1/4)	.240	I	12	1/2	3-1/2	772480	371.30	772480-C3	396.10
<b>1-1/2</b>	.062 (1/16)	.365	I	16	3/4	3-1/2	771130	472.80	771130-C3	503.90
	.078 (5/64)	.365	I	16	3/4	3-1/2	771140	472.80	771140-C3	503.90
	.093 (3/32)	.365	I	16	3/4	3-1/2	771150	472.80	771150-C3	503.90
	.125 (1/8)	.365	I	16	3/4	3-1/2	771160	472.80	771160-C3	503.90
	.187 (3/16)	.365	I	16	3/4	3-1/2	771170	472.80	771170-C3	503.90
	.250 (1/4)	.365	I	16	3/4	3-1/2	771180	472.80	771180-C3	503.90

\*Radial DOC Accounts for max transition radius at neck

KEYSEAT CUTTERS

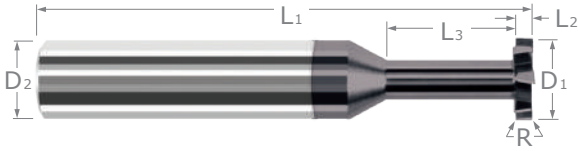


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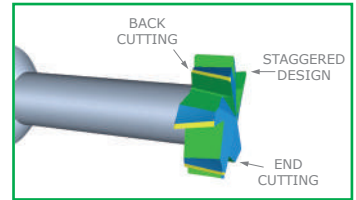
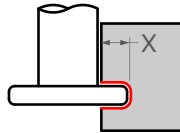
## Staggered Tooth – Corner Radius



**Staggered Tooth Design for Optimal Performance**

- Staggered tooth design with alternating RH / LH shear flutes, RH cut
- Design improves shearing action, minimizes chip dragging and recutting, decreases vibration, and improves side wall finish
- Relieved to allow cutting on both sides of head
- Tool can be offset to increase width of groove
- Corner radius for improved strength
- Solid carbide
- CNC ground in the USA

Standard Slotting (Type I)



KEYSEAT CUTTERS

CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.		UNCOATED		AIIIN COATED	
								D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> <sub>-.0005"</sub>	R <sup>+0.001"</sup> <sub>-.001"</sub>		L <sub>3</sub> <sup>+0.020"</sup> <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
<b>1/8</b>	.031 (1/32)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	43631	66.30	43631-C3	71.50
	.031 (1/32)	<b>.005</b>	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	989931	80.50	989931-C3	85.70
	.047 (3/64)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	43647	66.90	43647-C3	72.10
	.062 (1/16)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	43662	66.30	43662-C3	71.50
	.062 (1/16)	<b>.005</b>	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	989962	79.80	989962-C3	85.00
	.062 (1/16)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	44462	66.30	44462-C3	71.50
<b>3/16</b>	.031 (1/32)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	943531	73.50	943531-C3	79.10
	.047 (3/64)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	943547	73.50	943547-C3	79.10
	.062 (1/16)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	943562	73.50	943562-C3	79.10
	.062 (1/16)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	951762	73.50	951762-C3	79.10
<b>1/4</b>	.031 (1/32)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43831	91.60	43831-C3	99.20
	.031 (1/32)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44531	92.50	44531-C3	100.10
	.047 (3/64)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43847	91.60	43847-C3	99.20
	.047 (3/64)	<b>.005</b>	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	958047	106.00	958047-C3	113.60
	.062 (1/16)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43862	91.60	43862-C3	99.20
	.062 (1/16)	<b>.005</b>	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	958062	106.00	958062-C3	113.60
	.062 (1/16)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44562	91.60	44562-C3	99.20
	.093 (3/32)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43893	91.60	43893-C3	99.20
	.093 (3/32)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44593	92.50	44593-C3	100.10
	.125 (1/8)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43895	91.60	43895-C3	99.20
.125 (1/8)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44595	91.60	44595-C3	99.20	
<b>3/8</b>	.031 (1/32)	<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	967210	118.80	967210-C3	128.90
	.062 (1/16)	<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	967230	118.80	967230-C3	128.90
	.062 (1/16)	<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970930	118.80	970930-C3	128.90
	.093 (3/32)	<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	967250	118.80	967250-C3	128.90
	.093 (3/32)	<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970950	118.80	970950-C3	128.90
	.125 (1/8)	<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	967260	118.80	967260-C3	128.90
	.125 (1/8)	<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970960	118.80	970960-C3	128.90

\*Radial DOC accounts for max transition radius at neck

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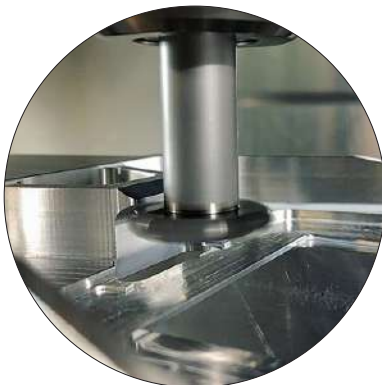
## KEYSEAT CUTTERS

## Staggered Tooth – Corner Radius (cont.)

continued from previous page

CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.		UNCOATED		AISI COATED	
								D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	R <sup>+0.001"</sup> / <sub>-0.001"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>	X								
1/2	.062 (1/16)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44330	147.20	44330-C3	162.30
	.062 (1/16)	.005	1/4	1-1/2 (3x)	.115	I	8	1/2	3	976730	162.90	976730-C3	178.00
	.062 (1/16)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44630	147.20	44630-C3	162.30
	.062 (1/16)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921330	147.20	921330-C3	162.30
	.093 (3/32)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44350	147.20	44350-C3	162.30
	.093 (3/32)	.005	1/4	1-1/2 (3x)	.115	I	8	1/2	3	976750	162.90	976750-C3	178.00
	.093 (3/32)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44650	147.20	44650-C3	162.30
	.093 (3/32)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921350	147.20	921350-C3	162.30
	.125 (1/8)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44360	147.20	44360-C3	162.30
	.125 (1/8)	.005	1/4	1-1/2 (3x)	.115	I	8	1/2	3	976760	162.90	976760-C3	178.00
	.125 (1/8)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44660	147.20	44660-C3	162.30
	.125 (1/8)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921360	147.20	921360-C3	162.30
	.187 (3/16)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44370	147.20	44370-C3	162.30
	.187 (3/16)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44670	147.20	44670-C3	162.30
	.250 (1/4)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44380	147.20	44380-C3	162.30
	.250 (1/4)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44680	147.20	44680-C3	162.30
.250 (1/4)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921380	147.20	921380-C3	162.30	
5/8	.125 (1/8)	.005	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	860460	208.00	860460-C3	223.10
	.125 (1/8)	.010	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	872960	208.00	872960-C3	223.10
	.187 (3/16)	.005	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	860470	208.00	860470-C3	223.10
	.187 (3/16)	.010	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	872970	208.00	872970-C3	223.10
	.250 (1/4)	.005	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	860480	208.00	860480-C3	223.10
	.250 (1/4)	.010	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	872980	208.00	872980-C3	223.10

\*Radial DOC accounts for max transition radius at neck



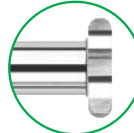
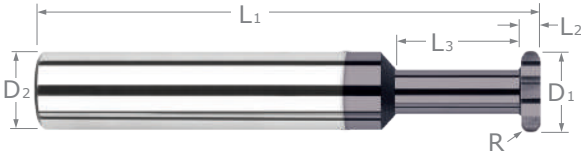
## Keyseat Cutter Considerations

With more than 1,800 individual keyseat cutter in the Harvey Tool catalog, there are certainly many different options to choose from. Learn which style is best for your machining operation in our "In the Loupe" blog post **Keyseat Cutter Considerations**.

[Read more on harveyperformance.com/in-the-loupe/](https://www.harveyperformance.com/in-the-loupe/)

# KEYSEAT CUTTERS

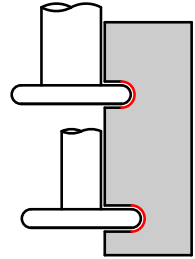
## Full Radius



Full Radius

Standard Slotting (Type I)

Deep Slotting (Type II)



- Ground form relieved (can be reground without losing radius)
- Both sides of cutter are dished for clearance
- Solid carbide • CNC ground in the USA

RADIUS	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
										TOOL #	PRICE	TOOL #	PRICE
R <sup>+0.001"</sup> / <sub>-.001"</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
.0075	<b>3/32</b>	.015 (1/64)	3/64	9/64 (1.5x)	.020	I	4	1/8	1-1/2	976907	81.30	976907-C3	86.50
.0075	<b>1/8</b>	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	67507	84.40	67507-C3	89.60
.0075	<b>1/4</b>	.015 (1/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67707	104.40	67707-C3	112.00
.0100	<b>3/32</b>	.020	3/64	9/64 (1.5x)	.020	I	4	1/8	1-1/2	976910	78.30	976910-C3	83.50
.0100	<b>1/8</b>	.020	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	67510	81.30	67510-C3	86.50
.0100	<b>5/32</b>	.020	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965310	85.40	965310-C3	91.00
.0100	<b>3/16</b>	.020	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68310	93.90	68310-C3	99.50
.0100	<b>1/4</b>	.020	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67710	101.00	67710-C3	108.60
.0100	<b>5/16</b>	.020	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944410	111.80	944410-C3	120.70
.0100	<b>3/8</b>	.020	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68410	120.10	68410-C3	130.20
.0156 (1/64)	<b>3/32</b>	.031 (1/32)	3/64	9/64 (1.5x)	.020	I	4	1/8	1-1/2	976915	69.80	976915-C3	75.00
.0156 (1/64)	<b>1/8</b>	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	67515	72.30	67515-C3	77.50
.0156 (1/64)	<b>1/8</b>	.031 (1/32)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	895215	77.10	895215-C3	82.30
.0156 (1/64)	<b>5/32</b>	.031 (1/32)	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965315	85.40	965315-C3	91.00
.0156 (1/64)	<b>3/16</b>	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68315	85.60	68315-C3	91.20
.0156 (1/64)	<b>3/16</b>	.031 (1/32)	3/32	9/16 (3x)	.037	I	6	3/16	2	924415	100.10	924415-C3	105.70
.0156 (1/64)	<b>1/4</b>	.031 (1/32)	5/64	1/8 (.5x)	<b>.076</b>	II	6	1/4	2-1/2	953915	96.60	953915-C3	104.20
.0156 (1/64)	<b>1/4</b>	.031 (1/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43315	92.10	43315-C3	99.70
.0156 (1/64)	<b>1/4</b>	.031 (1/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	971415	106.70	971415-C3	114.30
.0156 (1/64)	<b>5/16</b>	.031 (1/32)	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944415	102.40	944415-C3	111.30
.0156 (1/64)	<b>3/8</b>	.031 (1/32)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68415	111.00	68415-C3	121.10
.0156 (1/64)	<b>1/2</b>	.031 (1/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67915	114.50	67915-C3	129.60
.0200	<b>1/8</b>	.040	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	67520	72.30	67520-C3	77.50
.0200	<b>5/32</b>	.040	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965320	85.40	965320-C3	91.00
.0200	<b>3/16</b>	.040	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68320	85.60	68320-C3	91.20
.0200	<b>3/16</b>	.040	3/32	9/16 (3x)	.037	I	6	3/16	2	924420	100.10	924420-C3	105.70
.0200	<b>1/4</b>	.040	5/64	1/8 (.5x)	<b>.076</b>	II	6	1/4	2-1/2	953920	96.60	953920-C3	104.20
.0200	<b>1/4</b>	.040	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67720	93.00	67720-C3	100.60
.0200	<b>1/4</b>	.040	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	971420	106.70	971420-C3	114.30
.0200	<b>5/16</b>	.040	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944420	102.40	944420-C3	111.30
.0200	<b>3/8</b>	.040	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68420	112.10	68420-C3	122.20
.0200	<b>3/8</b>	.040	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968520	126.10	968520-C3	136.20
.0200	<b>1/2</b>	.040	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67920	115.00	67920-C3	130.10
.0250	<b>3/16</b>	.050	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68325	85.60	68325-C3	91.20
.0250	<b>1/4</b>	.050	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67725	93.00	67725-C3	100.60
.0250	<b>3/8</b>	.050	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68425	112.10	68425-C3	122.20
.0300	<b>5/32</b>	.060	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965330	85.40	965330-C3	91.00
.0300	<b>3/16</b>	.060	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68330	85.60	68330-C3	91.20
.0300	<b>1/4</b>	.060	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67730	93.00	67730-C3	100.60

\*Radial DOC accounts for max transition radius at neck

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KEYSEAT CUTTERS

## KEYSEAT CUTTERS

Full Radius (cont.)

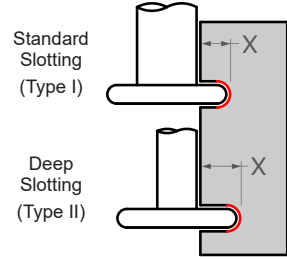
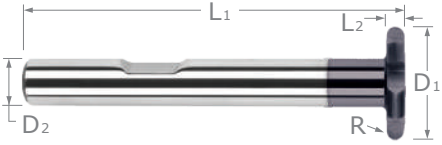
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RADIUS	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.		UNCOATED		A1TiN COATED	
								D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
R <sup>+0.001"</sup> -0.001"	D <sub>1</sub> <sup>+0.000"</sup> -0.002"	L <sub>2</sub>		L <sub>3</sub> <sup>+0.020"</sup> -0.000"	X			D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.0312 (1/32)	<b>3/16</b>	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68331	85.60	68331-C3	91.20
.0312 (1/32)	<b>3/16</b>	.062 (1/16)	3/32	9/16 (3x)	.037	I	6	3/16	2	924431	100.10	924431-C3	105.70
.0312 (1/32)	<b>1/4</b>	.062 (1/16)	5/64	1/8 (.5x)	<b>.076</b>	II	6	1/4	2-1/2	953931	96.60	953931-C3	104.20
.0312 (1/32)	<b>1/4</b>	.062 (1/16)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43331	92.10	43331-C3	99.70
.0312 (1/32)	<b>1/4</b>	.062 (1/16)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	971431	106.70	971431-C3	114.30
.0312 (1/32)	<b>5/16</b>	.062 (1/16)	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944431	102.40	944431-C3	111.30
.0312 (1/32)	<b>3/8</b>	.062 (1/16)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68431	111.00	68431-C3	121.10
.0312 (1/32)	<b>1/2</b>	.062 (1/16)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898531	120.40	898531-C3	135.50
.0312 (1/32)	<b>1/2</b>	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67931	114.50	67931-C3	129.60
.0312 (1/32)	<b>1/2</b>	.062 (1/16)	1/4	1-1/2 (3x)	.115	I	6	1/2	3-1/2	942731	124.90	942731-C3	140.00
.0312 (1/32)	<b>5/8</b>	.062 (1/16)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43431	187.50	43431-C3	202.60
.0394 (1 mm)	<b>1/4</b>	.078 (2 mm)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67739	93.00	67739-C3	100.60
.0394 (1 mm)	<b>5/16</b>	.078 (2 mm)	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944439	103.70	944439-C3	112.60
.0394 (1 mm)	<b>3/8</b>	.078 (2 mm)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	43339	112.10	43339-C3	122.20
.0394 (1 mm)	<b>3/8</b>	.078 (2 mm)	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968539	126.10	968539-C3	136.20
.0394 (1 mm)	<b>1/2</b>	.078 (2 mm)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67939	115.00	67939-C3	130.10
.0469 (3/64)	<b>1/4</b>	.093 (3/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67747	92.10	67747-C3	99.70
.0469 (3/64)	<b>5/16</b>	.093 (3/32)	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944447	102.40	944447-C3	111.30
.0469 (3/64)	<b>3/8</b>	.093 (3/32)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	43347	111.00	43347-C3	121.10
.0469 (3/64)	<b>3/8</b>	.093 (3/32)	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968547	126.10	968547-C3	136.20
.0469 (3/64)	<b>1/2</b>	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67947	114.50	67947-C3	129.60
.0469 (3/64)	<b>5/8</b>	.093 (3/32)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43447	187.50	43447-C3	202.60
.0500	<b>3/8</b>	.100	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68450	115.90	68450-C3	126.00
.0500	<b>1/2</b>	.100	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67950	131.10	67950-C3	146.20
.0590 (1.5 mm)	<b>5/16</b>	.118 (3 mm)	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944459	103.70	944459-C3	112.60
.0590 (1.5 mm)	<b>3/8</b>	.118 (3 mm)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68459	112.10	68459-C3	122.20
.0590 (1.5 mm)	<b>1/2</b>	.118 (3 mm)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67959	115.00	67959-C3	130.10
.0625 (1/16)	<b>5/16</b>	.125 (1/8)	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944462	102.40	944462-C3	111.30
.0625 (1/16)	<b>3/8</b>	.125 (1/8)	1/8	3/16 (.5x)	<b>.115</b>	II	6	3/8	2-1/2	949262	116.40	949262-C3	126.50
.0625 (1/16)	<b>3/8</b>	.125 (1/8)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	43362	111.00	43362-C3	121.10
.0625 (1/16)	<b>3/8</b>	.125 (1/8)	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968562	126.10	968562-C3	136.20
.0625 (1/16)	<b>1/2</b>	.125 (1/8)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898562	120.40	898562-C3	135.50
.0625 (1/16)	<b>1/2</b>	.125 (1/8)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67962	114.50	67962-C3	129.60
.0625 (1/16)	<b>1/2</b>	.125 (1/8)	1/4	1-1/2 (3x)	.115	I	6	1/2	3-1/2	942762	159.20	942762-C3	174.30
.0625 (1/16)	<b>5/8</b>	.125 (1/8)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43462	187.50	43462-C3	202.60
.0781 (5/64)	<b>3/8</b>	.156 (5/32)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68478	111.00	68478-C3	121.10
.0781 (5/64)	<b>1/2</b>	.156 (5/32)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898578	121.00	898578-C3	136.10
.0781 (5/64)	<b>1/2</b>	.156 (5/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	43378	115.00	43378-C3	130.10
.0781 (5/64)	<b>5/8</b>	.156 (5/32)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43478	187.50	43478-C3	202.60
.0937 (3/32)	<b>1/2</b>	.187 (3/16)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898593	121.00	898593-C3	136.10
.0937 (3/32)	<b>1/2</b>	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	43393	115.00	43393-C3	130.10
.0937 (3/32)	<b>1/2</b>	.187 (3/16)	1/4	1-1/2 (3x)	.115	I	6	1/2	3-1/2	942793	134.30	942793-C3	149.40
.0937 (3/32)	<b>5/8</b>	.187 (3/16)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43493	187.50	43493-C3	202.60
.1181 (3 mm)	<b>5/8</b>	.236 (6 mm)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	4343M	187.50	4343M-C3	202.60
.1250 (1/8)	<b>5/8</b>	.250 (1/4)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43408	187.50	43408-C3	202.60
.1250 (1/8)	<b>5/8</b>	.250 (1/4)	.300	2 (3x)	.152	I	6	5/8	4	983008	211.60	983008-C3	227.90

\*Radial DOC accounts for max transition radius at neck

# KEYSEAT CUTTERS

## Full Radius – Reduced Shank



- Ground form relieved (can be reground without losing radius)
- 6 flutes • Both sides of cutter are dished for clearance
- Solid carbide head with steel shank
- Weldon flat • CNC ground in the USA

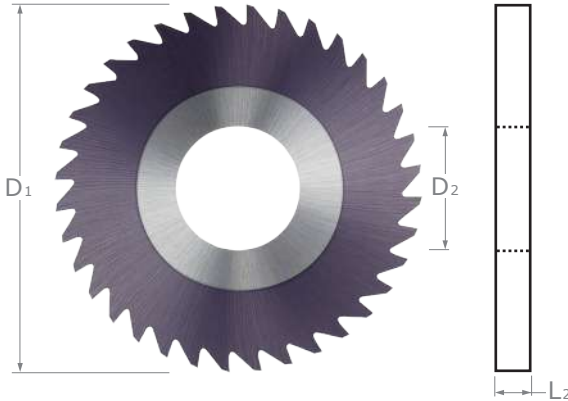
KEYSEAT CUTTERS

RADIUS	CUTTER DIAMETER	CUTTER WIDTH	RADIAL DOC*	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
							6 FL	PRICE	6 FL	PRICE
R $\begin{smallmatrix} +.001" \\ -.001" \end{smallmatrix}$	D1 $\begin{smallmatrix} +.010" \\ -.000" \end{smallmatrix}$	L2	X		D2	L1				
.0156 (1/64)	3/4	.031 (1/32)	.177	II	3/8	3-1/32	965415	159.80	965415-C3	176.10
.0156 (1/64)	3/4	.031 (1/32)	.115	I	1/2	3-1/32	32901	143.20	32901-C3	159.50
.0156 (1/64)	1	.031 (1/32)	.240	I	1/2	3-1/32	942615	157.20	942615-C3	182.00
.0200	3/4	.040	.115	I	1/2	3.040	959720	143.20	959720-C3	159.50
.0200	1	.040	.240	I	1/2	3.040	942620	157.20	942620-C3	182.00
.0300	3/4	.060	.177	II	3/8	3.060	965430	159.80	965430-C3	176.10
.0312 (1/32)	3/4	.062 (1/16)	.177	II	3/8	3-1/16	965431	159.80	965431-C3	176.10
.0312 (1/32)	3/4	.062 (1/16)	.115	I	1/2	3-1/16	32902	143.20	32902-C3	159.50
.0312 (1/32)	1	.062 (1/16)	.240	I	1/2	3-1/16	942631	157.20	942631-C3	182.00
.0394 (1 mm)	3/4	.078 (2 mm)	.115	I	1/2	3.078	3291M	143.20	3291M-C3	159.50
.0394 (1 mm)	1	.078 (2 mm)	.240	I	1/2	3.078	94261M	157.20	94261M-C3	182.00
.0469 (3/64)	3/4	.093 (3/32)	.177	II	3/8	3-3/32	965447	159.80	965447-C3	176.10
.0469 (3/64)	3/4	.093 (3/32)	.115	I	1/2	3-3/32	32903	143.20	32903-C3	159.50
.0469 (3/64)	1	.093 (3/32)	.240	I	1/2	3-3/32	942647	157.20	942647-C3	182.00
.0590 (1.5 mm)	3/4	.118 (3 mm)	.177	II	3/8	3.118	965459	159.80	965459-C3	176.10
.0625 (1/16)	3/4	.125 (1/8)	.177	II	3/8	3-1/8	965462	159.80	965462-C3	176.10
.0625 (1/16)	3/4	.125 (1/8)	.115	I	1/2	3-1/8	32904	143.20	32904-C3	159.50
.0625 (1/16)	1	.125 (1/8)	.302	II	3/8	3-1/8	937362	159.80	937362-C3	184.60
.0625 (1/16)	1	.125 (1/8)	.240	I	1/2	3-1/8	942662	157.20	942662-C3	182.00
.0781 (5/64)	3/4	.156 (5/32)	.115	I	1/2	3-5/32	959778	143.20	959778-C3	159.50
.0781 (5/64)	1	.156 (5/32)	.302	II	3/8	3-5/32	937378	162.50	937378-C3	187.30
.0781 (5/64)	1	.156 (5/32)	.240	I	1/2	3-5/32	32905	167.90	32905-C3	192.70
.0787 (2 mm)	3/4	.157 (4 mm)	.177	II	3/8	3.157	96542M	159.80	96542M-C3	176.10
.0787 (2 mm)	1	.157 (4 mm)	.240	I	1/2	3.157	3292M	167.90	3292M-C3	192.70
.0937 (3/32)	3/4	.187 (3/16)	.115	I	1/2	3-3/16	959793	143.20	959793-C3	159.50
.0937 (3/32)	1	.187 (3/16)	.302	II	3/8	3-3/16	937393	159.80	937393-C3	184.60
.0937 (3/32)	1	.187 (3/16)	.240	I	1/2	3-3/16	32906	167.90	32906-C3	192.70
.0937 (3/32)	1-1/2	.187 (3/16)	.365	I	3/4	3-11/16	850493	179.60	850493-C3	210.70
.1181 (3 mm)	1	.236 (6 mm)	.240	I	1/2	3.236	942694	167.90	942694-C3	188.70
.1250 (1/8)	1	.250 (1/4)	.302	II	3/8	3-1/4	937395	159.80	937395-C3	184.60
.1250 (1/8)	1	.250 (1/4)	.240	I	1/2	3-1/4	942695	167.90	942695-C3	192.70
.1250 (1/8)	1-1/4	.250 (1/4)	.365	II	1/2	3-1/4	848695	187.40	848695-C3	218.50
.1250 (1/8)	1-1/4	.250 (1/4)	.240	I	3/4	3-1/2	32908	188.60	32908-C3	219.70
.1250 (1/8)	1-1/2	.250 (1/4)	.365	I	3/4	3-3/4	850495	191.20	850495-C3	222.30
.1562 (5/32)	1-1/2	.312 (5/16)	.365	I	3/4	3-13/16	32910	231.10	32910-C3	262.20
.1875 (3/16)	1-3/8	.375 (3/8)	.302	I	3/4	3-5/8	32912	231.10	32912-C3	262.20
.2500 (1/4)	1-1/2	.500 (1/2)	.365	I	3/4	4	32916	255.90	32916-C3	287.00

\*Radial DOC accounts for max transition radius at neck



# SLITTING SAWS



◀ Fully stocked uncoated or AlTiN coated

- Sides of saw are dished for clearance
- Cutting on OD only
- No keyway or hub
- For use with standard saw arbors
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	THICKNESS	INSIDE DIAMETER	NUMBER OF TEETH	UNCOATED		AlTiN COATED	
				TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.000"</sub>	L <sub>2</sub> <sup>+0.00025"</sup> / <sub>-0.00025"</sub>	D <sub>2</sub> <sup>+0.0005"</sup> / <sub>+0.0001"</sub>					
<b>3/4</b>	.0100	1/4	18	SAG0100	63.40	SAG0100-C3	81.40
	.0156 (1/64)	1/4	18	SAG0156	63.40	SAG0156-C3	81.40
	.0200	1/4	18	SAG0200	63.40	SAG0200-C3	81.40
	.0312 (1/32)	1/4	18	SAG0312	63.40	SAG0312-C3	81.40
	.0400	1/4	18	SAG0400	63.40	SAG0400-C3	81.40
	.0625 (1/16)	1/4	18	SAG0625	56.30	SAG0625-C3	74.30
<b>1</b>	.0100	3/8	20	SAA0100	66.00	SAA0100-C3	87.70
	.0120	3/8	20	SAA0120	66.00	SAA0120-C3	87.70
	.0156 (1/64)	3/8	20	SAA0156	66.00	SAA0156-C3	87.70
	.0180	3/8	20	SAA0180	66.00	SAA0180-C3	87.70
	.0200	3/8	20	SAA0200	66.40	SAA0200-C3	88.10
	.0250	3/8	20	SAA0250	66.40	SAA0250-C3	88.10
	.0312 (1/32)	3/8	20	SAA0312	66.40	SAA0312-C3	88.10
	.0400	3/8	20	SAA0400	66.40	SAA0400-C3	88.10
	.0468 (3/64)	3/8	20	SAA0468	59.00	SAA0468-C3	80.70
.0625 (1/16)	3/8	20	SAA0625	59.00	SAA0625-C3	80.70	
<b>1-1/4</b>	.0100	3/8	24	SAB0100	78.60	SAB0100-C3	112.20
	.0156 (1/64)	3/8	24	SAB0156	78.60	SAB0156-C3	112.20
	.0200	3/8	24	SAB0200	73.60	SAB0200-C3	107.20
	.0312 (1/32)	3/8	24	SAB0312	73.60	SAB0312-C3	107.20
	.0625 (1/16)	3/8	24	SAB0625	73.60	SAB0625-C3	107.20
<b>1-1/2</b>	.0100	1/2	36	SAC0100	84.40	SAC0100-C3	118.00
	.0120	1/2	36	SAC0120	86.00	SAC0120-C3	119.60
	.0156 (1/64)	1/2	36	SAC0156	84.40	SAC0156-C3	118.00
	.0180	1/2	36	SAC0180	86.00	SAC0180-C3	119.60
	.0200	1/2	36	SAC0200	76.00	SAC0200-C3	109.60
	.0250	1/2	36	SAC0250	76.00	SAC0250-C3	109.60
	.0312 (1/32)	1/2	36	SAC0312	76.00	SAC0312-C3	109.60
	.0400	1/2	36	SAC0400	76.00	SAC0400-C3	109.60
	.0468 (3/64)	1/2	36	SAC0468	74.00	SAC0468-C3	107.60
	.0625 (1/16)	1/2	36	SAC0625	74.00	SAC0625-C3	107.60

SLITTING SAWS

continued on next page

## SLITTING SAWS

(cont.)

continued from previous page

CUTTER DIAMETER	THICKNESS	INSIDE DIAMETER	NUMBER OF TEETH	UNCOATED		AISI COATED	
				TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{matrix} +.005" \\ -.000" \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.00025" \\ -.00025" \end{matrix}$	D <sub>2</sub> $\begin{matrix} +.0005" \\ +.0001" \end{matrix}$					
<b>1-3/4</b>	.0100	1/2	38	SAD0100	102.90	SAD0100-C3	136.50
	.0156 (1/64)	1/2	38	SAD0156	102.90	SAD0156-C3	136.50
	.0200	1/2	38	SAD0200	90.40	SAD0200-C3	124.00
	.0312 (1/32)	1/2	38	SAD0312	90.40	SAD0312-C3	124.00
	.0625 (1/16)	1/2	38	SAD0625	98.50	SAD0625-C3	132.10
<b>2</b>	.0100	1/2	40	SAW0100	119.00	SAW0100-C3	152.60
	.0120	1/2	40	SAW0120	119.00	SAW0120-C3	152.60
	.0156 (1/64)	1/2	40	SAW0156	119.00	SAW0156-C3	152.60
	.0180	1/2	40	SAW0180	121.30	SAW0180-C3	154.90
	.0200	1/2	40	SAW0200	119.00	SAW0200-C3	152.60
	.0250	1/2	40	SAW0250	119.00	SAW0250-C3	152.60
	.0312 (1/32)	1/2	40	SAW0312	119.00	SAW0312-C3	152.60
	.0400	1/2	40	SAW0400	119.00	SAW0400-C3	152.60
	.0468 (3/64)	1/2	40	SAW0468	119.00	SAW0468-C3	152.60
	.0625 (1/16)	1/2	40	SAW0625	119.00	SAW0625-C3	152.60
.0937 (3/32)	1/2	40	SAW0937	119.00	SAW0937-C3	152.60	
.1250 (1/8)	1/2	40	SAW1250	149.60	SAW1250-C3	183.20	
<b>3</b>	.0200	1	72	SAE0200	184.80	SAE0200-C3	230.40
	.0312 (1/32)	1	72	SAE0312	184.80	SAE0312-C3	230.40
	.0625 (1/16)	1	72	SAE0625	208.10	SAE0625-C3	253.70
	.0937 (3/32)	1	72	SAE0937	266.20	SAE0937-C3	311.80
	.1250 (1/8)	1	72	SAE1250	303.50	SAE1250-C3	349.10
	.1875 (3/16)	1	72	SAE1875	386.20	SAE1875-C3	431.80
.2500 (1/4)	1	72	SAE2500	456.10	SAE2500-C3	501.70	
<b>4</b>	.0312 (1/32)	1	80	SAF0312	264.50	SAF0312-C3	323.20
	.0625 (1/16)	1	80	SAF0625	270.60	SAF0625-C3	329.30
	.0937 (3/32)	1	80	SAF0937	312.60	SAF0937-C3	371.30
	.1250 (1/8)	1	80	SAF1250	377.50	SAF1250-C3	436.20
	.1875 (3/16)	1	80	SAF1875	489.40	SAF1875-C3	548.10
	.2500 (1/4)	1	80	SAF2500	607.90	SAF2500-C3	666.60

For Saw Arbors, see page 504.

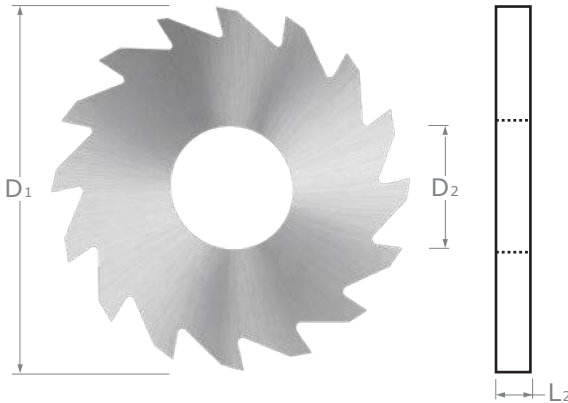


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**SLITTING SAWS**

For Non-Ferrous Materials



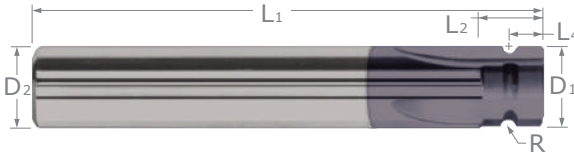
- Sides of saw have increased dish to minimize part contact
- Polished sides lessen saw binding in cut
- Cutting on OD only
- No keyway or hub
- For use with standard saw arbors
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	THICKNESS	INSIDE DIAMETER	NUMBER OF TEETH	UNCOATED	
				TOOL #	PRICE
$D_1 \begin{smallmatrix} +.005'' \\ -.000'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.00025'' \\ -.00025'' \end{smallmatrix}$	$D_2 \begin{smallmatrix} +.0005'' \\ +.0001'' \end{smallmatrix}$			
<b>1</b>	.0100	3/8	12	SNA0100	67.30
	.0156 (1/64)	3/8	12	SNA0156	66.60
	.0200	3/8	12	SNA0200	67.30
	.0312 (1/32)	3/8	12	SNA0312	67.30
	.0625 (1/16)	3/8	12	SNA0625	59.00
<b>1-1/4</b>	.0156 (1/64)	1/2	16	SNB0156	78.60
	.0200	1/2	16	SNB0200	73.60
	.0312 (1/32)	1/2	16	SNB0312	73.60
	.0625 (1/16)	1/2	16	SNB0625	75.00
<b>1-1/2</b>	.0120	1/2	16	SNC0120	86.00
	.0156 (1/64)	1/2	16	SNC0156	86.00
	.0200	1/2	16	SNC0200	76.00
	.0312 (1/32)	1/2	16	SNC0312	76.00
	.0400	1/2	16	SNC0400	76.00
	.0625 (1/16)	1/2	16	SNC0625	76.00
<b>1-3/4</b>	.0200	1/2	24	SND0200	92.20
	.0312 (1/32)	1/2	24	SND0312	92.20
	.0625 (1/16)	1/2	24	SND0625	98.50
<b>2</b>	.0200	1/2	24	SNE0200	121.30
	.0312 (1/32)	1/2	24	SNE0312	119.00
	.0400	1/2	24	SNE0400	119.00
	.0625 (1/16)	1/2	24	SNE0625	119.00
	.0937 (3/32)	1/2	24	SNE0937	119.00
	.1250 (1/8)	1/2	24	SNE1250	152.50
<b>3</b>	.0312 (1/32)	1	30	SNF0312	184.80
	.0625 (1/16)	1	30	SNF0625	208.10
	.0937 (3/32)	1	30	SNF0937	266.20
	.1250 (1/8)	1	30	SNF1250	303.50
<b>4</b>	.0312 (1/32)	1	36	SNG0312	269.60
	.0625 (1/16)	1	36	SNG0625	270.60
	.0937 (3/32)	1	36	SNG0937	318.60
	.1250 (1/8)	1	36	SNG1250	384.70

SLITTING SAWS

For Saw Arbors, see page 504.

## CONCAVE RADIUS END MILLS



- Ground form relieved (can be re-ground without losing radius)
- 4 flutes
- Cutting on OD and radius only (non-end cutting)
- Solid carbide
- CNC ground in the USA

RADIUS	CUTTER DIAMETER	LENGTH OF CUT	RADIUS CENTER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
						4 FL	PRICE	4 FL	PRICE
R $\begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.060'' \\ -.000'' \end{smallmatrix}$	L4 $\begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	D2	L1				
1/64	1/4	.281	.1406	1/4	2-1/2	45915	61.70	45915-C3	69.30
1/64	1/2	.281	.1406	1/2	3	32801	121.00	32801-C3	136.10
.020	1/4	.281	.1450	1/4	2-1/2	45920	60.60	45920-C3	68.20
1/32	1/4	.312	.1562	1/4	2-1/2	45931	61.70	45931-C3	69.30
1/32	1/2	.312	.1562	1/2	3	32802	118.70	32802-C3	133.80
1 mm	1/4	.329	.1644	1/4	2-1/2	4591M	62.50	4591M-C3	70.10
1 mm	1/2	.329	.1644	1/2	3	3281M	124.90	3281M-C3	140.00
3/64	1/4	.344	.1719	1/4	2-1/2	45947	61.70	45947-C3	69.30
3/64	1/2	.344	.1719	1/2	3	32803	120.80	32803-C3	135.90
1/16	3/8	.375	.1875	3/8	2-1/2	45962	76.80	45962-C3	86.90
1/16	1/2	.375	.1875	1/2	3	32804	118.70	32804-C3	133.80
5/64	1/2	.407	.2034	1/2	3	32805	118.70	32805-C3	133.80
2 mm	1/2	.407	.2044	1/2	3	3282M	124.90	3282M-C3	140.00
3/32	1/2	.437	.2187	1/2	3	32806	120.80	32806-C3	135.90
7/64	5/8	.469	.2344	5/8	3-1/2	32807	154.70	32807-C3	169.80
1/8	5/8	.500	.2500	5/8	3-1/2	32808	152.00	32808-C3	167.10
5/32	3/4	.562	.2812	3/4	4	32810	256.10	32810-C3	272.40
3/16	1	.624	.3120	3/4	3-1/2	32812*	207.60	32812-C3*	223.90
1/4	1-1/4	.750	.3750	3/4	4	32816*	243.90	32816-C3*	259.90

\*Solid carbide head with steel shank

CONCAVE RADIUS END MILLS



Access Simulation Files in DXF Format  
for Every Harvey Tool Product

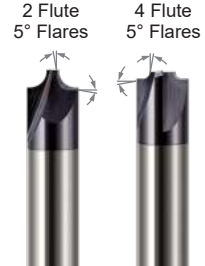
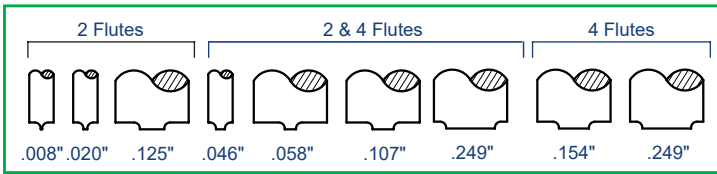
[harveytool.com/resources/simulation-files](http://harveytool.com/resources/simulation-files)

# CORNER ROUNDING END MILLS

## 2 & 4 Flute - Flared



- Flares are tangent to radius (flare is blended to radius to ensure smooth form)
- Double-ended
- Axial depth of cut  $\approx$  radius plus .005"
- End cutting
- Solid carbide • CNC ground in the USA



RADIUS	PILOT DIAMETER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
					TOOL #	PRICE	TOOL #	PRICE
$R \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.003	.046	2	1/8	1-1/2	17003	44.10	17003-C3	50.50
.004	.046	2	1/8	1-1/2	17004	44.10	17004-C3	50.50
.005	.008	2	1/8	1-1/2	67405	55.40	67405-C3	61.80
.005	.020	2	1/8	1-1/2	45305	47.60	45305-C3	54.00
.005	.046	2	1/8	1-1/2	17005	44.10	17005-C3	50.50
.005	.046	2	3/16	4	<b>LONG!</b> 31605	78.20	31605-C3	87.10
.005	.046	4	1/8	1-1/2	806105	59.90	806105-C3	66.30
.005	.058	4	1/8	1-1/2	67605	59.90	67605-C3	66.30
.005	.107	4	1/8	1-1/2	68005	59.90	68005-C3	66.30
.005	.249	4	3/8	2-1/2	21005	69.90	21005-C3	85.00
.006	.020	2	1/8	1-1/2	45306	47.60	45306-C3	54.00
.006	.046	2	1/8	1-1/2	17006	44.10	17006-C3	50.50
.006	.058	4	1/8	1-1/2	67606	60.50	67606-C3	66.90
.006	.107	4	1/8	1-1/2	68006	60.50	68006-C3	66.90
.007	.020	2	1/8	1-1/2	45307	47.60	45307-C3	54.00
.007	.046	2	1/8	1-1/2	17007	44.10	17007-C3	50.50
.007	.058	4	1/8	1-1/2	67607	59.90	67607-C3	66.30
.007	.107	4	1/8	1-1/2	68007	59.90	68007-C3	66.30
.008	.008	2	1/8	1-1/2	67408	55.40	67408-C3	61.80
.008	.020	2	1/8	1-1/2	45308	47.60	45308-C3	54.00
.008	.046	2	1/8	1-1/2	17008	44.10	17008-C3	50.50
.008	.046	2	3/16	4	<b>LONG!</b> 31608	78.20	31608-C3	87.10
.008	.058	4	1/8	1-1/2	67608	59.90	67608-C3	66.30
.008	.249	4	3/8	2-1/2	21008	69.90	21008-C3	85.00
.009	.020	2	1/8	1-1/2	45309	48.10	45309-C3	54.50
.009	.046	2	1/8	1-1/2	17009	44.10	17009-C3	50.50
.010	.008	2	1/8	1-1/2	67410	55.40	67410-C3	61.80
.010	.020	2	1/8	1-1/2	45310	47.60	45310-C3	54.00
.010	.046	2	1/8	1-1/2	17010	44.10	17010-C3	50.50
.010	.046	2	3/16	4	<b>LONG!</b> 31610	78.20	31610-C3	87.10

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CORNER ROUNDING END MILLS

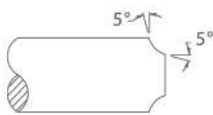
## CORNER ROUNDING END MILLS

## 2 &amp; 4 Flute – Flared (cont.)

continued from previous page

RADIUS	PILOT DIAMETER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
					TOOL #	PRICE	TOOL #	PRICE
R $^{+.0005}$ / $_{-.0005}$	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.010	.046	4	1/8	1-1/2	806110	60.00	806110-C3	66.40
.010	.058	4	1/8	1-1/2	67610	59.90	67610-C3	66.30
.010	.107	4	3/16	2	68010	64.90	68010-C3	72.50
.010	.125	2	3/16	2	941510	64.90	941510-C3	72.50
.010	.249	4	3/8	2-1/2	21010	69.90	21010-C3	85.00
.011	.020	2	1/8	1-1/2	45311	48.10	45311-C3	54.50
.011	.046	2	1/8	1-1/2	17011	44.10	17011-C3	50.50
.012	.020	2	1/8	1-1/2	45312	47.60	45312-C3	54.00
.012	.046	2	1/8	1-1/2	17012	44.10	17012-C3	50.50
.012	.107	4	3/16	2	68012	64.90	68012-C3	72.50
.013	.020	2	1/8	1-1/2	45313	47.60	45313-C3	54.00
.013	.046	2	1/8	1-1/2	17013	44.10	17013-C3	50.50
.014	.020	2	1/8	1-1/2	45314	47.60	45314-C3	54.00
.014	.046	2	1/8	1-1/2	17014	44.10	17014-C3	50.50
.015 (1/64)	.008	2	1/8	1-1/2	67415	55.40	67415-C3	61.80
.015 (1/64)	.020	2	1/8	1-1/2	45315	47.60	45315-C3	54.00
.015 (1/64)	.046	2	1/8	1-1/2	17015	44.10	17015-C3	50.50
.015 (1/64)	.046	2	3/16	4 <b>LONG!</b>	31615	78.20	31615-C3	87.10
.015 (1/64)	.046	4	1/8	1-1/2	806115	59.90	806115-C3	66.30
.015 (1/64)	.058	2	1/8	1-1/2	770515	44.10	770515-C3	50.50
.015 (1/64)	.058	4	1/8	1-1/2	67615	59.90	67615-C3	66.30
.015 (1/64)	.107	4	3/16	2	68015	64.90	68015-C3	72.50
.015 (1/64)	.125	2	3/16	2	941515	64.90	941515-C3	72.50
.015 (1/64)	.249	2	3/8	2	749015	66.90	749015-C3	80.20
.015 (1/64)	.249	4	3/8	2-1/2	21015	69.90	21015-C3	85.00
.018	.020	2	1/8	1-1/2	45318	47.60	45318-C3	54.00
.018	.046	2	1/8	1-1/2	17018	44.10	17018-C3	50.50
.018	.107	4	3/16	2	68018	64.90	68018-C3	72.50
.020	.008	2	1/8	1-1/2	67420	55.40	67420-C3	61.80
.020	.020	2	1/8	1-1/2	45320	47.60	45320-C3	54.00
.020	.046	2	1/8	1-1/2	17020	44.10	17020-C3	50.50
.020	.046	2	3/16	4 <b>LONG!</b>	31620	78.20	31620-C3	87.10
.020	.046	4	1/8	1-1/2	806120	59.90	806120-C3	66.30
.020	.058	2	1/8	1-1/2	770520	44.10	770520-C3	50.50
.020	.058	4	1/8	1-1/2	67620	59.90	67620-C3	66.30
.020	.107	2	3/16	2	748620	65.60	748620-C3	73.20
.020	.107	4	3/16	2	68020	64.90	68020-C3	71.30
.020	.125	2	3/16	2	941520	64.90	941520-C3	72.50
.020	.249	4	3/8	2-1/2	21020	69.90	21020-C3	85.00

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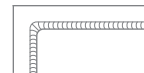
5° Flares at Shoulder  
and Pilot to Avoid Steps  
in Workpiece



Large Pilots for Profiling,  
Increasing Strength and  
Requiring Less Speed



Small Pilots  
for Narrow  
Slots and Holes



Small Pilots Allow  
Milling of Tight  
Inside Corners

## CORNER ROUNDING END MILLS

2 &amp; 4 Flute – Flared (cont.)

continued from previous page

RADIUS R $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	PILOT DIAMETER D <sub>1</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AIRTIN COATED		
					TOOL #	PRICE	TOOL #	PRICE	
.022	.020	2	1/8	1-1/2	45322	47.60	45322-C3	54.00	
.022	.046	2	1/8	1-1/2	17022	44.10	17022-C3	50.50	
.022	.107	4	3/16	2	68022	64.90	68022-C3	72.50	
.025	.008	2	1/8	1-1/2	67425	55.90	67425-C3	62.30	
.025	.020	2	1/8	1-1/2	45325	47.60	45325-C3	54.00	
.025	.046	2	1/8	1-1/2	17025	44.10	17025-C3	50.50	
.025	.046	2	3/16	4	LONG!	31625	78.20	31625-C3	87.10
.025	.058	4	1/8	1-1/2	67625	59.90	67625-C3	66.30	
.025	.107	4	3/16	2	68025	64.90	68025-C3	71.30	
.025	.125	2	3/16	2	941525	64.90	941525-C3	72.50	
.025	.249	4	3/8	2-1/2	21025	69.90	21025-C3	85.00	
.027	.046	2	1/8	1-1/2	17027	44.10	17027-C3	50.50	
.027	.107	4	3/16	2	68027	64.90	68027-C3	72.50	
.030	.008	2	1/8	1-1/2	67430	55.40	67430-C3	61.80	
.030	.020	2	1/8	1-1/2	45330	47.60	45330-C3	54.00	
.030	.046	2	1/8	1-1/2	17030	44.10	17030-C3	50.50	
.030	.046	2	3/16	4	LONG!	31630	78.20	31630-C3	87.10
.030	.046	4	1/8	1-1/2	806130	59.90	806130-C3	66.30	
.030	.058	2	1/8	1-1/2	756930	60.50	756930-C3	66.90	
.030	.058	4	1/8	1-1/2	67630	59.90	67630-C3	66.30	
.030	.107	2	3/16	2	748630	65.60	748630-C3	73.20	
.030	.107	4	3/16	2	68030	64.90	68030-C3	71.30	
.030	.125	2	3/16	2	941530	64.90	941530-C3	72.50	
.030	.249	2	3/8	2	749030	73.70	749030-C3	87.00	
.030	.249	4	3/8	2-1/2	21030	76.90	21030-C3	92.00	
.031 (1/32)	.008	2	1/8	1-1/2	67431	55.40	67431-C3	61.80	
.031 (1/32)	.020	2	1/8	1-1/2	45331	47.60	45331-C3	54.00	
.031 (1/32)	.046	2	1/8	1-1/2	17031	44.10	17031-C3	50.50	
.031 (1/32)	.046	2	3/16	4	LONG!	31631	78.20	31631-C3	87.10
.031 (1/32)	.046	4	1/8	1-1/2	806131	59.90	806131-C3	66.30	
.031 (1/32)	.058	4	1/8	1-1/2	67631	59.90	67631-C3	66.30	
.031 (1/32)	.107	4	3/16	2	68031	64.90	68031-C3	72.50	
.031 (1/32)	.125	2	3/16	2	941531	72.50	941531-C3	80.10	
.031 (1/32)	.154	4	1/4	2	946631	85.10	946631-C3	95.50	
.031 (1/32)	.249	4	3/8	2-1/2	21031	76.90	21031-C3	92.00	
.032	.046	2	1/8	1-1/2	17032	44.10	17032-C3	50.50	
.032	.249	4	3/8	2-1/2	21032	76.90	21032-C3	92.00	
.035	.020	2	1/8	1-1/2	67835	47.60	67835-C3	54.00	
.035	.046	2	1/8	1-1/2	17035	44.10	17035-C3	50.50	
.035	.046	2	3/16	4	LONG!	31635	78.20	31635-C3	87.10
.035	.058	4	3/16	2	67635	67.20	67635-C3	74.80	
.035	.125	2	1/4	2	941535	66.60	941535-C3	74.20	
.035	.249	4	3/8	2-1/2	21035	76.90	21035-C3	92.00	
.037	.107	4	3/16	2	68037	65.60	68037-C3	73.20	

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CORNER ROUNDING END MILLS

## CORNER ROUNDING END MILLS

## 2 &amp; 4 Flute – Flared (cont.)

continued from previous page

RADIUS R <sup>+0.0005"</sup> -0.0005"	PILOT DIAMETER D <sub>1</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AIRTIN COATED	
					TOOL #	PRICE	TOOL #	PRICE
.039 (1 mm)	.020	2	1/8	1-1/2	67839	47.60	67839-C3	54.00
.039 (1 mm)	.046	2	1/8	1-1/2	17039	44.10	17039-C3	50.50
.039 (1 mm)	.046	2	3/16	4 <b>LONG!</b>	31639	78.20	31639-C3	87.10
.039 (1 mm)	.046	4	1/8	1-1/2	806139	59.90	806139-C3	66.30
.039 (1 mm)	.058	4	3/16	2	67639	67.20	67639-C3	74.80
.039 (1 mm)	.100	2	3/16	2	45339	57.90	45339-C3	65.50
.039 (1 mm)	.107	4	3/16	2	68039	57.90	68039-C3	65.50
.039 (1 mm)	.154	4	1/4	2	946639	85.10	946639-C3	95.50
.039 (1 mm)	.249	4	3/8	2-1/2	21039	76.90	21039-C3	92.00
.040	.020	2	1/8	1-1/2	45340	47.60	45340-C3	54.00
.040	.046	2	3/16	2	17040	56.20	17040-C3	63.80
.040	.107	4	1/4	2	68040	85.10	68040-C3	95.50
.040	.249	4	3/8	2-1/2	21040	93.20	21040-C3	108.30
.043	.046	2	3/16	2	17043	56.20	17043-C3	63.80
.043	.058	4	3/16	2	67643	67.20	67643-C3	74.80
.043	.249	4	3/8	2-1/2	21043	94.10	21043-C3	109.20
.045	.046	2	3/16	2	17045	56.20	17045-C3	63.80
.045	.058	4	3/16	2	67645	67.20	67645-C3	74.80
.047 (3/64)	.020	2	1/8	1-1/2	67847	47.60	67847-C3	54.00
.047 (3/64)	.046	2	3/16	2	17047	56.20	17047-C3	63.80
.047 (3/64)	.046	2	3/16	4 <b>LONG!</b>	31647	78.20	31647-C3	87.10
.047 (3/64)	.058	4	3/16	2	67647	67.20	67647-C3	74.80
.047 (3/64)	.107	4	1/4	2	68047	85.10	68047-C3	95.50
.047 (3/64)	.125	2	1/4	2	45347	66.60	45347-C3	77.00
.047 (3/64)	.249	4	3/8	2-1/2	21047	93.20	21047-C3	108.30
.050	.020	2	1/8	1-1/2	67850	47.60	67850-C3	54.00
.050	.046	2	3/16	2	17050	56.20	17050-C3	63.80
.050	.046	2	1/4	4 <b>LONG!</b>	31650	92.90	31650-C3	101.70
.050	.058	4	3/16	2	67650	67.20	67650-C3	74.80
.050	.107	4	1/4	2	68050	85.10	68050-C3	95.50
.050	.125	2	1/4	2	45350	66.60	45350-C3	77.00
.050	.249	4	3/8	2-1/2	21050	93.20	21050-C3	108.30
.052	.107	4	1/4	2	68052	85.90	68052-C3	96.30
.055	.046	2	3/16	2	17055	56.20	17055-C3	63.80
.055	.058	4	3/16	2	67655	67.20	67655-C3	74.80
.055	.107	4	1/4	2	68055	85.10	68055-C3	95.50
.058	.107	4	1/4	2	68058	85.10	68058-C3	95.50
.060	.020	2	3/16	2	67860	58.40	67860-C3	66.00
.060	.046	2	3/16	2	17060	56.20	17060-C3	63.80
.060	.046	2	1/4	4 <b>LONG!</b>	31660	92.90	31660-C3	101.70
.060	.046	4	3/16	2	806060	64.10	806060-C3	71.70
.060	.058	2	3/16	2	756960	56.80	756960-C3	64.40
.060	.058	4	3/16	2	67660	67.20	67660-C3	74.80
.060	.107	2	1/4	2	748660	67.30	748660-C3	77.70
.060	.107	4	1/4	2	68060	85.10	68060-C3	95.50
.060	.125	2	1/4	2	45360	66.60	45360-C3	77.00
.060	.154	4	5/16	2-1/2	946660	98.20	946660-C3	110.80
.060	.249	4	1/2	3	21060	103.90	21060-C3	119.50

CORNER ROUNDING END MILLS

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## CORNER ROUNDING END MILLS

2 &amp; 4 Flute – Flared (cont.)

continued from previous page

RADIUS R $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	PILOT DIAMETER D <sub>1</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITIN COATED	
					TOOL #	PRICE	TOOL #	PRICE
.062 (1/16)	.020	2	3/16	2	67862	58.40	67862-C3	66.00
.062 (1/16)	.046	2	3/16	2	17062	56.20	17062-C3	63.80
.062 (1/16)	.046	2	1/4	4 <b>LONG!</b>	31662	92.90	31662-C3	101.70
.062 (1/16)	.046	4	3/16	2	806062	67.20	806062-C3	72.80
.062 (1/16)	.058	2	3/16	2	770562	56.20	770562-C3	63.80
.062 (1/16)	.058	4	3/16	2	67662	67.20	67662-C3	74.80
.062 (1/16)	.107	2	1/4	2	748662	67.30	748662-C3	77.70
.062 (1/16)	.107	4	1/4	2	68062	85.10	68062-C3	95.50
.062 (1/16)	.125	2	1/4	2	45362	66.60	45362-C3	77.00
.062 (1/16)	.154	4	5/16	2-1/2	946662	98.20	946662-C3	110.80
.062 (1/16)	.249	4	1/2	3	21062	103.90	21062-C3	124.60
.065	.046	2	3/16	2	17065	56.20	17065-C3	63.80
.070	.046	2	3/16	2	17070	56.20	17070-C3	63.80
.070	.058	4	1/4	2	67670	85.10	67670-C3	95.50
.070	.107	4	1/4	2	68070	85.10	68070-C3	95.50
.072	.046	2	1/4	2	17072	64.50	17072-C3	74.90
.072	.249	4	1/2	3	21072	108.80	21072-C3	129.50
.075	.046	2	1/4	2	17075	64.50	17075-C3	74.90
.078 (5/64)	.020	2	3/16	2	67878	64.90	67878-C3	72.50
.078 (5/64)	.046	2	1/4	2	17078	64.50	17078-C3	74.90
.078 (5/64)	.046	2	1/4	4 <b>LONG!</b>	31678	92.90	31678-C3	101.70
.078 (5/64)	.046	4	1/4	2	806078	85.10	806078-C3	95.50
.078 (5/64)	.058	4	1/4	2	67678	85.10	67678-C3	95.50
.078 (5/64)	.107	4	5/16	2-1/2	68078	98.20	68078-C3	110.80
.078 (5/64)	.125	2	5/16	2-1/2	941578	98.20	941578-C3	110.80
.078 (5/64)	.154	4	5/16	2-1/2	946678	98.20	946678-C3	110.80
.078 (5/64)	.249	4	1/2	3	21078	108.80	21078-C3	129.50
.080	.046	2	1/4	2	17080	64.50	17080-C3	74.90
.080	.058	4	1/4	2	67680	85.10	67680-C3	95.50
.080	.107	4	5/16	2-1/2	68080	98.20	68080-C3	110.80
.085	.046	2	1/4	2	17085	64.50	17085-C3	74.90
.089	.045	2	1/4	2	17089	64.50	17089-C3	74.90
.089	.107	4	5/16	2-1/2	68089	99.20	68089-C3	111.80
.089	.248	4	1/2	3	21089	109.90	21089-C3	130.60
.090	.045	2	1/4	2	17090	64.50	17090-C3	74.90
.090	.058	4	1/4	2	67690	85.10	67690-C3	95.50
.090	.107	4	5/16	2-1/2	68090	98.20	68090-C3	110.80
.093 (3/32)	.045	2	1/4	2	17093	64.50	17093-C3	74.90
.093 (3/32)	.045	2	5/16	4 <b>LONG!</b>	31693	122.40	31693-C3	136.50
.093 (3/32)	.046	4	1/4	2	806093	85.10	806093-C3	95.50
.093 (3/32)	.058	4	1/4	2	67693	85.10	67693-C3	95.50
.093 (3/32)	.107	4	5/16	2-1/2	68093	98.20	68093-C3	110.80
.093 (3/32)	.125	2	5/16	2-1/2	941593	99.20	941593-C3	111.80
.093 (3/32)	.154	4	3/8	2-1/2	946693	120.40	946693-C3	135.50
.093 (3/32)	.248	4	1/2	3	21093	110.80	21093-C3	131.50
.095	.045	2	1/4	2	17095	64.50	17095-C3	74.90

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CORNER ROUNDING END MILLS

# CORNER ROUNDING END MILLS

## 2 & 4 Flute – Flared (cont.)

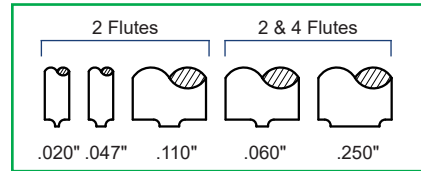
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RADIUS	PILOT DIAMETER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
					TOOL #	PRICE	TOOL #	PRICE
R <sup>+0.0005"</sup> <sub>-0.0005"</sub>	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.100	.045	2	1/4	2	17100	64.50	17100-C3	74.90
.100	.045	2	5/16	4 <b>LONG!</b>	31700	122.40	31700-C3	136.50
.100	.058	4	5/16	2-1/2	77800	98.70	77800-C3	111.30
.100	.107	4	5/16	2-1/2	68100	98.70	68100-C3	111.30
.100	.125	2	3/8	2-1/2	941600	118.40	941600-C3	128.50
.100	.248	4	1/2	3	21100	110.80	21100-C3	131.50
.109 (7/64)	.058	2	5/16	2-1/2	17109	98.70	17109-C3	111.30
.109 (7/64)	.107	4	3/8	2-1/2	68109	120.40	68109-C3	135.50
.118 (3 mm)	.058	2	5/16	2-1/2	17118	98.70	17118-C3	111.30
.118 (3 mm)	.107	4	3/8	2-1/2	68118	120.40	68118-C3	135.50
.118 (3 mm)	.125	2	3/8	2-1/2	941618	118.40	941618-C3	128.50
.118 (3 mm)	.248	4	1/2	3	21118	140.50	21118-C3	161.20
.125 (1/8)	.046	2	5/16	2-1/2	948425	95.80	948425-C3	108.40
.125 (1/8)	.046	4	5/16	2-1/2	805908	99.60	805908-C3	108.50
.125 (1/8)	.058	2	5/16	2-1/2	17125	98.70	17125-C3	111.30
.125 (1/8)	.058	2	3/8	4 <b>LONG!</b>	31725	146.20	31725-C3	154.20
.125 (1/8)	.058	4	5/16	2-1/2	67708	98.70	67708-C3	111.30
.125 (1/8)	.107	4	3/8	2-1/2	68125	120.40	68125-C3	135.50
.125 (1/8)	.125	2	7/16	2-1/2	941608	160.50	941608-C3	179.60
.125 (1/8)	.154	4	7/16	2-1/2	946725	160.50	946725-C3	179.60
.125 (1/8)	.248	4	5/8	3-1/2	21125	178.60	21125-C3	201.10
.140 (9/64)	.058	2	3/8	2-1/2	17140	118.40	17140-C3	133.50
.140 (9/64)	.107	4	7/16	2-1/2	68140	160.50	68140-C3	179.60
.156 (5/32)	.058	2	3/8	2-1/2	17156	118.40	17156-C3	133.50
.156 (5/32)	.107	4	7/16	2-1/2	68156	160.50	68156-C3	179.60
.156 (5/32)	.248	4	5/8	3-1/2	21156	196.60	21156-C3	219.10
.172 (11/64)	.058	2	7/16	2-1/2	17172	178.60	17172-C3	197.70
.187 (3/16)	.058	2	7/16	2-1/2	17187	178.60	17187-C3	197.70
.187 (3/16)	.107	4	1/2	3	68187	187.40	68187-C3	208.10
.187 (3/16)	.125	2	5/8	3-1/2	941612	215.60	941612-C3	230.70
.187 (3/16)	.248	4	5/8	3-1/2	21187	210.70	21187-C3	233.20
.197 (5 mm)	.058	2	1/2	3	17197	187.40	17197-C3	208.10
.197 (5 mm)	.107	4	5/8	3-1/2	68197	281.20	68197-C3	303.70
.219 (7/32)	.058	2	1/2	3	17219	189.10	17219-C3	209.80
.219 (7/32)	.107	4	5/8	3-1/2	68219	281.20	68219-C3	303.70
.236 (6 mm)	.107	2	5/8	3-1/2	17236	284.10	17236-C3	306.60
.236 (6 mm)	.107	4	5/8	3-1/2	68236	281.20	68236-C3	303.70
.250 (1/4)	.058	2	5/8	3-1/2	17199	284.10	17199-C3	306.60
.250 (1/4)	.107	2	5/8	3-1/2	17250	281.20	17250-C3	303.70
.250 (1/4)	.107	4	5/8	3-1/2	68250	281.20	68250-C3	303.70
.250 (1/4)	.154	4	3/4	4	946750	313.10	946750-C3	339.10
.250 (1/4)	.247	4	3/4	4	21250	313.10	21250-C3	339.10
.312 (5/16)	.247	4	1	4	21312	442.20	21312-C3	479.40
.375 (3/8)	.246	4	1	4	21375	482.80	21375-C3	520.00

CORNER ROUNDING END MILLS

## CORNER ROUNDING END MILLS

2 &amp; 4 Flute - Unflared



- Unflared shoulder and pilot for full radius form
- Double-ended
- Axial depth of cut = radius plus .005"
- End cutting
- Solid carbide
- CNC ground in the USA

2 Flute 4 Flute



RADIUS	PILOT DIA.	FLUTES	SHANK DIA.	OAL	UNCOATED		TiN COATED		AITiN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
R $^{+.0005}$ $_{-.0005}$	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>								
.005	.020	2	1/8	1-1/2	932205	45.40			932205-C3	51.80		
.005	.047	2	1/8	1-1/2	46005	35.00	46005-C1	41.40	46005-C3	41.40	46005-C4	54.30
.008	.047	2	1/8	1-1/2	46008	35.00	46008-C1	41.40	46008-C3	41.40		
.010	.020	2	1/8	1-1/2	932210	45.40			932210-C3	51.80		
.010	.047	2	1/8	1-1/2	46010	34.40	46010-C1	40.80	46010-C3	40.80	46010-C4	53.70
.010	.060	4	1/8	1-1/2	929910	54.90			929910-C3	61.30		
.010	.250	4	3/8	2-1/2	44010	60.30			44010-C3	75.40		
.012	.047	2	1/8	1-1/2	46012	35.00	46012-C1	41.40	46012-C3	41.40		
.015 (1/64)	.020	2	1/8	1-1/2	932215	45.40			932215-C3	51.80		
.015 (1/64)	.047	2	1/8	1-1/2	46015	34.40	46015-C1	40.80	46015-C3	40.80	46015-C4	53.70
.015 (1/64)	.047	2	3/16	4	LONG!	928015	71.20		928015-C3	80.10		
.015 (1/64)	.060	4	1/8	1-1/2	929915	54.90			929915-C3	61.30		
.015 (1/64)	.250	4	3/8	2-1/2	44015	60.30			44015-C3	75.40		
.018	.047	2	1/8	1-1/2	46018	35.00	46018-C1	41.40	46018-C3	41.40		
.020	.020	2	1/8	1-1/2	932220	45.40			932220-C3	51.80		
.020	.047	2	1/8	1-1/2	46020	34.40	46020-C1	40.80	46020-C3	40.80	46020-C4	53.70
.020	.047	2	3/16	4	LONG!	928020	69.80		928020-C3	78.70		
.020	.060	4	1/8	1-1/2	929920	55.90			929920-C3	62.30		
.020	.250	4	3/8	2-1/2	44020	60.30			44020-C3	75.40		
.022	.047	2	1/8	1-1/2	46022	35.00	46022-C1	41.40	46022-C3	41.40		
.025	.020	2	1/8	1-1/2	932225	45.40			932225-C3	51.80		
.025	.047	2	1/8	1-1/2	46025	34.40	46025-C1	40.80	46025-C3	40.80	46025-C4	53.70
.025	.250	4	3/8	2-1/2	44025	60.30			44025-C3	75.40		
.027	.047	2	1/8	1-1/2	46027	35.00	46027-C1	41.40	46027-C3	41.40		
.030	.047	2	1/8	1-1/2	46030	35.00	46030-C1	41.40	46030-C3	41.40	46030-C4	54.30
.030	.250	4	3/8	2-1/2	44030	66.10			44030-C3	81.20		
.031 (1/32)	.020	2	1/8	1-1/2	932231	45.40			932231-C3	51.80		
.031 (1/32)	.047	2	1/8	1-1/2	46031	34.40	46031-C1	40.80	46031-C3	40.80	46031-C4	53.70
.031 (1/32)	.047	2	3/16	4	LONG!	928031	69.80		928031-C3	78.70		
.031 (1/32)	.060	4	1/8	1-1/2	929931	54.90			929931-C3	61.30		
.031 (1/32)	.250	4	3/8	2-1/2	44031	66.10			44031-C3	81.20		
.032	.047	2	1/8	1-1/2	46032	38.80	46032-C1	45.20	46032-C3	45.20		
.035	.047	2	1/8	1-1/2	46035	38.80	46035-C1	45.20	46035-C3	45.20		
.039 (1 mm)	.020	2	1/8	1-1/2	932239	39.60			932239-C3	46.00		
.039 (1 mm)	.047	2	1/8	1-1/2	46039	38.80	46039-C1	45.20	46039-C3	45.20	46039-C4	58.10
.039 (1 mm)	.060	4	3/16	2	929939	55.90			929939-C3	63.50		
.039 (1 mm)	.250	4	3/8	2-1/2	44039	66.10			44039-C3	81.20		

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CORNER ROUNDING END MILLS

## CORNER ROUNDING END MILLS

## 2 &amp; 4 Flute – Unflared (cont.)

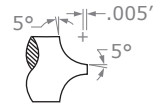
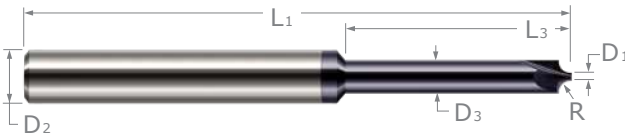
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RADIUS R $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	PILOT DIA. D <sub>1</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OAL L <sub>1</sub>	UNCOATED		TIN COATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.043	.047	2	3/16	2	46043	46.10	46043-C1	53.70	46043-C3	53.70		
.047 (3/64)	.047	2	3/16	2	46047	45.40	46047-C1	53.00	46047-C3	53.00	46047-C4	72.10
.047 (3/64)	.250	4	3/8	2-1/2	44047	67.40			44047-C3	82.50		
.050	.047	2	3/16	2	46050	45.40	46050-C1	53.00	46050-C3	53.00	46050-C4	72.10
.050	.250	4	3/8	2-1/2	44050	66.10			44050-C3	81.20		
.055	.047	2	3/16	2	46055	45.40	46055-C1	53.00	46055-C3	53.00		
.060	.047	2	3/16	2	46060	46.90	46060-C1	54.50	46060-C3	54.50	46060-C4	73.60
.060	.250	4	1/2	3	44060	93.30			44060-C3	114.00		
.062 (1/16)	.047	2	3/16	2	46062	46.10	46062-C1	53.70	46062-C3	53.70	46062-C4	72.80
.062 (1/16)	.047	2	1/4	4	LONG!	928062	83.40		928062-C3	93.60		
.062 (1/16)	.060	4	3/16	2	929962	61.70			929962-C3	69.30		
.062 (1/16)	.110	2	1/4	2	793462	53.10			793462-C3	63.50		
.062 (1/16)	.250	4	1/2	3	44062	93.30			44062-C3	114.00		
.067	.047	2	3/16	2	46067	46.90	46067-C1	54.50	46067-C3	54.50		
.072	.047	2	1/4	2	46072	53.90	46072-C1	64.00	46072-C3	64.30		
.078 (5/64)	.047	2	1/4	2	46078	53.10	46078-C1	63.20	46078-C3	63.50	46078-C4	83.50
.078 (5/64)	.250	4	1/2	3	44078	93.30			44078-C3	114.00		
.089	.047	2	1/4	2	46089	53.90	46089-C1	64.00	46089-C3	64.30		
.093 (3/32)	.047	2	1/4	2	46093	53.90	46093-C1	64.00	46093-C3	64.30	46093-C4	84.30
.093 (3/32)	.047	2	5/16	4	LONG!	928093	99.60		928093-C3	113.70		
.093 (3/32)	.060	4	1/4	2	929993	76.60			929993-C3	87.00		
.093 (3/32)	.250	4	1/2	3	44093	105.10			44093-C3	125.80		
.100	.047	2	1/4	2	46100	53.10	46100-C1	63.20	46100-C3	63.50	46100-C4	83.50
.104	.060	2	5/16	2-1/2	46104	74.90	46104-C1	87.50	46104-C3	87.50		
.109 (7/64)	.060	2	5/16	2-1/2	46109	73.70	46109-C1	86.30	46109-C3	86.30		
.118 (3 mm)	.060	2	5/16	2-1/2	46118	74.90	46118-C1	87.50	46118-C3	87.50	46118-C4	105.30
.118 (3 mm)	.250	4	1/2	3	44118	105.10			44118-C3	125.80		
.125 (1/8)	.060	2	5/16	2-1/2	46125	74.90	46125-C1	87.50	46125-C3	87.50	46125-C4	105.30
.125 (1/8)	.060	2	3/8	4	LONG!	928125	148.60		928125-C3	164.90		
.125 (1/8)	.110	2	3/8	3	793508	122.90			793508-C3	135.50		
.125 (1/8)	.250	4	5/8	3-1/2	44125	154.10			44125-C3	176.60		
.140 (9/64)	.060	2	3/8	2-1/2	46140	86.10	46140-C1	101.20	46140-C3	101.20		
.156 (5/32)	.060	2	3/8	2-1/2	46156	93.00	46156-C1	108.10	46156-C3	108.10		
.156 (5/32)	.250	4	5/8	3-1/2	44156	165.60			44156-C3	188.10		
.172 (11/64)	.060	2	7/16	2-1/2	46172	152.90	46172-C1	171.70	46172-C3	172.00		
.187 (3/16)	.060	2	7/16	2-1/2	46187	157.60	46187-C1	176.40	46187-C3	176.70		
.187 (3/16)	.250	4	5/8	3-1/2	44187	181.20			44187-C3	203.70		
.197 (5 mm)	.060	2	1/2	3	46197	218.80	46197-C1	238.80	46197-C3	239.50		
.219 (7/32)	.060	2	1/2	3	46219	210.00	46219-C1	230.00	46219-C3	230.70		
.236 (6 mm)	.110	2	5/8	3-1/2	46236	280.40	46236-C1	302.90	46236-C3	302.90		
.250 (1/4)	.060	4	5/8	3-1/2	930016	295.50			930016-C3	318.00		
.250 (1/4)	.110	2	5/8	3-1/2	46250	280.40	46250-C1	302.90	46250-C3	302.90		
.250 (1/4)	.250	4	3/4	4	44250	294.10			44250-C3	320.10		
.312 (5/16)	.250	2	1	4	46312	435.60	46312-C1	472.80	46312-C3	472.80		
.375 (3/8)	.250	2	1	4	46375	474.70	46375-C1	511.90	46375-C3	511.90		

CORNER ROUNDING END MILLS

## CORNER ROUNDING END MILLS

Long Reach – Flared



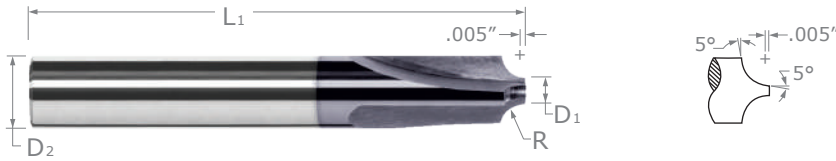
- **Reduced diameter for clearance along walls and in small features**
- Small pilot design for miniature holes, narrow slots and small inside corners
- Flares are tangent to radius (flare is blended to radius to ensure smooth form)
- Axial depth of cut = radius plus .005" • 2 flutes • Solid carbide
- CNC ground in the USA

RADIUS	PILOT DIAMETER	NECK DIAMETER	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED	
						2 FL	PRICE	2 FL	PRICE
R $^{+.0005}$ / $_{-.0005}$ "	D1 $^{+.000}$ / $_{-.001}$ "	D3	L3 $^{+.010}$ / $_{-.000}$ "	D2	L1	2 FL	PRICE	2 FL	PRICE
<b>.005</b>	.010	<b>.031</b>	.156	1/8	1-1/2	994605	41.20		
	.010	<b>.031</b>	.250	1/8	1-1/2	56905	41.20	56905-C3	46.40
	.010	<b>.031</b>	.375	1/8	1-1/2	57305	42.50		
	.020	<b>.031</b>	.156	1/8	1-1/2	992205	41.20	992205-C3	46.40
	.020	<b>.031</b>	.250	1/8	1-1/2	55705	41.20	55705-C3	46.40
	.020	<b>.031</b>	.375	1/8	1-1/2	56005	42.90		
	.020	<b>.062</b>	.312	1/8	1-1/2	990905	41.20	990905-C3	46.40
	.020	<b>.062</b>	.500	1/8	1-1/2	57505	41.20		
	.020	<b>.062</b>	.750	1/8	2	55305	42.50		
	.020	<b>.093</b>	.750	1/8	2	57405	47.30		
.020	<b>.093</b>	1.125	1/8	2	54305	47.80			
<b>.008</b>	.010	<b>.031</b>	.156	1/8	1-1/2	994608	41.20	994608-C3	46.40
	.010	<b>.031</b>	.250	1/8	1-1/2	56908	41.20		
	.010	<b>.031</b>	.375	1/8	1-1/2	57308	42.50	57308-C3	47.70
<b>.010</b>	.010	<b>.031</b>	.156	1/8	1-1/2	994610	41.20	994610-C3	46.40
	.010	<b>.031</b>	.250	1/8	1-1/2	56910	41.20	56910-C3	46.40
	.010	<b>.031</b>	.375	1/8	1-1/2	57310	42.50		
	.020	<b>.062</b>	.312	1/8	1-1/2	990910	41.20	990910-C3	46.40
	.020	<b>.062</b>	.500	1/8	1-1/2	57510	41.20	57510-C3	46.40
	.020	<b>.062</b>	.750	1/8	2	55310	42.50		
	.020	<b>.093</b>	.750	1/8	2	57410	47.30		
	.020	<b>.093</b>	1.125	1/8	2	54310	47.30		
<b>.015</b>	.020	<b>.062</b>	.312	1/8	1-1/2	990915	41.20	990915-C3	46.40
	.020	<b>.062</b>	.500	1/8	1-1/2	57515	41.20	57515-C3	46.40
	.020	<b>.062</b>	.750	1/8	2	55315	42.50		
	.020	<b>.093</b>	.750	1/8	2	57415	47.30		
	.020	<b>.093</b>	1.125	1/8	2	54315	47.80		
<b>.020</b>	.020	<b>.062</b>	.312	1/8	1-1/2	990920	41.20	990920-C3	46.40
	.020	<b>.062</b>	.500	1/8	1-1/2	57520	41.20	57520-C3	46.40
	.020	<b>.062</b>	.750	1/8	2	55320	42.50		
	.020	<b>.093</b>	.750	1/8	2	57420	47.30	57420-C3	52.50
	.020	<b>.093</b>	1.125	1/8	2	54320	47.30		
<b>.025</b>	.020	<b>.093</b>	.750	1/8	2	57425	47.30		
	.020	<b>.093</b>	1.125	1/8	2	54325	47.30		
<b>.030</b>	.020	<b>.093</b>	.750	1/8	2	57430	47.30	57430-C3	52.50
	.020	<b>.093</b>	1.125	1/8	2	54330	47.30		
<b>.031</b>	.020	<b>.093</b>	.750	1/8	2	57431	47.30	57431-C3	52.50
	.020	<b>.093</b>	1.125	1/8	2	54331	47.80		

CORNER ROUNDING END MILLS

# CORNER ROUNDING END MILLS

## 3 Flute – Flared

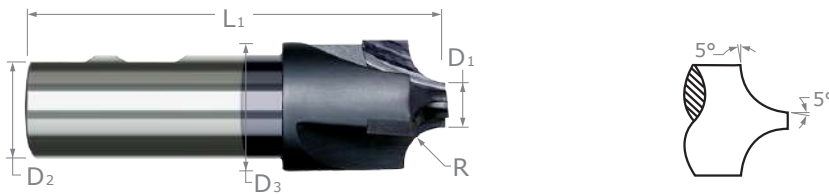


- Single end • Cutting on radius, flares, and end only (not center cutting)
- 5° flares tangent at pilot and shoulder to avoid steps
- Axial depth of cut  $\approx$  radius plus .005" • 3 flutes • Solid carbide • CNC ground in the USA

RADIUS	PILOT DIAMETER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
				3 FL	PRICE	3 FL	PRICE
R $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
.015 (1/64)	.046	1/8	1-1/2	760215	34.00	760215-C3	39.20
.015 (1/64)	.058	1/8	1-1/2	933415	34.00	933415-C3	39.20
.020	.046	1/8	1-1/2	760220	34.00	760220-C3	39.20
.020	.058	1/8	1-1/2	933420	34.00	933420-C3	39.20
.031 (1/32)	.046	1/8	1-1/2	760231	34.00	760231-C3	39.20
.031 (1/32)	.058	1/8	1-1/2	933431	34.00	933431-C3	39.20
.062 (1/16)	.058	3/16	2	933462	43.40	933462-C3	49.00
.062 (1/16)	.154	5/16	2-1/2	928262	74.40	928262-C3	83.30
.093 (3/32)	.058	1/4	2	933493	63.90	933493-C3	71.50
.093 (3/32)	.154	3/8	2-1/2	928293	84.90	928293-C3	95.00
.125 (1/8)	.058	5/16	2-1/2	933508	74.40	933508-C3	83.30
.125 (1/8)	.248	5/8	3-1/2	973008	124.40	973008-C3	139.50
.187 (3/16)	.058	7/16	2-1/2	933512	122.00	933512-C3	134.60
.187 (3/16)	.248	5/8	3-1/2	973012	141.10	973012-C3	156.20

# CORNER ROUNDING END MILLS

## 3 Flute – Flared – Carbide Tipped



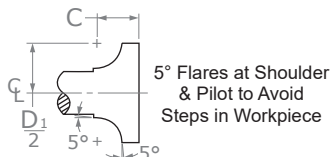
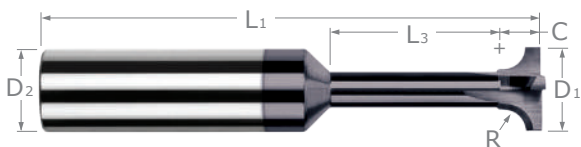
- Carbide tipped - cutting on radius and flares only
- 5° flares tangent to radius at pilot and shoulder to avoid steps
- 3 flutes • Weldon flat • CNC ground in the USA

RADIUS	PILOT DIAMETER	HEAD DIAMETER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
					3 FL	PRICE	3 FL	PRICE
R	D <sub>1</sub>	D <sub>3</sub>	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
1/4	13/32	1	3/4	3-1/4	45016	230.70	45016-C3	255.50
5/16	13/32	1-1/8	7/8	3-1/2	45020	236.40	45020-C3	256.40
3/8	13/32	1-1/4	7/8	3-3/4	45024	244.80	45024-C3	265.80
7/16	13/32	1-3/8	1	4	45028	274.30	45028-C3	299.10
1/2	13/32	1-1/2	1	4	45032	303.40	45032-C3	328.30
5/8	21/32	2	1-1/4	4-1/4	45040	376.40	45040-C3	407.50

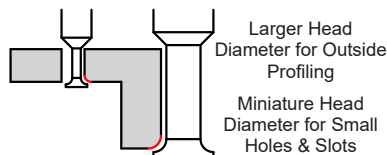
CORNER ROUNDING END MILLS

# CORNER ROUNDING END MILLS

## Back Corner Rounding End Mills – Flared



- Designed to mill radius on backside of workpiece
- 5° flares at neck and shoulder to avoid steps
- Flares are tangent to radius (flare is blended to radius to ensure smooth form)
- Cutting on radius and flares only
- Solid carbide
- CNC ground in the USA



RADIUS	HEAD DIAMETER	NECK DIAMETER	NECK LENGTH	RADIUS CENTER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
								TOOL #	PRICE	TOOL #	PRICE
R $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	D1 $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$		L3	C $\begin{smallmatrix} +.003" \\ -.001" \end{smallmatrix}$ *		D2	L1	TOOL #	PRICE	TOOL #	PRICE
.005	.030	.017	.062	.025	3	1/8	1-1/2	57705	66.60	57705-C3	71.80
.005	.060	.047	.250	.025	3	1/8	1-1/2	58005	66.60	58005-C3	71.80
.005	.115	.102	.875	.025	3	1/8	2	59805	69.40	59805-C3	74.60
.008	.075	.056	.312	.028	3	1/8	1-1/2	58708	66.60	58708-C3	71.80
.008	.187	.144	.500	.070	3	3/16	2	16008	70.70	16008-C3	76.30
.010	.045	.022	.078	.030	3	1/8	1-1/2	60910	66.60	60910-C3	71.80
.010	.075	.052	.281	.030	3	1/8	1-1/2	58710	66.60	58710-C3	71.80
.010	.187	.140	.500	.072	3	3/16	2	16010	70.70	16010-C3	76.30
.012	.075	.048	.250	.032	3	1/8	1-1/2	58712	66.60	58712-C3	71.80
.015 (1/64)	.060	.027	.093	.035	3	1/8	1-1/2	58515	66.60	58515-C3	71.80
.015 (1/64)	.090	.057	.312	.035	3	1/8	1-1/2	59715	66.60	59715-C3	71.80
.015 (1/64)	.187	.130	.500	.077	3	3/16	2	16015	70.70	16015-C3	76.30
.015 (1/64)	.187	.130	1.000	.077	3	3/16	2-1/2	992815	71.80	992815-C3	77.40
.020	.075	.032	.109	.040	3	1/8	1-1/2	59220	66.60	59220-C3	71.80
.020	.115	.072	.375	.040	3	1/8	1-1/2	60420	66.60	60420-C3	71.80
.020	.187	.120	.500	.082	3	3/16	2	16020	70.70	16020-C3	76.30
.022	.187	.116	.500	.084	3	3/16	2	16022	70.70	16022-C3	76.30
.025	.090	.037	.125	.055	3	1/8	1-1/2	60125	66.60	60125-C3	71.80
.025	.187	.110	.500	.087	3	3/16	2	16025	70.70	16025-C3	76.30
.027	.187	.106	.500	.089	3	3/16	2	16027	70.70	16027-C3	76.30
.030	.115	.052	.187	.060	3	1/8	1-1/2	60630	66.60	60630-C3	71.80
.030	.187	.100	.500	.092	3	3/16	2	16030	70.70	16030-C3	76.30
.030	.187	.100	1.000	.092	3	3/16	2-1/2	992830	71.80	992830-C3	77.40
.031 (1/32)	.115	.050	.156	.061	3	1/8	1-1/2	60631	66.60	60631-C3	71.80
.031 (1/32)	.187	.098	.500	.093	3	3/16	2	16031	70.70	16031-C3	76.30
.031 (1/32)	.187	.098	1.000	.093	3	3/16	2-1/2	992831	71.80	992831-C3	77.40
.035	.250	.153	.500	.097	3	1/4	2-1/2	16035	76.90	16035-C3	84.50
.039 (1 mm)	.250	.145	.500	.101	3	1/4	2-1/2	16039	76.90	16039-C3	84.50
.039 (1 mm)	.250	.145	1.000	.101	3	1/4	2-1/2	992839	76.90	992839-C3	84.50
.040	.250	.143	.500	.102	3	1/4	2-1/2	16040	76.90	16040-C3	84.50
.045	.250	.133	.500	.107	3	1/4	2-1/2	16045	76.90	16045-C3	84.50

\*Radius center is in the same plane as cutter OD (radial component of radius center = D1/2, see above drawing).

continued on next page

CORNER ROUNDING END MILLS

## CORNER ROUNDING END MILLS

## Back Corner Rounding End Mills – Flared (cont.)

continued from previous page

RADIUS	HEAD DIAMETER	NECK DIAMETER	NECK LENGTH	RADIUS CENTER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
R $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	D1 $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$		L3	C $\begin{smallmatrix} +.003" \\ -.001" \end{smallmatrix}$ *		D2	L1				
.047 (3/64)	.250	.128	.625	.109	3	1/4	2-1/2	16047	76.90	16047-C3	84.50
.047 (3/64)	.250	.128	1.250	.109	3	1/4	3	992847	84.90	992847-C3	92.50
.050	.250	.122	.375	.112	3	1/4	2-1/2	985050	76.90	985050-C3	84.50
.050	.250	.122	.625	.112	3	1/4	2-1/2	16050	76.90	16050-C3	84.50
.050	.250	.122	1.250	.112	3	1/4	3	992850	84.10	992850-C3	91.70
.055	.250	.113	.625	.117	3	1/4	2-1/2	16055	76.90	16055-C3	84.50
.060	.312	.164	.437	.122	3	5/16	2-1/2	985060	105.40	985060-C3	114.30
.060	.312	.165	.875	.122	3	5/16	2-1/2	16060	105.40	16060-C3	114.30
.062 (1/16)	.312	.160	.437	.124	3	5/16	2-1/2	985062	105.40	985062-C3	114.30
.062 (1/16)	.312	.161	.875	.124	3	5/16	2-1/2	16062	105.40	16062-C3	114.30
.062 (1/16)	.312	.160	1.250	.124	3	5/16	3	992862	111.40	992862-C3	120.30
.070	.375	.207	.875	.132	3	3/8	2-1/2	16070	120.70	16070-C3	130.80
.078 (5/64)	.375	.191	.500	.171	3	3/8	2-1/2	985078	120.70	985078-C3	130.80
.078 (5/64)	.375	.191	1.000	.171	3	3/8	2-1/2	16078	120.70	16078-C3	130.80
.078 (5/64)	.375	.191	1.500	.171	3	3/8	3	992878	131.00	992878-C3	141.10
.080	.375	.187	1.000	.173	3	3/8	2-1/2	16080	120.70	16080-C3	130.80
.090	.375	.167	1.000	.183	3	3/8	2-1/2	16090	121.90	16090-C3	132.00
.093 (3/32)	.375	.161	.500	.186	3	3/8	2-1/2	985093	120.70	985093-C3	130.80
.093 (3/32)	.375	.161	1.000	.186	3	3/8	2-1/2	16093	120.70	16093-C3	130.80
.093 (3/32)	.375	.161	1.500	.186	3	3/8	3	992893	131.00	992893-C3	141.10
.100	.500	.272	.500	.193	4	1/2	3	985100	173.90	985100-C3	189.00
.100	.500	.272	1.000	.193	4	1/2	3	16100	173.90	16100-C3	189.00
.118 (3 mm)	.500	.236	1.000	.211	4	1/2	3	1613M	173.90	1613M-C3	189.00
.125 (1/8)	.500	.222	.500	.218	4	1/2	3	985108	173.90	985108-C3	189.00
.125 (1/8)	.500	.222	1.000	.218	4	1/2	3	16108	173.90	16108-C3	189.00
.125 (1/8)	.500	.222	1.500	.218	4	1/2	3-1/2	992908	180.60	992908-C3	195.70
.156 (5/32)	.625	.284	1.000	.250	4	5/8	3-1/2	16110	235.70	16110-C3	250.80
.187 (3/16)	.625	.222	1.000	.281	4	5/8	3-1/2	16112	235.70	16112-C3	250.80
.250 (1/4)	1.000	.471	1.500	.376	4	1	4	16116	353.90	16116-C3	378.70

\*Radius center is in the same plane as cutter OD (radial component of radius center = D1/2, see above drawing).

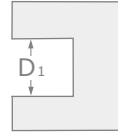
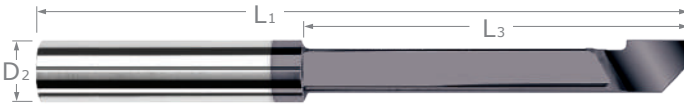
CORNER ROUNDING END MILLS



Check Out All of Our Corner Rounding Solutions!



**BORING BARS**



- Helical back rake flute improves accuracy and chip flow
- Square neck improves rigidity and has less deflection
- Tip is ground to sharp corner
- 70% stronger than round neck design
- Solid carbide
- CNC ground in the USA

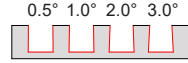
**Helical Back Rake  
Design!**

MIN. BORE DIAMETER	MAX BORE DEPTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED	
				TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub>	L <sub>3</sub>	D <sub>2</sub>	L <sub>1</sub>				
.031	<b>5/32</b>	1/8	1-1/2	29030	36.10	29030-C3	41.30
.036	<b>5/32</b>	1/8	1-1/2	29035	36.80		
.042	<b>1/4</b>	1/8	1-1/2	29040	33.00	29040-C3	38.20
.052	<b>5/16</b>	1/8	1-1/2	29050	32.00	29050-C3	37.20
.057	<b>5/16</b>	1/8	1-1/2	29055	32.00		
.062	<b>3/8</b>	1/8	1-1/2	29060	32.00	29060-C3	37.20
.062	<b>1/2</b>	1/8	1-1/2	29060L	33.80	29060L-C3	39.00
.072	<b>7/16</b>	1/8	1-1/2	29070	32.00	29070-C3	37.20
.082	<b>1/2</b>	1/8	1-1/2	29080	32.00		
.087	<b>1/2</b>	1/8	1-1/2	29085	32.00		
<b>NEW</b> .087	<b>5/8</b>	1/8	2	29085L	37.70	<b>29085L-C3</b>	42.90
.092	<b>1/2</b>	1/8	1-1/2	29090	32.00	29090-C3	37.20
.092	<b>5/8</b>	1/8	2	29090L	37.70	29090L-C3	42.90
.102	<b>9/16</b>	1/8	1-1/2	29100	32.00	29100-C3	37.20
.102	<b>5/8</b>	1/8	2	29100L	38.40	29100L-C3	43.60
.112	<b>9/16</b>	1/8	1-1/2	29110	32.00	29110-C3	37.20
.112	<b>5/8</b>	1/8	2	29110L	37.70	29110L-C3	42.90
.120	<b>5/8</b>	1/8	1-1/2	29120	32.00	29120-C3	37.20
.120	<b>3/4</b>	1/8	2	29120L	37.70	29120L-C3	42.90
.135	<b>3/4</b>	5/32	2	29135	35.80	29135-C3	41.40
.150	<b>3/4</b>	3/16	2	29150	36.80	29150-C3	42.40
.150	<b>1</b>	3/16	2	29150L	43.90	29150L-C3	49.50
.150	<b>1-1/2</b>	3/16	2-1/2	29150XL	46.90	29150XL-C3	52.50
.180	<b>1</b>	3/16	2	29180	36.80	29180-C3	42.40
.180	<b>1-1/2</b>	3/16	2-1/2	29180L	44.60	29180L-C3	50.20
.180	<b>2</b>	3/16	3	29180XL	58.20	29180XL-C3	63.80
.210	<b>1</b>	1/4	2	29210	38.30	29210-C3	45.90
.210	<b>1-1/2</b>	1/4	2-1/2	29210L	45.20	29210L-C3	52.80
.210	<b>2</b>	1/4	3	29210XL	55.60	29210XL-C3	63.20
.240	<b>1</b>	1/4	2	29240	38.30	29240-C3	45.90
.240	<b>1-1/2</b>	1/4	2-1/2	29240L	45.20	29240L-C3	52.80
.240	<b>2</b>	1/4	3	29240XL	66.70	29240XL-C3	74.30
.300	<b>1</b>	5/16	2-1/2	29300	92.80	29300-C3	101.70
.360	<b>2</b>	3/8	3	29360	121.80	29360-C3	131.90

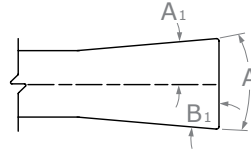
BORING BARS

# BACKDRAFT CUTTERS

## Square



- Designed to clean up bottom corner of pockets while backdraft angle minimizes rubbing
- 4 helical flutes (20° helix)
- Center cutting
- Solid carbide
- CNC ground in the USA



$$A = 180 - 2B1$$

$$B1 = 90 - (A/2)$$

$$A1 = 90 - B1$$

$$A1 = A/2$$

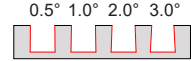
$$A = 2A1$$

ANGLES PER SIDE	CUTTER DIA.	LOC	NECK DIA.	OVERALL REACH	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
							4 FL	PRICE	4 FL	PRICE
A1 <sup>+0°15'</sup> / <sub>-0°15'</sub>	D1 <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L2 <sup>+0.010"</sup> / <sub>-0.000"</sub>		L3 <sup>+0.010"</sup> / <sub>-0.000"</sub>	D2 (h6)	L1	4 FL	PRICE	4 FL	PRICE
0.5°	.062	.093	.058	.312 (5x)	1/8	2-1/2	781362	54.00	781362-C3	59.20
	.093	.139	.088	.500 (5x)	1/8	2-1/2	781393	54.00	781393-C3	59.20
1°	.062	.093	.056	.312 (5x)	1/8	2-1/2	780762	54.00	780762-C3	59.20
	.093	.139	.086	.500 (5x)	1/8	2-1/2	780793	54.00	780793-C3	59.20
2°	.062	.093	.053	.312 (5x)	1/8	2-1/2	780162	54.00	780162-C3	59.20
	.093	.139	.081	.500 (5x)	1/8	2-1/2	780193	53.50	780193-C3	58.70
3°	.062	.093	.049	.312 (5x)	1/8	2-1/2	779562	53.50	779562-C3	58.70
	.093	.139	.075	.500 (5x)	1/8	2-1/2	779593	53.50	779593-C3	58.70

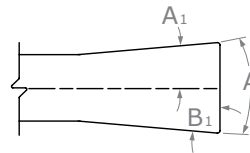
ANGLES PER SIDE	CUTTER DIA.	LOC	NECK DIA.	OVERALL REACH	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
							4 FL	PRICE	4 FL	PRICE
A1 <sup>+0°15'</sup> / <sub>-0°15'</sub>	D1 <sup>+0.000"</sup> / <sub>-0.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-0.000"</sub>		L3 <sup>+0.030"</sup> / <sub>-0.000"</sub>	D2 (h6)	L1	4 FL	PRICE	4 FL	PRICE
0.5°	.125	.187	.117	.625 (5x)	1/8	2-1/2	781408	54.00	781408-C3	59.20
	.187	.285	.177	1.000 (5x)	3/16	2-1/2	781412	58.40	781412-C3	64.00
	.250	.375	.238	1.250 (5x)	1/4	2-1/2	781416	64.90	781416-C3	72.50
1°	.125	.187	.113	.625 (5x)	1/8	2-1/2	780808	54.00	780808-C3	59.20
	.187	.285	.172	1.000 (5x)	3/16	2-1/2	780812	58.40	780812-C3	64.00
	.250	.375	.231	1.250 (5x)	1/4	2-1/2	780816	64.90	780816-C3	72.50
2°	.125	.187	.105	.625 (5x)	1/8	2-1/2	780208	53.50	780208-C3	58.70
	.187	.285	.160	1.000 (5x)	3/16	2-1/2	780212	58.40	780212-C3	64.00
	.250	.375	.217	1.250 (5x)	1/4	2-1/2	780216	64.90	780216-C3	72.50
3°	.125	.187	.098	.625 (5x)	1/8	2-1/2	779608	53.50	779608-C3	58.70
	.187	.285	.149	1.000 (5x)	3/16	2-1/2	779612	57.80	779612-C3	63.40
	.250	.375	.203	1.250 (5x)	1/4	2-1/2	779616	64.90	779616-C3	72.50

# BACKDRAFT CUTTERS

## Corner Radius



- Designed to clean up bottom corner of pockets while backdraft angle minimizes rubbing
- Corner radius for improved strength and wear resistance
- 4 helical flutes (20° helix)
- Center cutting
- Solid carbide
- CNC ground in the USA



$$A = 180 - 2B1$$

$$B1 = 90 - (A/2)$$

$$B1 = 90 - A1$$

$$A1 = 90 - B1$$

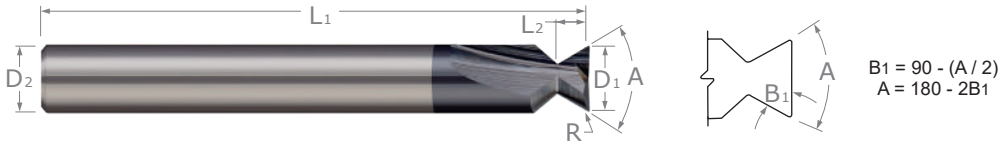
$$A1 = A/2$$

$$A = 2A1$$

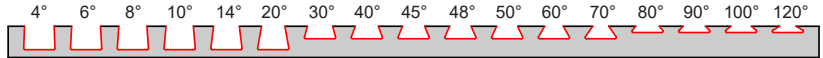
ANGLES PER SIDE	CUTTER DIA.	CORNER RADIUS	LOC	NECK DIA.	OVERALL REACH	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
A1 +0°15' -0°15'	D1 +.0005" -.0005"	R +.001" -.001"	L2 +.010" -.000"	L3 +.010" -.000"	D2 (h6)	L1	4 FL	PRICE	4 FL	PRICE	
0.5°	.062	.005	.093	.058	.312 (5x)	1/8	2-1/2	780962	55.30	780962-C3	60.50
	.093	.005	.139	.088	.500 (5x)	1/8	2-1/2	780993	54.50	780993-C3	59.70
1°	.062	.005	.093	.056	.312 (5x)	1/8	2-1/2	780362	55.30	780362-C3	60.50
	.093	.005	.139	.086	.500 (5x)	1/8	2-1/2	780393	54.80	780393-C3	60.00
2°	.062	.005	.093	.053	.312 (5x)	1/8	2-1/2	779762	55.30	779762-C3	60.50
	.093	.005	.139	.081	.500 (5x)	1/8	2-1/2	779793	55.30	779793-C3	60.50
3°	.062	.005	.093	.049	.312 (5x)	1/8	2-1/2	779162	54.80	779162-C3	60.00
	.093	.005	.139	.075	.500 (5x)	1/8	2-1/2	779193	54.80	779193-C3	60.00

A1 +0°15' -0°15'	D1 +.000" -.002"	R +.001" -.001"	L2 +.030" -.000"	L3 +.030" -.000"	D2 (h6)	L1	4 FL	PRICE	4 FL	PRICE	
0.5°	.125	.010	.187	.117	.625 (5x)	1/8	2-1/2	781208	55.30	781208-C3	60.50
	.187	.010	.285	.177	1.000 (5x)	3/16	2-1/2	781212	59.70	781212-C3	65.30
	.250	.010	.375	.238	1.250 (5x)	1/4	2-1/2	781216	67.30	781216-C3	74.90
1°	.125	.010	.187	.113	.625 (5x)	1/8	2-1/2	780608	55.30	780608-C3	60.50
	.187	.010	.285	.172	1.000 (5x)	3/16	2-1/2	780612	59.70	780612-C3	65.30
	.250	.010	.375	.231	1.250 (5x)	1/4	2-1/2	780616	67.30	780616-C3	74.90
2°	.125	.010	.187	.105	.625 (5x)	1/8	2-1/2	780008	55.30	780008-C3	60.50
	.187	.010	.285	.160	1.000 (5x)	3/16	2-1/2	780012	59.20	780012-C3	64.80
	.250	.010	.375	.217	1.250 (5x)	1/4	2-1/2	780016	67.30	780016-C3	74.90
3°	.125	.010	.187	.098	.625 (5x)	1/8	2-1/2	779408	54.80	779408-C3	60.00
	.187	.010	.285	.149	1.000 (5x)	3/16	2-1/2	779412	59.20	779412-C3	64.80
	.250	.010	.375	.203	1.250 (5x)	1/4	2-1/2	779416	66.60	779416-C3	74.20

# DOVETAIL CUTTERS



- Offered with sharp corner, .003", .005", .010", .015", or .030" Corner Radius
- Solid carbide
- CNC ground in the USA



Stocked in *Seventeen* Included Angles!

INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		AISI COATED	
								TOOL #	PRICE	TOOL #	PRICE
A +1° -1°	D1 +.000" -.002"	L2 +.020" -.000"		R		D2	L1				
4°	1/16	.125	.054	.005	2	1/8	1-1/2	930004	101.50	930004-C3	106.70
	3/32	.187	.081	.010	2	1/8	1-1/2	991406	98.40	991406-C3	103.60
	1/8	.250	.108	<b>SHARP!</b>	2	1/8	1-1/2	883608	101.50	883608-C3	106.70
	1/8	.250	.108	.010	2	1/8	1-1/2	991408	103.20	991408-C3	108.40
	3/16	.375	.161	<b>SHARP!</b>	2	3/16	2	883612	104.50	883612-C3	110.10
	3/16	.375	.162	.010	2	3/16	2	991412	106.20	991412-C3	111.80
	1/4	.500	.215	<b>SHARP!</b>	2	1/4	2	883616	130.80	883616-C3	138.40
	1/4	.500	.216	.010	2	1/4	2	991416	133.10	991416-C3	140.70
	3/8	.750	.323	<b>SHARP!</b>	3	3/8	2-1/2	883624	151.40	883624-C3	161.50
	3/8	.750	.323	.010	3	3/8	2-1/2	991424	153.80	991424-C3	163.90
1/2	1.000	.431	.010	3	1/2	3	991432	208.50	991432-C3	223.60	
6°	1/16	.125	.049	.005	2	1/8	1-1/2	932304	101.50	932304-C3	106.70
	3/32	.187	.074	.010	2	1/8	1-1/2	989206	98.40	989206-C3	103.60
	1/8	.250	.099	<b>SHARP!</b>	2	1/8	1-1/2	891208	99.80	891208-C3	105.00
	1/8	.250	.100	.010	2	1/8	1-1/2	989208	101.50	989208-C3	106.70
	3/16	.375	.148	<b>SHARP!</b>	2	3/16	2	891212	102.60	891212-C3	108.20
	3/16	.375	.149	.010	2	3/16	2	989212	104.30	989212-C3	109.90
	1/4	.500	.198	<b>SHARP!</b>	2	1/4	2	891216	129.50	891216-C3	137.10
	1/4	.500	.199	.010	2	1/4	2	989216	131.60	989216-C3	139.20
	3/8	.750	.296	<b>SHARP!</b>	3	3/8	2-1/2	891224	149.40	891224-C3	159.50
	3/8	.750	.297	.010	3	3/8	2-1/2	989224	151.80	989224-C3	161.90
1/2	1.000	.396	.010	3	1/2	3	989232	205.70	989232-C3	220.80	
8°	1/8	.218	.096	.010	2	1/8	1-1/2	984808	98.40	984808-C3	103.60
	3/16	.281	.150	.010	2	3/16	2	984812	101.40	984812-C3	107.00
	1/4	.375	.199	.010	2	1/4	2	984816	128.60	984816-C3	136.20
10°	1/32	.047	.023	<b>SHARP!</b>	2	1/8	1-1/2	990102	94.20	990102-C3	99.40
	1/16	.093	.046	<b>SHARP!</b>	2	1/8	1-1/2	990104	94.20	990104-C3	99.40
	1/16	.093	.047	.005	2	1/8	1-1/2	61504	96.00	61504-C3	101.20
	5/64	.109	.060	.005	2	1/8	1-1/2	61505	96.00	61505-C3	101.20
	3/32	.125	.071	<b>SHARP!</b>	2	1/8	1-1/2	990106	91.20	990106-C3	96.40
	3/32	.125	.073	.010	2	1/8	1-1/2	27006	92.90	27006-C3	98.10

\*Diameter measured over radii (not to theoretical sharp corner).

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# DOVETAIL CUTTERS

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INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
10°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		R		D <sub>2</sub>	L <sub>1</sub>				
	1/8	.187	.092	<b>SHARP!</b>	2	1/8	1-1/2	990108	91.20	990108-C3	96.40
	1/8	.187	.094	.010	2	1/8	1-1/2	27008	92.90	27008-C3	98.10
	3/16	.250	.144	<b>SHARP!</b>	2	3/16	2	990112	93.90	990112-C3	99.50
	3/16	.250	.146	.010	2	3/16	2	27012	95.80	27012-C3	101.40
	1/4	.312	.195	<b>SHARP!</b>	2	1/4	2	990116	119.20	990116-C3	126.80
	1/4	.312	.197	.010	2	1/4	2	27016	121.60	27016-C3	129.20
	5/16	.375	.247	<b>SHARP!</b>	3	5/16	2-1/2	990120	126.20	990120-C3	135.10
	5/16	.375	.249	.010	3	5/16	2-1/2	27020	128.30	27020-C3	137.20
	3/8	.500	.288	<b>SHARP!</b>	3	3/8	2-1/2	990124	135.70	990124-C3	145.80
	3/8	.500	.289	.010	3	3/8	2-1/2	27024	138.10	27024-C3	148.20
	1/2	.625	.391	<b>SHARP!</b>	3	1/2	3	990132	188.20	990132-C3	203.30
1/2	.625	.392	.010	3	1/2	3	27032	191.40	27032-C3	206.50	
14°	1/16	.093	.040	.005	2	1/8	1-1/2	873404	96.00	873404-C3	101.20
	3/32	.125	.065	.010	2	1/8	1-1/2	979406	92.90	979406-C3	98.10
	1/8	.187	.082	.010	2	1/8	1-1/2	979408	92.90	979408-C3	98.10
	3/16	.250	.129	.010	2	3/16	2	979412	95.80	979412-C3	101.40
	1/4	.312	.176	.010	2	1/4	2	979416	121.60	979416-C3	129.20
	5/16	.375	.223	.010	3	5/16	2-1/2	979420	129.50	979420-C3	138.40
	3/8	.500	.255	.010	3	3/8	2-1/2	979424	138.10	979424-C3	148.20
	1/2	.625	.349	.010	3	1/2	3	979432	191.40	979432-C3	206.50
20°	1/32	.031	.020	<b>SHARP!</b>	2	1/8	1-1/2	986002	78.70	986002-C3	83.90
	1/16	.062	.040	<b>SHARP!</b>	2	1/8	1-1/2	986004	78.70	986004-C3	83.90
	1/16	.062	.042	.005	2	1/8	1-1/2	62304	80.20	62304-C3	85.40
	5/64	.078	.052	.005	2	1/8	1-1/2	62305	80.20	62305-C3	85.40
	3/32	.093	.060	<b>SHARP!</b>	2	1/8	1-1/2	986006	75.40	986006-C3	80.60
	3/32	.093	.064	.010	2	1/8	1-1/2	16406	77.10	16406-C3	82.30
	1/8	.125	.081	<b>SHARP!</b>	2	1/8	1-1/2	986008	75.70	986008-C3	80.90
	1/8	.125	.085	.010	2	1/8	1-1/2	16408	77.10	16408-C3	82.30
	3/16	.187	.122	<b>SHARP!</b>	2	3/16	2	986012	78.60	986012-C3	84.20
	3/16	.187	.125	.010	2	3/16	2	16412	79.80	16412-C3	85.40
	1/4	.250	.162	<b>SHARP!</b>	2	1/4	2	986016	99.00	986016-C3	106.60
	1/4	.250	.163	.005	2	1/4	2	62316	100.80	62316-C3	108.40
	1/4	.250	.166	.010	2	1/4	2	16416	100.80	16416-C3	108.40
	5/16	.312	.202	<b>SHARP!</b>	3	5/16	2-1/2	986020	108.20	986020-C3	117.10
	5/16	.312	.206	.010	3	5/16	2-1/2	16420	110.30	16420-C3	119.20
	3/8	.375	.243	<b>SHARP!</b>	3	3/8	2-1/2	986024	114.00	986024-C3	124.10
	3/8	.375	.247	.010	3	3/8	2-1/2	16424	115.90	16424-C3	126.00
	1/2	.500	.324	<b>SHARP!</b>	3	1/2	3	986032	156.80	986032-C3	171.90
	1/2	.500	.328	.010	3	1/2	3	16432	159.80	16432-C3	174.90
	5/8	.625	.409	.010	4	5/8	3	16440	183.00	16440-C3	198.10
3/4	.750	.489	.010	4	3/4	3	16448	193.20	16448-C3	209.50	

\*Diameter measured over radii (not to theoretical sharp corner).

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DOVETAIL CUTTERS

# DOVETAIL CUTTERS

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INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		AII <sup>n</sup> COATED		
								TOOL #	PRICE	TOOL #	PRICE	
30°	A $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+ .000"$ $-.002"$	L <sub>2</sub> $+ .020"$ $-.000"$	R		D <sub>2</sub>	L <sub>1</sub>					
		1/32	.020	.020	<b>SHARP!</b>	2	1/8	1-1/2	983302	80.20	983302-C3	85.40
		1/16	.040	.041	<b>SHARP!</b>	2	1/8	1-1/2	983304	78.70	983304-C3	83.90
		1/16	.045	.041	.005	2	1/8	1-1/2	63404	80.20	63404-C3	85.40
		5/64	.055	.052	.005	2	1/8	1-1/2	63405	80.20	63405-C3	85.40
		3/32	.062	.060	<b>SHARP!</b>	2	1/8	1-1/2	983306	75.40	983306-C3	80.60
		3/32	.078	.057	.010	2	1/8	1-1/2	16506	77.10	16506-C3	82.30
		1/8	.082	.081	<b>SHARP!</b>	2	1/8	1-1/2	983308	75.70	983308-C3	80.90
		1/8	.093	.081	.010	2	1/8	1-1/2	16508	77.10	16508-C3	82.30
		3/16	.125	.121	<b>SHARP!</b>	2	3/16	2	983312	76.80	983312-C3	82.40
		3/16	.125	.127	.010	2	3/16	2	16512	78.30	16512-C3	83.90
		1/4	.156	.166	<b>SHARP!</b>	2	1/4	2	983316	97.30	983316-C3	104.90
		1/4	.156	.172	.010	2	1/4	2	16516	99.00	16516-C3	106.60
		5/16	.218	.196	<b>SHARP!</b>	3	5/16	2-1/2	983320	108.30	983320-C3	117.20
		5/16	.187	.218	.010	3	5/16	2-1/2	16520	108.30	16520-C3	117.20
		3/8	.250	.241	<b>SHARP!</b>	3	3/8	2-1/2	983324	111.90	983324-C3	122.00
		3/8	.250	.243	.005	3	3/8	2-1/2	63424	114.00	63424-C3	124.10
		3/8	.250	.247	.010	3	3/8	2-1/2	16524	114.00	16524-C3	124.10
	1/2	.312	.333	<b>SHARP!</b>	3	1/2	3	983332	154.10	983332-C3	169.20	
	1/2	.312	.339	.010	3	1/2	3	16532	156.80	16532-C3	171.90	
	5/8	.375	.430	.010	4	5/8	3	16540	180.10	16540-C3	195.20	
	3/4	.500	.488	.010	4	3/4	3	16548	190.50	16548-C3	206.80	
40°		1/16	.035	.037	<b>SHARP!</b>	2	1/8	1-1/2	977804	78.70	977804-C3	83.90
		1/16	.040	.037	.005	2	1/8	1-1/2	64604	80.20	64604-C3	85.40
		5/64	.050	.046	.005	2	1/8	1-1/2	64605	80.20	64605-C3	85.40
		3/32	.062	.056	.010	2	1/8	1-1/2	28506	77.10	28506-C3	82.30
		1/8	.078	.068	<b>SHARP!</b>	2	1/8	1-1/2	977808	75.70	977808-C3	80.90
		1/8	.093	.066	.010	2	1/8	1-1/2	28508	77.10	28508-C3	82.30
		3/16	.109	.108	<b>SHARP!</b>	2	3/16	2	977812	78.60	977812-C3	84.20
		3/16	.125	.101	.005	2	3/16	2	64612	79.80	64612-C3	85.40
		3/16	.125	.105	.010	2	3/16	2	28512	79.80	28512-C3	85.40
		1/4	.156	.136	<b>SHARP!</b>	2	1/4	2	977816	99.00	977816-C3	106.60
		1/4	.156	.145	.010	2	1/4	2	28516	100.80	28516-C3	108.40
		5/16	.187	.176	<b>SHARP!</b>	3	5/16	2-1/2	977820	108.20	977820-C3	117.10
		5/16	.187	.185	.010	3	5/16	2-1/2	28520	110.30	28520-C3	119.20
		3/8	.218	.216	<b>SHARP!</b>	3	3/8	2-1/2	977824	114.00	977824-C3	124.10
		3/8	.250	.202	.010	3	3/8	2-1/2	28524	115.90	28524-C3	126.00
		1/2	.312	.273	<b>SHARP!</b>	3	1/2	3	977832	156.80	977832-C3	171.90
		1/2	.312	.281	.010	3	1/2	3	28532	159.80	28532-C3	174.90
		5/8	.375	.361	.010	4	5/8	3	28540	183.00	28540-C3	198.10
	3/4	.500	.395	.010	4	3/4	3	28548	193.20	28548-C3	209.50	
45°		1/8	.093	.058	.010	2	1/8	1-1/2	928408	84.70	928408-C3	89.90
		3/16	.125	.094	.010	2	3/16	2	928412	87.50	928412-C3	93.10
		1/4	.156	.121	<b>SHARP!</b>	2	1/4	2	874516	107.60	874516-C3	115.20
		1/4	.156	.131	.010	2	1/4	2	928416	109.30	928416-C3	116.90
		3/8	.250	.168	<b>SHARP!</b>	3	3/8	2-1/2	874524	124.50	874524-C3	134.60
		3/8	.250	.178	.010	3	3/8	2-1/2	928424	126.20	928424-C3	136.30
		1/2	.312	.242	<b>SHARP!</b>	3	1/2	3	874532	170.70	874532-C3	185.80
		1/2	.312	.251	.010	3	1/2	3	928432	173.40	928432-C3	188.50

NEW

\*Diameter measured over radii (not to theoretical sharp corner).

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# DOVETAIL CUTTERS

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INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		AIRTIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
48°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>		R		D <sub>2</sub>	L <sub>1</sub>				
	1/16	.035	.036	.005	2	1/8	1-1/2	896504	78.30	896504-C3	83.50
	5/64	.045	.043	.005	2	1/8	1-1/2	896505	78.30	896505-C3	83.50
	3/32	.050	.059	.010	2	1/8	1-1/2	16606	74.50	16606-C3	79.70
	1/8	.070	.063	<b>SHARP!</b>	2	1/8	1-1/2	973108	72.90	973108-C3	78.10
	1/8	.093	.053	.010	2	1/8	1-1/2	16608	74.50	16608-C3	79.70
	3/16	.109	.090	<b>SHARP!</b>	2	3/16	2	973112	76.60	973112-C3	82.20
	3/16	.125	.087	.010	2	3/16	2	16612	78.10	16612-C3	83.70
	1/4	.156	.111	<b>SHARP!</b>	2	1/4	2	973116	96.40	973116-C3	104.00
	1/4	.156	.122	.010	2	1/4	2	16616	98.20	16616-C3	105.80
	5/16	.187	.157	.010	3	5/16	2-1/2	16620	107.80	16620-C3	116.70
48°	3/8	.250	.152	<b>SHARP!</b>	3	3/8	2-1/2	973124	113.50	973124-C3	123.60
	3/8	.250	.163	.010	3	3/8	2-1/2	16624	113.20	16624-C3	123.30
	1/2	.312	.222	<b>SHARP!</b>	3	1/2	3	973132	156.40	973132-C3	171.50
	1/2	.312	.233	.010	3	1/2	3	16632	156.10	16632-C3	171.20
50°	1/8	.093	.050	.010	2	1/8	1-1/2	926208	76.90	926208-C3	82.10
	3/16	.125	.082	.010	2	3/16	2	926212	80.80	926212-C3	86.40
	1/4	.156	.116	.010	2	1/4	2	926216	104.70	926216-C3	112.30
	3/8	.250	.153	.010	3	3/8	2-1/2	926224	119.90	926224-C3	130.00
	1/2	.312	.220	.010	3	1/2	3	926232	166.50	926232-C3	181.60
60°	1/32	.014	.015	<b>SHARP!</b>	2	1/8	1-1/2	995202	75.10	995202-C3	80.30
	1/16	.028	.030	<b>SHARP!</b>	2	1/8	1-1/2	995204	76.80	995204-C3	82.00
	1/16	.032	.028	.003	2	1/8	1-1/2	811404	79.80	811404-C3	85.00
	1/16	.032	.032	.005	2	1/8	1-1/2	65104	78.30	65104-C3	83.50
	5/64	.035	.038	<b>SHARP!</b>	2	1/8	1-1/2	995205	76.80	995205-C3	82.00
	5/64	.040	.039	.005	2	1/8	1-1/2	65105	78.30	65105-C3	83.50
	3/32	.040	.047	<b>SHARP!</b>	2	1/8	1-1/2	995206	72.90	995206-C3	78.10
	3/32	.045	.056	.010	2	1/8	1-1/2	16706	74.50	16706-C3	79.70
	.118 (3 mm)	.053	.057	<b>SHARP!</b>	2	1/8	1-1/2	995296	76.50	995296-C3	81.70
	.118 (3 mm)	.059	.065	.010	2	1/8	1-1/2	16796	78.20	16796-C3	83.40
	1/8	.056	.060	<b>SHARP!</b>	2	1/8	1-1/2	995208	72.90	995208-C3	78.10
	1/8	.062	.056	.003	2	1/8	1-1/2	811408	74.50	811408-C3	79.70
	1/8	.062	.061	.005	2	1/8	1-1/2	65108	74.50	65108-C3	79.70
	1/8	.062	.068	.010	2	1/8	1-1/2	16708	74.50	16708-C3	79.70
	9/64	.063	.063	<b>SHARP!</b>	2	3/16	2	995209	80.10	995209-C3	85.70
	9/64	.070	.074	.010	2	3/16	2	16709	81.80	16709-C3	87.40
	5/32	.070	.075	<b>SHARP!</b>	2	3/16	2	995210	76.60	995210-C3	82.20
	5/32	.078	.073	.005	2	3/16	2	65110	79.60	65110-C3	85.20
	5/32	.078	.081	.010	2	3/16	2	16710	78.10	16710-C3	83.70
	3/16	.085	.089	<b>SHARP!</b>	2	3/16	2	995212	76.60	995212-C3	82.20
	3/16	.093	.083	.003	2	3/16	2	811412	78.10	811412-C3	83.70
	3/16	.093	.087	.005	2	3/16	2	65112	78.10	65112-C3	83.70
	3/16	.093	.095	.010	2	3/16	2	16712	78.10	16712-C3	83.70
3/16	.109	.104	.030	2	3/16	2	845112	78.10	845112-C3	83.70	

\*Diameter measured over radii (not to theoretical sharp corner).

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DOVETAIL CUTTERS

# DOVETAIL CUTTERS

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INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
60°	A $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.000''$ $-0.002''$	L <sub>2</sub> $+0.020''$ $-0.000''$	R		D <sub>2</sub>	L <sub>1</sub>				
	1/4	.118	.114	<b>SHARP!</b>	2	1/4	2	995216	94.70	995216-C3	102.30
	1/4	.125	.109	.003	2	1/4	2	811416	96.40	811416-C3	104.00
	1/4	.125	.113	.005	2	1/4	2	65116	96.40	65116-C3	104.00
	1/4	.125	.120	.010	2	1/4	2	16716	96.40	16716-C3	104.00
	1/4	.125	.126	.015	2	1/4	2	<b>738016</b>	96.40	<b>738016-C3</b>	104.00 <b>NEW</b>
	1/4	.140	.131	.030	2	1/4	2	845116	96.40	845116-C3	104.00
	5/16	.141	.150	<b>SHARP!</b>	3	5/16	2-1/2	995220	103.70	995220-C3	112.60
	5/16	.156	.138	.005	3	5/16	2-1/2	65120	105.60	65120-C3	114.50
	5/16	.156	.147	.010	3	5/16	2-1/2	16720	105.60	16720-C3	114.50
	3/8	.156	.195	<b>SHARP!</b>	3	3/8	2-1/2	995224	108.30	995224-C3	118.40
	3/8	.187	.166	.005	3	3/8	2-1/2	65124	110.60	65124-C3	120.70
	3/8	.187	.174	.010	3	3/8	2-1/2	16724	110.60	16724-C3	120.70
	3/8	.187	.181	.015	3	3/8	2-1/2	<b>738024</b>	110.60	<b>738024-C3</b>	120.70 <b>NEW</b>
	3/8	.187	.203	.030	3	3/8	2-1/2	845124	110.40	845124-C3	120.50
	7/16	.187	.222	<b>SHARP!</b>	3	7/16	2-3/4	995228	117.10	995228-C3	129.70
	7/16	.218	.200	.010	3	7/16	2-3/4	16728	119.90	16728-C3	132.50
	1/2	.218	.248	<b>SHARP!</b>	3	1/2	3	995232	150.60	995232-C3	165.70
	1/2	.250	.219	.005	3	1/2	3	65132	153.50	65132-C3	166.00
	1/2	.250	.226	.010	3	1/2	3	16732	153.50	16732-C3	168.60
1/2	.250	.233	.015	3	1/2	3	<b>738032</b>	153.50	<b>738032-C3</b>	168.60 <b>NEW</b>	
1/2	.250	.255	.030	3	1/2	3	845132	151.20	845132-C3	163.70	
5/8	.281	.301	<b>SHARP!</b>	4	5/8	3	995240	225.10	995240-C3	240.20	
5/8	.312	.279	.010	4	5/8	3	16740	227.90	16740-C3	243.00	
3/4	.343	.354	<b>SHARP!</b>	4	3/4	3	995248	270.50	995248-C3	286.80	
3/4	.375	.332	.010	4	3/4	3	16748	273.30	16748-C3	289.60	
1	.500	.437	.010	4	1	4	16764	493.90	16764-C3	518.70	
70°	1/4	.109	.116	.010	2	1/4	2	832316	104.70	832316-C3	112.30
	1/2	.218	.213	.010	3	1/2	3	832332	166.50	832332-C3	181.60
80°	1/4	.093	.117	.010	2	1/4	2	827916	104.70	827916-C3	112.30
	1/2	.187	.209	.010	3	1/2	3	827932	166.50	827932-C3	181.60
90°	1/32	.008	.015	<b>SHARP!</b>	2	1/8	1-1/2	992002	78.30	992002-C3	83.50
	1/16	.023	.030	.005	2	1/8	1-1/2	66304	78.30	66304-C3	83.50
	5/64	.027	.038	.005	2	1/8	1-1/2	66305	78.30	66305-C3	83.50
	3/32	.025	.043	<b>SHARP!</b>	2	1/8	1-1/2	992006	72.90	992006-C3	78.10
	3/32	.031	.059	.010	2	1/8	1-1/2	16806	74.50	16806-C3	79.70
	1/8	.034	.057	<b>SHARP!</b>	2	1/8	1-1/2	992008	71.70	992008-C3	76.90
	1/8	.040	.059	.005	2	1/8	1-1/2	66308	73.30	66308-C3	78.50
	1/8	.040	.073	.010	2	1/8	1-1/2	16808	73.30	16808-C3	78.50
	5/32	.047	.090	.010	2	3/16	2	16810	78.10	16810-C3	83.70
	3/16	.052	.084	<b>SHARP!</b>	2	3/16	2	992012	76.60	992012-C3	82.20
	3/16	.047	.122	.010	2	3/16	2	16812	78.10	16812-C3	83.70
	1/4	.068	.114	<b>SHARP!</b>	2	1/4	2	992016	94.70	992016-C3	102.30
	1/4	.062	.140	.005	2	1/4	2	66316	96.40	66316-C3	104.00
	1/4	.063	.154	.010	2	1/4	2	16816	96.40	16816-C3	104.00
5/16	.085	.143	<b>SHARP!</b>	3	5/16	2-1/2	992020	103.70	992020-C3	112.60	
5/16	.093	.155	.010	3	5/16	2-1/2	16820	105.60	16820-C3	114.50	

\*Diameter measured over radii (not to theoretical sharp corner).

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DOVETAIL CUTTERS



# DOVETAIL CUTTERS

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INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		AITIN COATED		
								TOOL #	PRICE	TOOL #	PRICE	
A $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.000''$ $-0.002''$	L <sub>2</sub> $+0.020''$ $-0.000''$		R		D <sub>2</sub>	L <sub>1</sub>					
NEW  NEW	90°	3/8	.105	.165	<b>SHARP!</b>	3	3/8	2-1/2	992024	108.30	992024-C3	118.40
		3/8	.109	.171	.005	3	3/8	2-1/2	66324	110.60	66324-C3	120.70
		3/8	.125	.153	.010	3	3/8	2-1/2	16824	110.60	16824-C3	120.70
		3/8	.125	.164	.015	3	3/8	2-1/2	737924	110.60	737924-C3	120.70
		7/16	.141	.185	.010	3	7/16	2-3/4	16828	119.90	16828-C3	132.50
		1/2	.141	.218	<b>SHARP!</b>	3	1/2	3	992032	150.60	992032-C3	165.70
		1/2	.156	.202	.005	3	1/2	3	66332	153.50	66332-C3	166.00
		1/2	.156	.216	.010	3	1/2	3	16832	153.50	16832-C3	168.60
		1/2	.156	.227	.015	3	1/2	3	737932	153.50	737932-C3	168.60
		1/2	.172	.241	.030	3	1/2	3	833932	153.50	833932-C3	166.00
		5/8	.187	.279	.010	4	5/8	3	16840	227.90	16840-C3	243.00
		3/4	.218	.342	.010	4	3/4	3	16848	273.30	16848-C3	289.60
100°	1/8	.040	.065	.010	2	1/8	1-1/2	964408	79.90	964408-C3	85.10	
	3/16	.047	.110	.010	2	3/16	2	964412	83.90	964412-C3	89.50	
	1/4	.062	.137	.010	2	1/4	2	964416	104.70	964416-C3	112.30	
	3/8	.093	.188	.010	3	3/8	2-1/2	964424	119.70	964424-C3	129.80	
	1/2	.125	.237	.010	3	1/2	3	964432	167.90	964432-C3	183.00	
120°	1/8	.039	.045	.010	2	1/8	1-1/2	959908	79.10	959908-C3	84.30	
	3/16	.047	.079	.010	2	3/16	2	959912	83.10	959912-C3	88.70	
	1/4	.062	.090	.010	2	1/4	2	959916	104.70	959916-C3	112.30	
	3/8	.093	.107	.010	3	3/8	2-1/2	959924	119.70	959924-C3	129.80	
	1/2	.109	.177	.010	3	1/2	3	959932	166.30	959932-C3	181.40	

\*Diameter measured over radii (not to theoretical sharp corner).



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# DOVETAIL CUTTERS

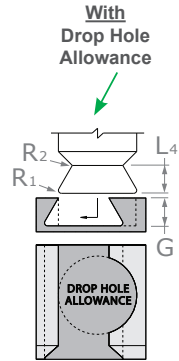
## Parker Hannifin O-Ring Dovetail Cutters



### With Drop Hole Allowance



- **Designed for milling full dovetail grooves with drop hole allowance**
- Designed to the standards suggested by the O-Ring Division of Parker Hannifin Corporation (ORD 5700/USA, ORD 5700)
- Undersized cutter design allows climb milling on both faces of groove for improved finish
- Mills both top and bottom radii
- 24° per side, 48° included
- 2 straight flutes
- Center cutting
- Solid carbide
- CNC ground in the USA



O-RING X-SECTION	CUTTER DIA.*	GLAND DEPTH	CORNER RADIUS	NECK DIA.*	NECK RADIUS	RADIUS CENTER	SHANK DIA.	OAL	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
									TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.070	.079	.051	.015	.054	.005	.047	1/8	1-1/2	23807+	76.40	23807-C3+	81.60	23807-C8+	84.00
.070	.084	.054	.015	.056	.005	.050	1/8	1-1/2	56307Δ	76.40	56307-C3Δ	81.60	56307-C8Δ	84.00
.103	.135	.082	.015	.088	.010	.073	3/16	2	23814	79.50	23814-C3	85.10	23814-C8	87.10
.139	.172	.112	.031	.116	.010	.103	3/16	2	23821	79.50	23821-C3	85.10	23821-C8	87.10
.210	.284	.172	.031	.179	.015	.158	5/16	2-1/2	23828	105.20	23828-C3	114.10	23828-C8	122.60
.275	.362	.232	.062	.237	.015	.219	3/8	2-1/2	23835	121.80	23835-C3	131.90	23835-C8	142.90
.375	.488	.317	.093	.327	.020	.299	1/2	3	23842	156.10	23842-C3	171.20	23842-C8	180.90

\*Diameter measured over radii (not to theoretical sharp corner). †Meets ORD 5700/USA spec. ΔMeets ORD 5700 spec. All other tools meet BOTH specifications.

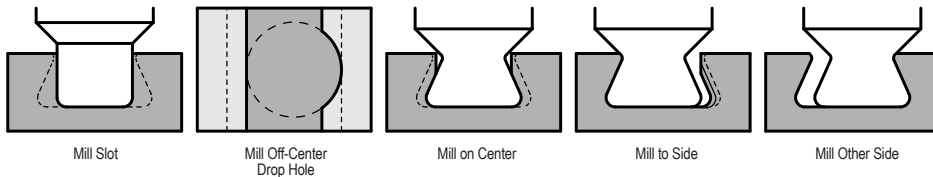
### RECOMMENDED O-RING DOVETAIL MILLING TECHNIQUES

#### With Drop Hole Allowance

- Rough out slot with appropriate O-Ring Slotting End Mill (see series 565xx) or with other comparable end mill.
- Mill off-center drop hole.
- Insert O-Ring Cutter through drop hole and mill single pass down center of groove. Please note that cutter is contacting both sides of part and it may be necessary to reduce the feed rate (up to 40%).
- Mill multiple passes with descending radial stepover on one side of part.
- Mill multiple passes with descending radial stepover on other side of part.



For Radial Calculations, scan the QR code or visit [harveytool.com/resources](http://harveytool.com/resources)



DOVETAIL CUTTERS

### O-Ring Slotting End Mills



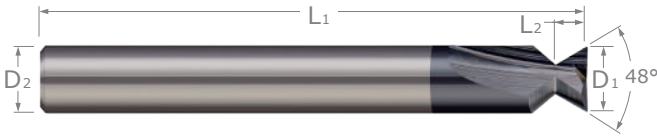
◀ See page 413

- **Ideal for slotting o-ring dovetail grooves!**
- **Achieve the right slot width and shape without radial stepovers!**

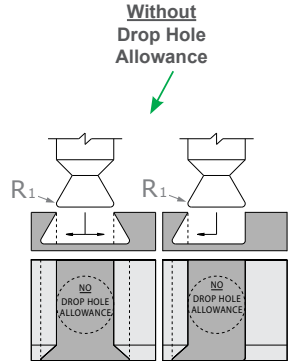
# DOVETAIL CUTTERS

## Parker Hannifin O-Ring Dovetail Cutters

### Without Drop Hole Allowance



- **Designed for milling half dovetails or full dovetails with no drop hole allowance**
- Designed to the standards suggested by the O-Ring Division of Parker Hannifin Corporation (tools meet both specs: ORD 5700/USA, ORD 5700)
- Mills bottom radius only
- 24° per side, 48° included
- 2 straight flutes
- Center cutting
- Solid carbide
- CNC ground in the USA



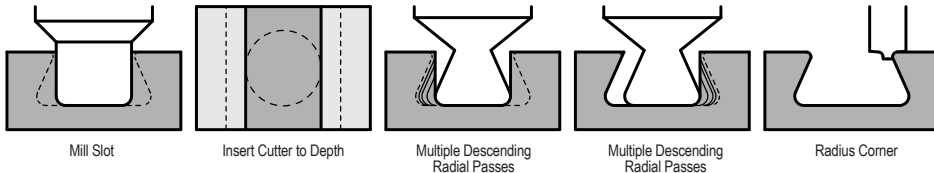
O-RING X-SECTION	CUTTER DIA.*	LOC	CORNER RADIUS	NECK DIA.**	SHANK DIA.	OAL	UNCOATED		AlTiN COATED		TiB <sub>2</sub> COATED	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	R <sub>1</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.070	.055	.054	.015	.023	1/8	1-1/2	23907	74.60	23907-C3	79.80	23907-C8	82.20
.103	.083	.085	.015	.024	1/8	1-1/2	23914	74.60	23914-C3	79.80	23914-C8	82.20
.139	.113	.115	.031	.044	1/8	1-1/2	23921	74.60	23921-C3	79.80	23921-C8	82.20
.210	.171	.176	.031	.048	3/16	2	23928	77.70	23928-C3	83.30	23928-C8	85.30
.275	.231	.238	.062	.086	1/4	2	23935	101.90	23935-C3	109.50	23935-C8	110.10
.375	.315	.323	.093	.128	3/8	2-1/2	23942	119.00	23942-C3	129.10	23942-C8	140.10

\*Diameter measured over radii (not to theoretical sharp corner). \*\*Diameter at length of cut.

### RECOMMENDED O-RING DOVETAIL MILLING TECHNIQUES

#### Without Drop Hole Allowance

- **Tools are very fragile. Reduced neck profile and small o-ring groove size result in weakened tool for this difficult application. Always reconsider the potential to use the WITH drop hole allowance.**
- Rough out slot with appropriate O-Ring Slotting End Mill (see series 565xx) or with other comparable end mill.
- Insert O-Ring Cutter into slot at full axial depth.
- Mill multiple passes with descending radial stepover on one side of part.
- Mill multiple passes with descending radial stepover on other side of part.
- These tools are able to mill both Full and Half O-Ring grooves. As such, a corner radius at the top of the part must be machined for final groove form (see series 170xx).



#### O-Ring Corner Rounding End Mills



◀ See page 413

- **Ideal for creating radius on top part of o-ring dovetail groove!**
- **Design ensures smooth, blended form on part!**

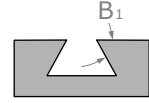
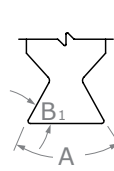


For Radial Calculations, scan the QR code or visit [harveytool.com/resources](http://harveytool.com/resources)

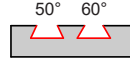
DOVETAIL CUTTERS

# DOVETAIL CUTTERS

## Sight Groove Dovetail Cutters



Off the Shoulder Angle  
 $B_1 = 90 - (A / 2)$   
 $A = 180 - 2B_1$



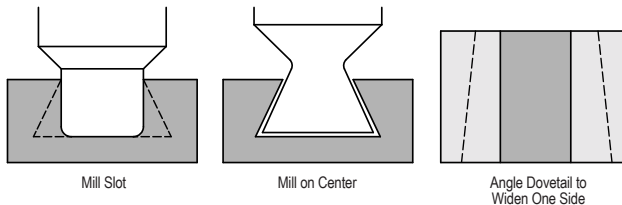
Stocked in *Two* Included Angles!

- Designed for milling dovetail grooves for Sight Attachments
- Diameters match common brand standards
- Offered with sharp corner
- Solid carbide
- CNC ground in the USA

INCL. ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
A $+1^\circ$ $-1^\circ$	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
50°	.330	.093	.242	3	3/8	2-1/2	806833	118.70	806833-C3	128.80
	.344	.125	.226	3	3/8	2-1/2	806834	117.60	806834-C3	127.70
	.495	.250	.261	3	1/2	3	806849	165.70	806849-C3	180.80
60°	.300	.093	.191	3	5/16	2-1/2	806730	104.70	806730-C3	113.60
	.359	.125	.213	3	3/8	2-1/2	806735	109.40	806735-C3	119.50

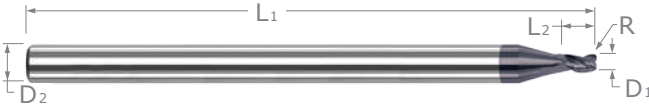
### RECOMMENDED SIGHT GROOVE DOVETAIL MILLING TECHNIQUES

- Use an endmill that is smaller than the top of the groove width to slot.
- With required dovetail, mill groove down the centerline of slot to shape the rest of the dovetail groove
- Since most sights are press fitted, filing or additional adjustments may be required to ensure proper sight fit.
  - Angle the dovetail cutter slightly to create a slightly larger width on one side of the groove.
  - Dovetail should finish on same location on other side of the groove to create a trapezoidal shaped slot.
  - The sight itself can be adjusted by using an appropriate file to shape male dovetail until desired fitting.



## DOVETAIL CUTTERS

## O-Ring Slotting End Mills



Ideal for Slotting

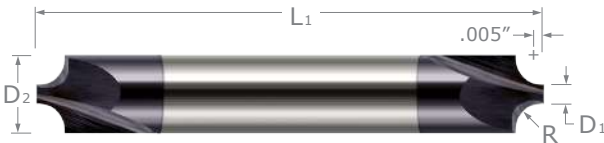
◀ O-Ring Dovetail Grooves!

- Optimized for O-Ring grooves
- Diameters designed to gland width opening
- Stub flute length for improved strength
- Corner radius to match Parker Hannifin standards
- High helix and optimized geometry for improved performance
- 3 Flutes • Center cutting
- Solid carbide • CNC ground in the USA

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
D <sub>1</sub> $\begin{matrix} +.000'' \\ -.001'' \end{matrix}$	R $\begin{matrix} +.001'' \\ -.001'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.055	.015	.065	1/8	1-1/2	56510	27.20	56510-C3	32.40	56510-C8	36.90
.085	.015	.100	1/8	1-1/2	56520	27.20	56520-C3	32.40	56520-C8	36.90
.115	.031	.140	1/8	1-1/2	56530	27.20	56530-C3	32.40	56530-C8	36.90
D <sub>1</sub> $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	R $\begin{matrix} +.001'' \\ -.001'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.176	.031	.210	3/16	2	56540	30.30	56540-C3	35.90	56540-C8	40.10
.236	.062	.280	1/4	2-1/2	56550	40.10	56550-C3	47.70	56550-C8	48.30
.323	.093	.380	3/8	2-1/2	56560	57.20	56560-C3	67.30	56560-C8	78.30

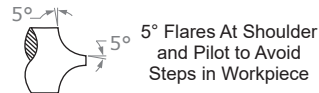
## DOVETAIL CUTTERS

## O-Ring Corner Rounding End Mills



◀ For Creating Radius on Top Part of O-Ring Dovetail Groove

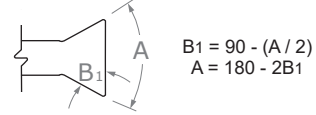
- Radius matches Parker Hannifin standards
- Double-ended
- Flares are tangent to radius
- Design ensures smooth, blended form on part
- Depth of cut = radius plus .005"
- 2 flutes
- Solid carbide
- CNC ground in the USA



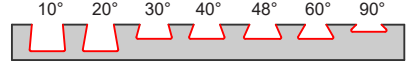
O-RING X-SECTION	RADIUS	PILOT DIAMETER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					2 FL	PRICE	2 FL	PRICE
	R $\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.070	.005	.046	1/8	1-1/2	17005	44.10	17005-C3	50.50
.103	.010	.046	1/8	1-1/2	17010	44.10	17010-C3	50.50
.139	.010	.046	1/8	1-1/2	17010	44.10	17010-C3	50.50
.210	.015	.046	1/8	1-1/2	17015	44.10	17015-C3	50.50
.275	.015	.046	1/8	1-1/2	17015	44.10	17015-C3	50.50
.375	.020	.046	1/8	1-1/2	17020	44.10	17020-C3	50.50

# DOVETAIL CUTTERS

## Long Reach



- Reduced neck for long reach machining
- Corner radius for improved strength
- Solid carbide • CNC ground in the USA























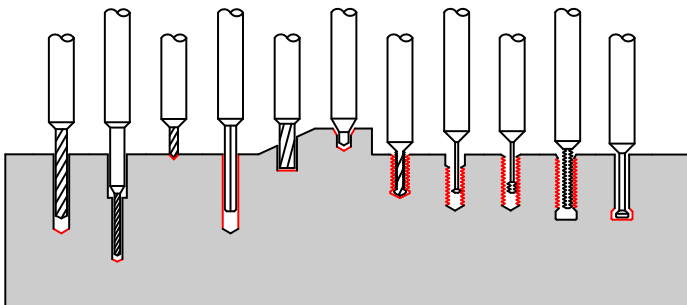
Stocked in *Seven* Included Angles!

INCL. ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	NECK LENGTH	CORNER RADIUS	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
									TOOL #	PRICE	TOOL #	PRICE
A $\pm 1^\circ$	D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		L3 $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	R		D2	L1				
10°	1/8	.187	.094	.125	.010	2	1/8	1-1/2	899108	106.00	899108-C3	111.20
	1/4	.312	.197	.250	.010	2	1/4	2	899116	134.90	899116-C3	142.50
	1/2	.625	.392	.250	.010	3	1/2	3	899132	204.70	899132-C3	219.80
20°	1/8	.125	.085	.125	.010	2	1/8	1-1/2	877408	92.80	877408-C3	98.00
	1/4	.250	.166	.250	.010	2	1/4	2	877416	117.60	877416-C3	125.20
	1/2	.500	.328	.250	.010	3	1/2	3	877432	180.30	877432-C3	195.40
30°	1/16	.045	.041	.062	.005	2	1/8	1-1/2	849904	96.00	849904-C3	101.20
	3/32	.078	.057	.093	.010	2	1/8	1-1/2	914806	92.80	914806-C3	98.00
	1/8	.093	.081	.125	.010	2	1/8	1-1/2	914808	92.80	914808-C3	98.00
	3/16	.125	.127	.187	.010	2	3/16	2	914812	96.20	914812-C3	101.80
	1/4	.156	.172	.250	.010	2	1/4	2	914816	115.60	914816-C3	123.20
	3/8	.250	.247	.250	.010	3	3/8	2-1/2	914824	172.90	914824-C3	183.00
	1/2	.312	.339	.250	.010	3	1/2	3	914832	175.70	914832-C3	190.80
40°	1/8	.093	.066	.125	.010	2	1/8	1-1/2	864008	96.00	864008-C3	101.20
	1/4	.156	.145	.250	.010	2	1/4	2	864016	115.60	864016-C3	123.20
	1/2	.312	.281	.250	.010	3	1/2	3	864032	175.70	864032-C3	190.80
48°	1/8	.093	.053	.125	.010	2	1/8	1-1/2	760108	96.90	760108-C3	102.10
60°	1/16	.032	.032	.062	.005	2	1/8	1-1/2	865504	93.20	865504-C3	98.40
	3/32	.045	.056	.093	.010	2	1/8	1-1/2	925306	89.90	925306-C3	95.10
	1/8	.056	.060	.125	<b>SHARP!</b>	2	1/8	1-1/2	865908	88.40	865908-C3	93.60
	1/8	.062	.068	.125	.010	2	1/8	1-1/2	925308	89.90	925308-C3	95.10
	3/16	.093	.095	.187	.010	2	3/16	2	925312	93.80	925312-C3	99.40
	1/4	.118	.114	.250	<b>SHARP!</b>	2	1/4	2	865916	111.40	865916-C3	119.00
	1/4	.125	.120	.250	.010	2	1/4	2	925316	113.10	925316-C3	120.70
	3/8	.187	.174	.250	.010	3	3/8	2-1/2	925324	126.20	925324-C3	136.30
	1/2	.218	.248	.250	<b>SHARP!</b>	3	1/2	3	865932	168.80	865932-C3	183.90
	1/2	.250	.226	.250	.010	3	1/2	3	925332	171.50	925332-C3	186.60
90°	1/16	.023	.030	.062	.005	2	1/8	1-1/2	885704	93.20	885704-C3	98.40
	3/32	.031	.059	.093	.010	2	1/8	1-1/2	931006	89.90	931006-C3	95.10
	1/8	.034	.057	.125	<b>SHARP!</b>	2	1/8	1-1/2	884608	88.40	884608-C3	93.60
	1/8	.040	.073	.125	.010	2	1/8	1-1/2	931008	88.60	931008-C3	93.80
	3/16	.052	.084	.187	<b>SHARP!</b>	2	3/16	2	884612	92.10	884612-C3	97.70
	3/16	.047	.122	.187	.010	2	3/16	2	931012	93.80	931012-C3	99.40
	1/4	.068	.114	.250	<b>SHARP!</b>	2	1/4	2	884616	111.40	884616-C3	119.00
	1/4	.062	.154	.250	.010	2	1/4	2	931016	113.10	931016-C3	120.70
	3/8	.105	.165	.250	<b>SHARP!</b>	3	3/8	2-1/2	884624	124.50	884624-C3	134.60
	3/8	.125	.153	.250	.010	3	3/8	2-1/2	931024	126.20	931024-C3	136.30
	1/2	.141	.218	.250	<b>SHARP!</b>	3	1/2	3	884632	168.80	884632-C3	183.90
	1/2	.156	.216	.250	.010	3	1/2	3	931032	171.50	931032-C3	186.60

\*Diameter measured over radii (not to theoretical sharp corner).

# HOLEMAKING & THREADING

<b>Miniature High Performance Drills</b> .....		416
Hardened Steels <b>New Sizes!</b> .....		416
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Double Margin Design for Exceptional Hole Accuracy

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- Double margin design for exceptional hole accuracy and finish
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- h6 shank tolerance for high precision tool holders
- Select carbide grade for improved tool life
- CNC ground in the USA

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0100	#87	.254 mm	.047	<b>1.20 mm</b>	(3x)	3 mm	50 mm	CSG0100-C6	42.20
.0110	#85	.279 mm	.053	<b>1.35 mm</b>	(3x)	3 mm	50 mm	CSG0110-C6	42.20
.0120	#83	.304 mm	.057	<b>1.45 mm</b>	(3x)	3 mm	50 mm	CSG0120-C6	42.20
.0130	#81	.330 mm	.061	<b>1.55 mm</b>	(3x)	3 mm	50 mm	CSG0130-C6	42.20
.0144	#79	.368 mm	.069	<b>1.75 mm</b>	(3x)	3 mm	50 mm	CSG0144-C6	42.20
.0150		.381 mm	.071	<b>1.80 mm</b>	(3x)	3 mm	50 mm	CSG0150-C6	42.20
.0150		.381 mm	.102	<b>2.60 mm</b>	(5x)	3 mm	50 mm	BGN0150-C6	44.90
.0150		.381 mm	.146	<b>3.70 mm</b>	(8x)	3 mm	50 mm	ARY0150-C6	46.80
.0156 (1/64)		.396 mm	.075	<b>1.90 mm</b>	(3x)	3 mm	50 mm	CSG0156-C6	42.20
.0156 (1/64)		.396 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BGN0156-C6	44.90
.0156 (1/64)		.396 mm	.154	<b>3.90 mm</b>	(8x)	3 mm	50 mm	ARY0156-C6	46.80
.0156 (1/64)		.396 mm	.185	<b>4.70 mm</b>	(10x)	3 mm	50 mm	DXT0156-C6	49.50
.0156 (1/64)		.396 mm	.213	<b>5.40 mm</b>	(12x)	3 mm	50 mm	EFG0156-C6	52.40
.0160	#78	.406 mm	.079	<b>2.00 mm</b>	(3x)	3 mm	50 mm	CSG0160-C6	42.20
.0160	#78	.406 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BGN0160-C6	44.90
.0160	#78	.406 mm	.157	<b>4.00 mm</b>	(8x)	3 mm	50 mm	ARY0160-C6	46.80
.0160	#78	.406 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	EFG0160-C6	52.40
.0170		.431 mm	.083	<b>2.10 mm</b>	(3x)	3 mm	50 mm	CSG0170-C6	42.20
.0170		.431 mm	.165	<b>4.20 mm</b>	(8x)	3 mm	50 mm	ARY0170-C6	46.80
.0180	#77	.457 mm	.087	<b>2.20 mm</b>	(3x)	3 mm	50 mm	CSG0180-C6	42.20
.0180	#77	.457 mm	.122	<b>3.10 mm</b>	(5x)	3 mm	50 mm	BGN0180-C6	44.90
.0180	#77	.457 mm	.177	<b>4.50 mm</b>	(8x)	3 mm	50 mm	ARY0180-C6	46.80
.0180	#77	.457 mm	.244	<b>6.20 mm</b>	(12x)	3 mm	50 mm	EFG0180-C6	52.40
.0190		.482 mm	.091	<b>2.30 mm</b>	(3x)	3 mm	50 mm	CSG0190-C6	40.80
.0190		.482 mm	.185	<b>4.70 mm</b>	(8x)	3 mm	50 mm	ARY0190-C6	45.30
.0196		.500 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	CSG0196-C6	40.80
.0196		.500 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BGN0196-C6	42.90
.0196		.500 mm	.193	<b>4.90 mm</b>	(8x)	3 mm	50 mm	ARY0196-C6	45.30
.0196		.500 mm	.228	<b>5.80 mm</b>	(10x)	3 mm	50 mm	DXT0196-C6	48.00
.0196		.500 mm	.268	<b>6.80 mm</b>	(12x)	3 mm	50 mm	EFG0196-C6	50.80
.0200	#76	.508 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	CSG0200-C6	40.80
.0200	#76	.508 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BGN0200-C6	42.90
.0200	#76	.508 mm	.197	<b>5.00 mm</b>	(8x)	3 mm	50 mm	ARY0200-C6	45.30
.0200	#76	.508 mm	.236	<b>6.00 mm</b>	(10x)	3 mm	50 mm	DXT0200-C6	48.00
.0200	#76	.508 mm	.276	<b>7.00 mm</b>	(12x)	3 mm	50 mm	EFG0200-C6	50.80

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# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
D <sub>1</sub>		+ .000mm - .013mm	L <sub>2</sub>		+ .25mm - .00mm	D <sub>2</sub> (h6)	L <sub>1</sub>		
.0210	#75	.533 mm	.098	<b>2.50 mm</b>	(3x)	3 mm	50 mm	CSG0210-C6	40.80
.0210	#75	.533 mm	.142	<b>3.60 mm</b>	(5x)	3 mm	50 mm	BGN0210-C6	42.90
.0210	#75	.533 mm	.205	<b>5.20 mm</b>	(8x)	3 mm	50 mm	ARY0210-C6	45.30
.0210	#75	.533 mm	.291	<b>7.40 mm</b>	(12x)	3 mm	50 mm	EFG0210-C6	50.80
.0220		.558 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	CSG0220-C6	40.80
.0220		.558 mm	.213	<b>5.40 mm</b>	(8x)	3 mm	50 mm	ARY0220-C6	45.30
.0225	#74	.571 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	CSG0225-C6	40.80
.0225	#74	.571 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BGN0225-C6	42.90
.0225	#74	.571 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ARY0225-C6	45.30
.0225	#74	.571 mm	.307	<b>7.80 mm</b>	(12x)	3 mm	50 mm	EFG0225-C6	50.80
.0230		.584 mm	.110	<b>2.80 mm</b>	(3x)	3 mm	50 mm	CSG0230-C6	40.80
.0230		.584 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ARY0230-C6	45.30
.0236		.600 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	CSG0236-C6	40.80
.0236		.600 mm	.228	<b>5.80 mm</b>	(8x)	3 mm	50 mm	ARY0236-C6	45.30
.0240	#73	.609 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	CSG0240-C6	40.80
.0240	#73	.609 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BGN0240-C6	42.90
.0240	#73	.609 mm	.236	<b>6.00 mm</b>	(8x)	3 mm	50 mm	ARY0240-C6	45.30
.0240	#73	.609 mm	.331	<b>8.40 mm</b>	(12x)	3 mm	50 mm	EFG0240-C6	50.80
.0250	#72	.635 mm	.118	<b>3.00 mm</b>	(3x)	3 mm	50 mm	CSG0250-C6	40.80
.0250	#72	.635 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BGN0250-C6	42.90
.0250	#72	.635 mm	.244	<b>6.20 mm</b>	(8x)	3 mm	50 mm	ARY0250-C6	45.30
.0250	#72	.635 mm	.346	<b>8.80 mm</b>	(12x)	3 mm	50 mm	EFG0250-C6	50.80
.0260	#71	.660 mm	.122	<b>3.10 mm</b>	(3x)	3 mm	50 mm	CSG0260-C6	40.80
.0260	#71	.660 mm	.173	<b>4.40 mm</b>	(5x)	3 mm	50 mm	BGN0260-C6	42.90
.0260	#71	.660 mm	.252	<b>6.40 mm</b>	(8x)	3 mm	50 mm	ARY0260-C6	45.30
.0260	#71	.660 mm	.354	<b>9.00 mm</b>	(12x)	3 mm	50 mm	EFG0260-C6	50.80
.0270		.685 mm	.130	<b>3.30 mm</b>	(3x)	3 mm	50 mm	CSG0270-C6	40.80
.0270		.685 mm	.260	<b>6.60 mm</b>	(8x)	3 mm	50 mm	ARY0270-C6	45.30
.0275		.700 mm	.130	<b>3.30 mm</b>	(3x)	3 mm	50 mm	CSG0275-C6	40.80
.0275		.700 mm	.268	<b>6.80 mm</b>	(8x)	3 mm	50 mm	ARY0275-C6	45.30
.0280	#70	.711 mm	.134	<b>3.40 mm</b>	(3x)	3 mm	50 mm	CSG0280-C6	40.80
.0280	#70	.711 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BGN0280-C6	42.90
.0280	#70	.711 mm	.276	<b>7.00 mm</b>	(8x)	3 mm	50 mm	ARY0280-C6	45.30
.0280	#70	.711 mm	.386	<b>9.80 mm</b>	(12x)	3 mm	50 mm	EFG0280-C6	50.80
.0292	#69	.741 mm	.138	<b>3.50 mm</b>	(3x)	3 mm	50 mm	CSG0292-C6	40.80
.0292	#69	.741 mm	.197	<b>5.00 mm</b>	(5x)	3 mm	50 mm	BGN0292-C6	42.90
.0292	#69	.741 mm	.283	<b>7.20 mm</b>	(8x)	3 mm	50 mm	ARY0292-C6	45.30
.0292	#69	.741 mm	.394	<b>10.00 mm</b>	(12x)	3 mm	50 mm	EFG0292-C6	50.80
.0300		.762 mm	.142	<b>3.60 mm</b>	(3x)	3 mm	50mm	CSG0300-C6	41.40
.0300		.762 mm	.205	<b>5.20 mm</b>	(5x)	3 mm	50 mm	BGN0300-C6	43.60
.0300		.762 mm	.291	<b>7.40 mm</b>	(8x)	3 mm	50 mm	ARY0300-C6	45.30
.0300		.762 mm	.354	<b>9.00 mm</b>	(10x)	3 mm	50 mm	DXT0300-C6	48.00
.0310	#68	.787 mm	.146	<b>3.70 mm</b>	(3x)	3 mm	50 mm	CSG0310-C6	41.40
.0310	#68	.787 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BGN0310-C6	43.60
.0310	#68	.787 mm	.299	<b>7.60 mm</b>	(8x)	3 mm	50 mm	ARY0310-C6	45.30
.0310	#68	.787 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	EFG0310-C6	51.80

HARDENED STEELS

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# MINIATURE HIGH PERFORMANCE DRILLS

## Hardened Steels (cont.)

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HARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TiN NANO COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
D <sub>1</sub>		$+0.00\text{mm}$ $-.013\text{mm}$	L <sub>2</sub>		$+0.25\text{mm}$ $-.00\text{mm}$				
.0312 (1/32)		.793 mm	.150	<b>3.80 mm</b>	(3x)	3 mm	50 mm	CSG0312-C6	41.40
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BGN0312-C6	43.60
.0312 (1/32)		.793 mm	.307	<b>7.80 mm</b>	(8x)	3 mm	50 mm	ARY0312-C6	46.20
.0312 (1/32)		.793 mm	.370	<b>9.40 mm</b>	(10x)	3 mm	50 mm	DXT0312-C6	48.90
.0312 (1/32)		.793 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	EFG0312-C6	51.80
.0315		.800 mm	.150	<b>3.80 mm</b>	(3x)	3 mm	50 mm	CSG0315-C6	41.40
.0315		.800 mm	.307	<b>7.80 mm</b>	(8x)	3 mm	50 mm	ARY0315-C6	46.20
.0320	#67	.812 mm	.154	<b>3.90 mm</b>	(3x)	3 mm	50 mm	CSG0320-C6	41.40
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BGN0320-C6	43.60
.0320	#67	.812 mm	.315	<b>8.00 mm</b>	(8x)	3 mm	50 mm	ARY0320-C6	46.20
.0320	#67	.812 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	EFG0320-C6	51.80
.0330	#66	.838 mm	.157	<b>4.00 mm</b>	(3x)	3 mm	50 mm	CSG0330-C6	41.40
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	BGN0330-C6	43.60
.0330	#66	.838 mm	.323	<b>8.20 mm</b>	(8x)	3 mm	50 mm	ARY0330-C6	46.20
.0330	#66	.838 mm	.453	<b>11.50 mm</b>	(12x)	3 mm	50 mm	EFG0330-C6	51.80
.0350	#65	.889 mm	.165	<b>4.20 mm</b>	(3x)	3 mm	50 mm	CSG0350-C6	41.40
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BGN0350-C6	43.60
.0350	#65	.889 mm	.339	<b>8.60 mm</b>	(8x)	3 mm	50 mm	ARY0350-C6	46.20
.0350	#65	.889 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	DXT0350-C6	48.90
.0350	#65	.889 mm	.472	<b>12.00 mm</b>	(12x)	3 mm	50 mm	EFG0350-C6	51.80
.0354		.900 mm	.165	<b>4.20 mm</b>	(3x)	3 mm	50 mm	CSG0354-C6	41.40
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BGN0354-C6	43.60
.0354		.900 mm	.346	<b>8.80 mm</b>	(8x)	3 mm	50 mm	ARY0354-C6	46.20
.0360	#64	.914 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	CSG0360-C6	41.40
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	BGN0360-C6	43.60
.0360	#64	.914 mm	.354	<b>9.00 mm</b>	(8x)	3 mm	50 mm	ARY0360-C6	46.20
.0360	#64	.914 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	EFG0360-C6	51.80
.0370	#63	.939 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	CSG0370-C6	41.40
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	BGN0370-C6	43.60
.0370	#63	.939 mm	.362	<b>9.20 mm</b>	(8x)	3 mm	50 mm	ARY0370-C6	46.20
.0370	#63	.939 mm	.512	<b>13.00 mm</b>	(12x)	3 mm	50 mm	EFG0370-C6	51.80
.0380	#62	.965 mm	.181	<b>4.60 mm</b>	(3x)	3 mm	50 mm	CSG0380-C6	41.40
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BGN0380-C6	43.60
.0380	#62	.965 mm	.370	<b>9.40 mm</b>	(8x)	3 mm	50 mm	ARY0380-C6	46.20
.0380	#62	.965 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	EFG0380-C6	51.80
.0390	#61	.990 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	CSG0390-C6	41.40
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BGN0390-C6	43.60
.0390	#61	.990 mm	.378	<b>9.60 mm</b>	(8x)	3 mm	50 mm	ARY0390-C6	46.20
.0390	#61	.990 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	EFG0390-C6	51.80
.0393		1.000 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	CSG0393-C6	45.00
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BGN0393-C6	47.40
.0393		1.000 mm	.386	<b>9.80 mm</b>	(8x)	3 mm	50 mm	ARY0393-C6	49.40
.0393		1.000 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	DXT0393-C6	52.60
.0393		1.000 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	EFG0393-C6	55.60
.0400	#60	1.016 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	CSG0400-C6	45.00
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BGN0400-C6	47.40
.0400	#60	1.016 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	ARY0400-C6	49.40
.0400	#60	1.016 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	EFG0400-C6	55.60

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# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AISI NANO COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> -0.013mm		L <sub>2</sub> <sup>+0.25mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0410	#59	1.041 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	CSG0410-C6	45.00
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	BGN0410-C6	47.40
.0410	#59	1.041 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	ARY0410-C6	49.40
.0410	#59	1.041 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	EFG0410-C6	55.60
.0420	#58	1.066 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	CSG0420-C6	45.00
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	BGN0420-C6	47.40
.0420	#58	1.066 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ARY0420-C6	49.40
.0420	#58	1.066 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	EFG0420-C6	55.60
.0430	#57	1.092 mm	.205	<b>5.20 mm</b>	(3x)	3 mm	50 mm	CSG0430-C6	45.00
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	BGN0430-C6	47.40
.0430	#57	1.092 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ARY0430-C6	49.40
.0430	#57	1.092 mm	.591	<b>15.00 mm</b>	(12x)	3 mm	50 mm	EFG0430-C6	55.60
.0450		1.143 mm	.213	<b>5.40 mm</b>	(3x)	3 mm	50 mm	CSG0450-C6	45.00
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	BGN0450-C6	47.40
.0450		1.143 mm	.433	<b>11.00 mm</b>	(8x)	3 mm	50 mm	ARY0450-C6	49.40
.0465	#56	1.181 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	CSG0465-C6	45.00
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BGN0465-C6	47.40
.0465	#56	1.181 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ARY0465-C6	49.40
.0465	#56	1.181 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	DXT0465-C6	52.60
.0465	#56	1.181 mm	.630	<b>16.00 mm</b>	(12x)	3 mm	63 mm	EFG0465-C6	55.60
.0468 (3/64)		1.190 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	CSG0468-C6	45.00
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BGN0468-C6	47.40
.0468 (3/64)		1.190 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ARY0468-C6	49.40
.0468 (3/64)		1.190 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	DXT0468-C6	52.60
.0468 (3/64)		1.190 mm	.650	<b>16.50 mm</b>	(12x)	3 mm	63 mm	EFG0468-C6	55.60
.0492		1.250 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	CSG0492-C6	45.00
.0492		1.250 mm	.472	<b>12.00 mm</b>	(8x)	3 mm	50 mm	ARY0492-C6	53.00
.0492		1.250 mm	.669	<b>17.00 mm</b>	(12x)	3 mm	63 mm	EFG0492-C6	57.00
.0500		1.270 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	CSG0500-C6	45.00
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BGN0500-C6	47.40
.0500		1.270 mm	.492	<b>12.50 mm</b>	(8x)	3 mm	50 mm	ARY0500-C6	49.40
.0500		1.270 mm	.689	<b>17.50 mm</b>	(12x)	3 mm	63 mm	EFG0500-C6	55.60
.0520	#55	1.320 mm	.244	<b>6.20 mm</b>	(3x)	3 mm	50 mm	CSG0520-C6	45.00
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	BGN0520-C6	47.40
.0520	#55	1.320 mm	.512	<b>13.00 mm</b>	(8x)	3 mm	50 mm	ARY0520-C6	49.40
.0520	#55	1.320 mm	.709	<b>18.00 mm</b>	(12x)	3 mm	63 mm	EFG0520-C6	55.60
.0550	#54	1.397 mm	.260	<b>6.60 mm</b>	(3x)	3 mm	50 mm	CSG0550-C6	45.00
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	BGN0550-C6	47.40
.0550	#54	1.397 mm	.531	<b>13.50 mm</b>	(8x)	3 mm	50 mm	ARY0550-C6	49.40
.0550	#54	1.397 mm	.650	<b>16.50 mm</b>	(10x)	3 mm	63 mm	DXT0550-C6	54.20
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	EFG0550-C6	55.60
.0590		1.500 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	CSG0590-C6	48.50
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BGN0590-C6	50.90
.0590		1.500 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ARY0590-C6	53.00
.0590		1.500 mm	.689	<b>17.50 mm</b>	(10x)	3 mm	63 mm	DXT0590-C6	56.00
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	EFG0590-C6	59.20

NEW

NEW

HARDENED STEELS

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## MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TIN NANO COATED	
inch	wire	metric	inch	metric	hole depth				
		$D_1 \begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		$L_2 \begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		$D_2$ (h6)	$L_1$	2 FL	PRICE
.0595	#53	1.511 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	CSG0595-C6	48.50
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BGN0595-C6	50.90
.0595	#53	1.511 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ARY0595-C6	53.00
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	EFG0595-C6	59.20
.0600		1.524 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	CSG0600-C6	48.50
.0600		1.524 mm	.591	<b>15.00 mm</b>	(8x)	3 mm	50 mm	ARY0600-C6	53.00
.0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	CSG0625-C6	48.50
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BGN0625-C6	50.90
.0625 (1/16)		1.587 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ARY0625-C6	53.00
.0625 (1/16)		1.587 mm	.728	<b>18.50 mm</b>	(10x)	3 mm	63 mm	DXT0625-C6	56.00
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	EFG0625-C6	59.20
.0635	#52	1.612 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	CSG0635-C6	48.50
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	BGN0635-C6	50.90
.0635	#52	1.612 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ARY0635-C6	53.00
.0635	#52	1.612 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	EFG0635-C6	59.20
.0670	#51	1.701 mm	.315	<b>8.00 mm</b>	(3x)	3 mm	50 mm	CSG0670-C6	48.50
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	BGN0670-C6	50.90
.0670	#51	1.701 mm	.650	<b>16.50 mm</b>	(8x)	3 mm	63 mm	ARY0670-C6	53.00
.0670	#51	1.701 mm	.906	<b>23.00 mm</b>	(12x)	3 mm	63 mm	EFG0670-C6	59.20
.0700	#50	1.778 mm	.335	<b>8.50 mm</b>	(3x)	3 mm	50 mm	CSG0700-C6	48.50
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	BGN0700-C6	50.90
.0700	#50	1.778 mm	.689	<b>17.50 mm</b>	(8x)	3 mm	63 mm	ARY0700-C6	53.00
.0700	#50	1.778 mm	.827	<b>21.00 mm</b>	(10x)	3 mm	63 mm	DXT0700-C6	56.10
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	EFG0700-C6	59.20
.0730	#49	1.854 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	CSG0730-C6	48.50
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	BGN0730-C6	50.90
.0730	#49	1.854 mm	.709	<b>18.00 mm</b>	(8x)	3 mm	63 mm	ARY0730-C6	53.00
.0730	#49	1.854 mm	.984	<b>25.00 mm</b>	(12x)	3 mm	63 mm	EFG0730-C6	59.20
.0760	#48	1.930 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	CSG0760-C6	48.50
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	BGN0760-C6	50.90
.0760	#48	1.930 mm	.748	<b>19.00 mm</b>	(8x)	3 mm	63 mm	ARY0760-C6	53.00
.0760	#48	1.930 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	EFG0760-C6	59.20
.0781 (5/64)		1.984 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	CSG0781-C6	48.50
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BGN0781-C6	50.90
.0781 (5/64)		1.984 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ARY0781-C6	53.00
.0781 (5/64)		1.984 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	DXT0781-C6	56.00
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	EFG0781-C6	59.20
.0785	#47	1.993 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	CSG0785-C6	51.90
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BGN0785-C6	54.90
.0785	#47	1.993 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ARY0785-C6	53.00
.0785	#47	1.993 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	EFG0785-C6	64.10
.0787		2.000 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	CSG0787-C6	51.90
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BGN0787-C6	54.90
.0787		2.000 mm	.768	<b>19.50 mm</b>	(8x)	4 mm	63 mm	ARY0787-C6	57.70
.0787		2.000 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	DXT0787-C6	60.90
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	EFG0787-C6	64.10

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# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TiN NANO COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> $\begin{smallmatrix} +.00\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0800		2.032 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	CSG0800-C6	51.90
.0800		2.032 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ARY0800-C6	57.70
.0810	#46	2.057 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	CSG0810-C6	51.90
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BGN0810-C6	54.90
.0810	#46	2.057 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ARY0810-C6	57.70
.0810	#46	2.057 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	EFG0810-C6	64.10
.0820	#45	2.082 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	CSG0820-C6	51.90
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BGN0820-C6	54.90
.0820	#45	2.082 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ARY0820-C6	57.70
.0820	#45	2.082 mm	1.142	<b>29.00 mm</b>	(12x)	4 mm	75 mm	EFG0820-C6	64.10
.0860	#44	2.184 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	CSG0860-C6	51.90
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BGN0860-C6	54.90
.0860	#44	2.184 mm	.827	<b>21.00 mm</b>	(8x)	4 mm	63 mm	ARY0860-C6	57.70
.0860	#44	2.184 mm	1.181	<b>30.00 mm</b>	(12x)	4 mm	75 mm	EFG0860-C6	64.10
.0890	#43	2.260 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	CSG0890-C6	51.90
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BGN0890-C6	54.90
.0890	#43	2.260 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	ARY0890-C6	57.70
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	EFG0890-C6	64.10
.0900		2.286 mm	.433	<b>11.00 mm</b>	(3x)	4 mm	50 mm	CSG0900-C6	51.90
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BGN0900-C6	54.90
.0900		2.286 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	ARY0900-C6	57.70
.0935	#42	2.374 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	CSG0935-C6	51.90
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BGN0935-C6	54.90
.0935	#42	2.374 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ARY0935-C6	57.70
.0935	#42	2.374 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	EFG0935-C6	64.10
.0937 (3/32)		2.381 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	CSG0937-C6	51.90
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BGN0937-C6	54.90
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ARY0937-C6	57.70
.0937 (3/32)		2.381 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	DXT0937-C6	60.90
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	EFG0937-C6	64.10
.0960	#41	2.438 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	CSG0960-C6	51.90
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BGN0960-C6	54.90
.0960	#41	2.438 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ARY0960-C6	57.70
.0960	#41	2.438 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	EFG0960-C6	64.10
.0980	#40	2.489 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG0980-C6	51.90
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN0980-C6	54.90
.0980	#40	2.489 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ARY0980-C6	57.70
.0980	#40	2.489 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	EFG0980-C6	64.10
.0984		2.500 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG0984-C6	55.00
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN0984-C6	58.30
.0984		2.500 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ARY0984-C6	61.40
.0984		2.500 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	EFG0984-C6	66.30
.0995	#39	2.527 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG0995-C6	55.00
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN0995-C6	58.30
.0995	#39	2.527 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ARY0995-C6	61.40
.0995	#39	2.527 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	EFG0995-C6	68.00

NEW

HARDENED STEELS

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## MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TiN NANO COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>		
.1000		2.540 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG1000-C6	55.00
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN1000-C6	58.30
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ARY1000-C6	61.40
.1015	#38	2.578 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG1015-C6	55.00
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN1015-C6	58.30
.1015	#38	2.578 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ARY1015-C6	61.40
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	EFG1015-C6	68.00
.1040	#37	2.641 mm	.492	<b>12.50 mm</b>	(3x)	4 mm	50 mm	CSG1040-C6	55.00
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BGN1040-C6	58.30
.1040	#37	2.641 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ARY1040-C6	61.40
.1040	#37	2.641 mm	1.417	<b>36.00 mm</b>	(12x)	4 mm	75 mm	EFG1040-C6	68.00
.1065	#36	2.705 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	CSG1065-C6	55.00
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BGN1065-C6	58.30
.1065	#36	2.705 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ARY1065-C6	61.40
.1065	#36	2.705 mm	1.457	<b>37.00 mm</b>	(12x)	4 mm	75 mm	EFG1065-C6	68.00
.1093 (7/64)		2.778 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	CSG1093-C6	55.00
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1093-C6	58.30
.1093 (7/64)		2.778 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ARY1093-C6	61.40
.1093 (7/64)		2.778 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	DXT1093-C6	64.60
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	EFG1093-C6	68.00
.1100	#35	2.794 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	CSG1100-C6	55.00
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1100-C6	58.30
.1100	#35	2.794 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ARY1100-C6	61.40
.1100	#35	2.794 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	EFG1100-C6	68.00
.1110	#34	2.819 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	CSG1110-C6	55.00
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1110-C6	58.30
.1110	#34	2.819 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ARY1110-C6	61.40
.1110	#34	2.819 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	EFG1110-C6	68.00
.1130	#33	2.870 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	CSG1130-C6	55.00
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1130-C6	58.30
.1130	#33	2.870 mm	1.102	<b>28.00 mm</b>	(8x)	4 mm	63 mm	ARY1130-C6	61.40
.1130	#33	2.870 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	EFG1130-C6	68.00
.1160	#32	2.946 mm	.551	<b>14.00 mm</b>	(3x)	4 mm	50 mm	CSG1160-C6	55.00
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BGN1160-C6	58.30
.1160	#32	2.946 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	ARY1160-C6	61.40
.1160	#32	2.946 mm	1.575	<b>40.00 mm</b>	(12x)	4 mm	75 mm	EFG1160-C6	68.00
.1181		3.000 mm	.571	<b>14.50 mm</b>	(3x)	4 mm	50 mm	CSG1181-C6	56.30
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BGN1181-C6	59.30
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	ARY1181-C6	62.60
.1181		3.000 mm	1.378	<b>35.00 mm</b>	(10x)	4 mm	75 mm	DXT1181-C6	65.70
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	EFG1181-C6	69.20
		D <sub>1</sub> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.75\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.1200	#31	3.048 mm	.571	<b>14.50 mm</b>	(3x)	6 mm	63 mm	CSG1200-C6	63.10
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BGN1200-C6	54.80
.1200	#31	3.048 mm	1.181	<b>30.00 mm</b>	(8x)	6 mm	75 mm	ARY1200-C6	70.30

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## MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.75mm</sup> / <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>		
.1200	#31	3.048 mm	1.654	<b>42.00 mm</b>	(12x)	6 mm	100 mm	EFG1200-C6	77.10
.1250 (1/8)		3.175 mm	.591	<b>15.00 mm</b>	(3x)	6 mm	63 mm	CSG1250-C6	63.10
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BGN1250-C6	66.30
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	ARY1250-C6	70.30
.1250 (1/8)		3.175 mm	1.457	<b>37.00 mm</b>	(10x)	6 mm	100 mm	DXT1250-C6	73.60
.1250 (1/8)		3.175 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	EFG1250-C6	77.10
.1285	#30	3.263 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	CSG1285-C6	63.10
.1285	#30	3.263 mm	1.220	<b>32.00 mm</b>	(8x)	6 mm	75 mm	ARY1285-C6	70.30
.1360	#29	3.454 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	CSG1360-C6	63.10
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BGN1360-C6	66.30
.1360	#29	3.454 mm	1.339	<b>34.00 mm</b>	(8x)	6 mm	75 mm	ARY1360-C6	70.30
.1360	#29	3.454 mm	1.890	<b>48.00 mm</b>	(12x)	6 mm	100 mm	EFG1360-C6	77.10
.1405	#28	3.568 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	CSG1405-C6	63.10
.1405	#28	3.568 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	ARY1405-C6	70.30
.1406 (9/64)		3.571 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	CSG1406-C6	63.10
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BGN1406-C6	66.30
.1406 (9/64)		3.571 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	ARY1406-C6	70.30
.1406 (9/64)		3.571 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	EFG1406-C6	77.10
.1440	#27	3.657 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	CSG1440-C6	63.10
.1440	#27	3.657 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	ARY1440-C6	70.30
.1470	#26	3.733 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	CSG1470-C6	63.10
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BGN1470-C6	66.30
.1470	#26	3.733 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	ARY1470-C6	70.30
.1470	#26	3.733 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	EFG1470-C6	77.10
.1495	#25	3.797 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	CSG1495-C6	63.10
.1495	#25	3.797 mm	1.457	<b>37.00 mm</b>	(8x)	6 mm	100 mm	ARY1495-C6	70.30
.1520	#24	3.860 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	CSG1520-C6	63.10
.1520	#24	3.860 mm	1.496	<b>38.00 mm</b>	(8x)	6 mm	100 mm	ARY1520-C6	70.30
.1540	#23	3.911 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1540-C6	63.10
.1540	#23	3.911 mm	1.496	<b>38.00 mm</b>	(8x)	6 mm	100 mm	ARY1540-C6	70.30
.1562 (5/32)		3.968 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1562-C6	63.10
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BGN1562-C6	66.30
.1562 (5/32)		3.968 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1562-C6	70.30
.1562 (5/32)		3.968 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	EFG1562-C6	77.10
.1570	#22	3.987 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1570-C6	63.10
.1570	#22	3.987 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1570-C6	70.30
.1574		4.000 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1574-C6	63.10
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BGN1574-C6	66.30
.1574		4.000 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1574-C6	70.30
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1590-C6	63.10
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BGN1590-C6	66.30
.1590	#21	4.038 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1590-C6	70.30
.1590	#21	4.038 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	EFG1590-C6	77.10
.1610	#20	4.089 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1610-C6	63.10
.1610	#20	4.089 mm	1.575	<b>40.00 mm</b>	(8x)	6 mm	100 mm	ARY1610-C6	70.30
.1660	#19	4.216 mm	.787	<b>20.00 mm</b>	(3x)	6 mm	63 mm	CSG1660-C6	63.10

HARDENED STEELS

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## MINIATURE HIGH PERFORMANCE DRILLS

## Hardened Steels (cont.)

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HARDENED STEELS	DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER		OVERALL LENGTH		AITiN NANO COATED	
	inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)		L <sub>1</sub>		2 FL	PRICE
			D <sub>1</sub> <sup>+0.00mm</sup> -0.013mm		L <sub>2</sub> <sup>+0.75mm</sup> -0.00mm							
.1660	#19	4.216 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1660-C6	70.30			
.1695	#18	4.305 mm	.787	<b>20.00 mm</b>	(3x)	6 mm	63 mm	CSG1695-C6	63.10			
.1695	#18	4.305 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1695-C6	70.30			
.1718 (11/64)		4.365 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	CSG1718-C6	63.10			
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BGN1718-C6	66.30			
.1718 (11/64)		4.365 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1718-C6	70.30			
.1730	#17	4.394 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	CSG1730-C6	63.10			
.1730	#17	4.394 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1730-C6	70.30			
.1770	#16	4.495 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	CSG1770-C6	63.10			
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BGN1770-C6	66.30			
.1770	#16	4.495 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ARY1770-C6	70.30			
.1770	#16	4.495 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	EFG1770-C6	77.10			
.1800	#15	4.572 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	CSG1800-C6	63.10			
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BGN1800-C6	66.30			
.1800	#15	4.572 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ARY1800-C6	70.30			
.1800	#15	4.572 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	EFG1800-C6	77.10			
.1820	#14	4.622 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	CSG1820-C6	63.10			
.1820	#14	4.622 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1820-C6	70.30			
.1850	#13	4.700 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	CSG1850-C6	63.10			
.1850	#13	4.700 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1850-C6	70.30			
.1875 (3/16)		4.762 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1875-C6	63.10			
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BGN1875-C6	66.30			
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1875-C6	70.30			
.1875 (3/16)		4.762 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	EFG1875-C6	77.10			
.1890	#12	4.800 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1890-C6	63.10			
.1890	#12	4.800 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1890-C6	70.30			
.1910	#11	4.851 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1910-C6	63.10			
.1910	#11	4.851 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1910-C6	70.30			
.1935	#10	4.914 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1935-C6	63.10			
.1935	#10	4.914 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1935-C6	70.30			
.1960	#9	4.978 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG1960-C6	63.10			
.1960	#9	4.978 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1960-C6	70.30			
.1968		5.000 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG1968-C6	63.10			
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BGN1968-C6	66.30			
.1968		5.000 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1968-C6	70.30			
.1990	#8	5.054 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG1990-C6	63.10			
.1990	#8	5.054 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY1990-C6	70.30			
.2009	#7	5.105 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2009-C6	63.10			
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BGN2009-C6	66.30			
.2009	#7	5.105 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2009-C6	70.30			
.2031 (13/64)		5.159 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2031-C6	63.10			
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BGN2031-C6	66.30			
.2031 (13/64)		5.159 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2031-C6	70.30			
.2040	#6	5.181 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2040-C6	63.10			
.2040	#6	5.181 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2040-C6	70.30			

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# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED		
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE	
		D <sub>1</sub> $\begin{matrix} +.000\text{mm} \\ -.013\text{mm} \end{matrix}$		L <sub>2</sub> $\begin{matrix} +.75\text{mm} \\ -.00\text{mm} \end{matrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>			
.2055	#5	5.219 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2055-C6	63.10	
.2055	#5	5.219 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2055-C6	70.30	
.2090	#4	5.308 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2090-C6	63.10	
.2090	#4	5.308 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	ARY2090-C6	70.30	
.2129	#3	5.410 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2129-C6	63.10	
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BGN2129-C6	66.30	
.2129	#3	5.410 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	ARY2129-C6	70.30	
.2187 (7/32)		5.556 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2187-C6	63.10	
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BGN2187-C6	66.30	
.2187 (7/32)		5.556 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	ARY2187-C6	70.30	
.2210	#2	5.613 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2210-C6	63.10	
.2210	#2	5.613 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	ARY2210-C6	70.30	
.2280	#1	5.791 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2280-C6	63.10	
.2280	#1	5.791 mm	2.205	<b>56.00 mm</b>	(8x)	6 mm	100 mm	ARY2280-C6	70.30	
.2340	A	5.943 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2340-C6	63.10	
.2340	A	5.943 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ARY2340-C6	70.30	
.2343 (15/64)		5.953 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2343-C6	63.10	
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BGN2343-C6	66.30	
.2343 (15/64)		5.953 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ARY2343-C6	70.30	
.2362		6.000 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2362-C6	63.10	
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BGN2362-C6	66.30	
.2362		6.000 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ARY2362-C6	70.30	
.2380	B	6.045 mm	1.102	<b>28.00 mm</b>	(3x)	8 mm	75 mm	CSG2380-C6	65.30	
.2380	B	6.045 mm	2.283	<b>58.00 mm</b>	(8x)	8 mm	100 mm	ARY2380-C6	72.30	
.2420	C	6.146 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	CSG2420-C6	65.30	
.2420	C	6.146 mm	2.362	<b>60.00 mm</b>	(8x)	8 mm	100 mm	ARY2420-C6	72.30	
.2460	D	6.248 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	CSG2460-C6	65.30	
.2460	D	6.248 mm	2.362	<b>60.00 mm</b>	(8x)	8 mm	100 mm	ARY2460-C6	72.30	
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	CSG2500-C6	65.30	
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BGN2500-C6	68.40	
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	ARY2500-C6	72.30	
<b>NEW</b>	.2570	F	6.528 mm	1.260	<b>32.00 mm</b>	(3x)	8 mm	75 mm	<b>CSG2570-C6</b>	72.60
<b>NEW</b>	.2812		7.142 mm	1.339	<b>34.00 mm</b>	(3x)	8 mm	75 mm	<b>CSG2812-C6</b>	72.60
<b>NEW</b>	.3125 (5/16)		7.937 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	<b>CSG3125-C6</b>	72.60
<b>NEW</b>	.3150		8.000 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	<b>CSG3150-C6</b>	72.60
<b>NEW</b>	.3750 (3/8)		9.525 mm	1.811	<b>46.00 mm</b>	(3x)	10 mm	100 mm	<b>CSG3750-C6</b>	119.60

HARDENED STEELS

## SPEEDS & FEEDS (Miniature High Performance Drills – Hardened Steels)

**Important Note:** Values in table are in inches and are based on 3x and 5x drill lengths. For longer lengths, table values of IPR must be reduced (for 8x and 10x, reduce to 75%. For 12x, reduce to 65%). Pecking cycles are recommended to avoid chip piling and breakage. For materials at 38-45 Rc, initial peck depth should be 1-2x Diameter with each subsequent peck at .5-1x Diameter. For higher hardness materials, peck depths should be .5-1x Diameter. For complete speeds and feeds charts, please go to [www.harveytool.com](http://www.harveytool.com).

Material	Hardness	SFM	Chip Load IPR (Inches Per Revolution) By Drill Diameter									
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.375
Hardened Steels	38-45 Rc	150	.00029	.00060	.00090	.00119	.00150	.00179	.00240	.00359	.00480	.00720
	46-55 Rc	90	.00022	.00045	.00068	.00089	.00112	.00134	.00180	.00269	.00360	.00540
	56-68 Rc	40	.00014	.00030	.00045	.00060	.00075	.00089	.00120	.00180	.00240	.00360

# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels



Available for 3x, 5x, 8x, 10x, & 12x Hole Depths!

- Optimized for drilling prehardened medium alloy steels, stainless steels, and tool steels up to 45Rc
- 140° point angle
- Specialized flute shape for improved chip evacuation and maximum rigidity
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Solid carbide • CNC ground in the USA



Specialized Flute Shape for Improved Chip Evacuation

PREHARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0078		.200 mm	.037	<b>.95 mm</b>	(3x)	3 mm	50 mm	DHE0078-C3	42.20
.0078		.200 mm	.053	<b>1.35 mm</b>	(5x)	3 mm	50 mm	BVT0078-C3	44.70
.0079		.201 mm	.053	<b>1.35 mm</b>	(5x)	3 mm	50 mm	BVT0079-C3	44.70
.0083	#91	.210 mm	.039	<b>1.00 mm</b>	(3x)	3 mm	50 mm	DHE0083-C3	42.20
.0083	#91	.210 mm	.055	<b>1.40 mm</b>	(5x)	3 mm	50 mm	BVT0083-C3	44.70
.0087	#90	.221 mm	.041	<b>1.05 mm</b>	(3x)	3 mm	50 mm	DHE0087-C3	42.20
.0087	#90	.221 mm	.059	<b>1.50 mm</b>	(5x)	3 mm	50 mm	BVT0087-C3	44.70
.0091	#89	.231 mm	.043	<b>1.10 mm</b>	(3x)	3 mm	50 mm	DHE0091-C3	42.20
.0091	#89	.231 mm	.061	<b>1.55 mm</b>	(5x)	3 mm	50 mm	BVT0091-C3	44.70
.0095	#88	.241 mm	.045	<b>1.15 mm</b>	(3x)	3 mm	50 mm	DHE0095-C3	42.20
.0095	#88	.241 mm	.065	<b>1.65 mm</b>	(5x)	3 mm	50 mm	BVT0095-C3	44.70
.0100	#87	.254 mm	.047	<b>1.20 mm</b>	(3x)	3 mm	50 mm	DHE0100-C3	41.20
.0100	#87	.254 mm	.067	<b>1.70 mm</b>	(5x)	3 mm	50 mm	BVT0100-C3	43.40
.0100	#87	.254 mm	.098	<b>2.50 mm</b>	(8x)	3 mm	50 mm	ADS0100-C3	47.90
.0100	#87	.254 mm	.118	<b>3.00 mm</b>	(10x)	3 mm	50 mm	EXP0100-C3	50.80
.0100	#87	.254 mm	.138	<b>3.50 mm</b>	(12x)	3 mm	50 mm	CHT0100-C3	54.00
.0105	#86	.266 mm	.049	<b>1.25 mm</b>	(3x)	3 mm	50 mm	DHE0105-C3	41.20
.0105	#86	.266 mm	.071	<b>1.80 mm</b>	(5x)	3 mm	50 mm	BVT0105-C3	43.40
.0105	#86	.266 mm	.102	<b>2.60 mm</b>	(8x)	3 mm	50 mm	ADS0105-C3	47.90
.0105	#86	.266 mm	.146	<b>3.70 mm</b>	(12x)	3 mm	50 mm	CHT0105-C3	54.00
.0110	#85	.279 mm	.053	<b>1.35 mm</b>	(3x)	3 mm	50 mm	DHE0110-C3	41.20
.0110	#85	.279 mm	.075	<b>1.90 mm</b>	(5x)	3 mm	50 mm	BVT0110-C3	43.40
.0110	#85	.279 mm	.106	<b>2.70 mm</b>	(8x)	3 mm	50 mm	ADS0110-C3	47.90
.0110	#85	.279 mm	.130	<b>3.30 mm</b>	(10x)	3 mm	50 mm	EXP0110-C3	50.80
.0110	#85	.279 mm	.150	<b>3.80 mm</b>	(12x)	3 mm	50 mm	CHT0110-C3	54.00
.0115	#84	.292 mm	.055	<b>1.40 mm</b>	(3x)	3 mm	50 mm	DHE0115-C3	41.20
.0115	#84	.292 mm	.079	<b>2.00 mm</b>	(5x)	3 mm	50 mm	BVT0115-C3	43.40
.0115	#84	.292 mm	.110	<b>2.80 mm</b>	(8x)	3 mm	50 mm	ADS0115-C3	47.90
.0115	#84	.292 mm	.157	<b>4.00 mm</b>	(12x)	3 mm	50 mm	CHT0115-C3	54.00
.0118		.300 mm	.079	<b>2.00 mm</b>	(5x)	3 mm	50 mm	BVT0118-C3	43.40
.0118		.300 mm	.161	<b>4.10 mm</b>	(12x)	3 mm	50 mm	CHT0118-C3	54.00
.0120	#83	.304 mm	.057	<b>1.45 mm</b>	(3x)	3 mm	50 mm	DHE0120-C3	41.20
.0120	#83	.304 mm	.083	<b>2.10 mm</b>	(5x)	3 mm	50 mm	BVT0120-C3	43.40
.0120	#83	.304 mm	.118	<b>3.00 mm</b>	(8x)	3 mm	50 mm	ADS0120-C3	47.90
.0120	#83	.304 mm	.142	<b>3.60 mm</b>	(10x)	3 mm	50 mm	EXP0120-C3	50.80
.0120	#83	.304 mm	.165	<b>4.20 mm</b>	(12x)	3 mm	50 mm	CHT0120-C3	54.00

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**MINIATURE HIGH PERFORMANCE DRILLS**

Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0125	#82	.317 mm	.059	<b>1.50 mm</b>	(3x)	3 mm	50 mm	DHE0125-C3	41.20
.0125	#82	.317 mm	.083	<b>2.10 mm</b>	(5x)	3 mm	50 mm	BVT0125-C3	43.40
.0125	#82	.317 mm	.122	<b>3.10 mm</b>	(8x)	3 mm	50 mm	ADS0125-C3	47.90
.0125	#82	.317 mm	.173	<b>4.40 mm</b>	(12x)	3 mm	50 mm	CHT0125-C3	54.00
.0130	#81	.330 mm	.061	<b>1.55 mm</b>	(3x)	3 mm	50 mm	DHE0130-C3	41.20
.0130	#81	.330 mm	.087	<b>2.20 mm</b>	(5x)	3 mm	50 mm	BVT0130-C3	43.40
.0130	#81	.330 mm	.126	<b>3.20 mm</b>	(8x)	3 mm	50 mm	ADS0130-C3	47.90
.0130	#81	.330 mm	.154	<b>3.90 mm</b>	(10x)	3 mm	50 mm	EXP0130-C3	50.80
.0130	#81	.330 mm	.177	<b>4.50 mm</b>	(12x)	3 mm	50 mm	CHT0130-C3	54.00
.0135	#80	.342 mm	.065	<b>1.65 mm</b>	(3x)	3 mm	50 mm	DHE0135-C3	41.20
.0135	#80	.342 mm	.091	<b>2.30 mm</b>	(5x)	3 mm	50 mm	BVT0135-C3	43.40
.0135	#80	.342 mm	.130	<b>3.30 mm</b>	(8x)	3 mm	50 mm	ADS0135-C3	47.90
.0135	#80	.342 mm	.185	<b>4.70 mm</b>	(12x)	3 mm	50 mm	CHT0135-C3	54.00
.0140		.355 mm	.067	<b>1.70 mm</b>	(3x)	3 mm	50 mm	DHE0140-C3	41.20
.0140		.355 mm	.094	<b>2.40 mm</b>	(5x)	3 mm	50 mm	BVT0140-C3	43.40
.0140		.355 mm	.138	<b>3.50 mm</b>	(8x)	3 mm	50 mm	ADS0140-C3	47.90
.0140		.355 mm	.193	<b>4.90 mm</b>	(12x)	3 mm	50 mm	CHT0140-C3	54.00
.0144	#79	.368 mm	.069	<b>1.75 mm</b>	(3x)	3 mm	50 mm	DHE0144-C3	41.20
.0144	#79	.368 mm	.098	<b>2.50 mm</b>	(5x)	3 mm	50 mm	BVT0144-C3	43.40
.0144	#79	.368 mm	.142	<b>3.60 mm</b>	(8x)	3 mm	50 mm	ADS0144-C3	47.90
.0144	#79	.368 mm	.169	<b>4.30 mm</b>	(10x)	3 mm	50 mm	EXP0144-C3	50.80
.0144	#79	.368 mm	.197	<b>5.00 mm</b>	(12x)	3 mm	50 mm	CHT0144-C3	54.00
.0150		.381 mm	.071	<b>1.80 mm</b>	(3x)	3 mm	50 mm	DHE0150-C3	41.20
.0150		.381 mm	.102	<b>2.60 mm</b>	(5x)	3 mm	50 mm	BVT0150-C3	43.40
.0150		.381 mm	.146	<b>3.70 mm</b>	(8x)	3 mm	50 mm	ADS0150-C3	47.90
.0150		.381 mm	.205	<b>5.20 mm</b>	(12x)	3 mm	50 mm	CHT0150-C3	54.00
.0156 (1/64)		.396 mm	.075	<b>1.90 mm</b>	(3x)	3 mm	50 mm	DHE0156-C3	41.20
.0156 (1/64)		.396 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BVT0156-C3	43.40
.0156 (1/64)		.396 mm	.154	<b>3.90 mm</b>	(8x)	3 mm	50 mm	ADS0156-C3	47.90
.0156 (1/64)		.396 mm	.185	<b>4.70 mm</b>	(10x)	3 mm	50 mm	EXP0156-C3	50.80
.0156 (1/64)		.396 mm	.213	<b>5.40 mm</b>	(12x)	3 mm	50 mm	CHT0156-C3	54.00
.0157		.400 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BVT0157-C3	43.40
.0157		.400 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	CHT0157-C3	54.00
.0160	#78	.406 mm	.079	<b>2.00 mm</b>	(3x)	3 mm	50 mm	DHE0160-C3	41.20
.0160	#78	.406 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BVT0160-C3	43.40
.0160	#78	.406 mm	.157	<b>4.00 mm</b>	(8x)	3 mm	50 mm	ADS0160-C3	47.90
.0160	#78	.406 mm	.189	<b>4.80 mm</b>	(10x)	3 mm	50 mm	EXP0160-C3	50.80
.0160	#78	.406 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	CHT0160-C3	54.00
.0170		.431 mm	.083	<b>2.10 mm</b>	(3x)	3 mm	50 mm	DHE0170-C3	41.20
.0170		.431 mm	.114	<b>2.90 mm</b>	(5x)	3 mm	50 mm	BVT0170-C3	43.40
.0170		.431 mm	.165	<b>4.20 mm</b>	(8x)	3 mm	50 mm	ADS0170-C3	47.90
.0170		.431 mm	.236	<b>6.00 mm</b>	(12x)	3 mm	50 mm	CHT0170-C3	54.00
.0180	#77	.457 mm	.087	<b>2.20 mm</b>	(3x)	3 mm	50 mm	DHE0180-C3	41.20
.0180	#77	.457 mm	.122	<b>3.10 mm</b>	(5x)	3 mm	50 mm	BVT0180-C3	43.40
.0180	#77	.457 mm	.177	<b>4.50 mm</b>	(8x)	3 mm	50 mm	ADS0180-C3	48.30
.0180	#77	.457 mm	.213	<b>5.40 mm</b>	(10x)	3 mm	50 mm	EXP0180-C3	50.80
.0180	#77	.457 mm	.244	<b>6.20 mm</b>	(12x)	3 mm	50 mm	CHT0180-C3	54.00

PREHARDENED STEELS

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# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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PREHARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0190		.482 mm	.091	<b>2.30 mm</b>	(3x)	3 mm	50 mm	DHE0190-C3	41.20
.0190		.482 mm	.130	<b>3.30 mm</b>	(5x)	3 mm	50 mm	BVT0190-C3	43.40
.0190		.482 mm	.185	<b>4.70 mm</b>	(8x)	3 mm	50 mm	ADS0190-C3	47.90
.0190		.482 mm	.260	<b>6.60 mm</b>	(12x)	3 mm	50 mm	CHT0190-C3	54.00
.0196		.500 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	DHE0196-C3	40.60
.0196		.500 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BVT0196-C3	42.80
.0196		.500 mm	.193	<b>4.90 mm</b>	(8x)	3 mm	50 mm	ADS0196-C3	48.30
.0196		.500 mm	.228	<b>5.80 mm</b>	(10x)	3 mm	50 mm	EXP0196-C3	51.00
.0196		.500 mm	.268	<b>6.80 mm</b>	(12x)	3 mm	50 mm	CHT0196-C3	52.70
.0200	#76	.508 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	DHE0200-C3	40.60
.0200	#76	.508 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BVT0200-C3	42.80
.0200	#76	.508 mm	.197	<b>5.00 mm</b>	(8x)	3 mm	50 mm	ADS0200-C3	48.30
.0200	#76	.508 mm	.236	<b>6.00 mm</b>	(10x)	3 mm	50 mm	EXP0200-C3	51.00
.0200	#76	.508 mm	.276	<b>7.00 mm</b>	(12x)	3 mm	50 mm	CHT0200-C3	52.70
.0210	#75	.533 mm	.098	<b>2.50 mm</b>	(3x)	3 mm	50 mm	DHE0210-C3	40.60
.0210	#75	.533 mm	.142	<b>3.60 mm</b>	(5x)	3 mm	50 mm	BVT0210-C3	42.80
.0210	#75	.533 mm	.205	<b>5.20 mm</b>	(8x)	3 mm	50 mm	ADS0210-C3	48.30
.0210	#75	.533 mm	.244	<b>6.20 mm</b>	(10x)	3 mm	50 mm	EXP0210-C3	51.00
.0210	#75	.533 mm	.291	<b>7.40 mm</b>	(12x)	3 mm	50 mm	CHT0210-C3	52.70
.0220		.558 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	DHE0220-C3	40.60
.0220		.558 mm	.150	<b>3.80 mm</b>	(5x)	3 mm	50 mm	BVT0220-C3	42.80
.0220		.558 mm	.213	<b>5.40 mm</b>	(8x)	3 mm	50 mm	ADS0220-C3	48.30
.0220		.558 mm	.299	<b>7.60 mm</b>	(12x)	3 mm	50 mm	CHT0220-C3	52.70
.0225	#74	.571 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	DHE0225-C3	40.60
.0225	#74	.571 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BVT0225-C3	42.80
.0225	#74	.571 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ADS0225-C3	48.30
.0225	#74	.571 mm	.268	<b>6.80 mm</b>	(10x)	3 mm	50 mm	EXP0225-C3	51.00
.0225	#74	.571 mm	.307	<b>7.80 mm</b>	(12x)	3 mm	50 mm	CHT0225-C3	52.70
.0230		.584 mm	.110	<b>2.80 mm</b>	(3x)	3 mm	50 mm	DHE0230-C3	40.60
.0230		.584 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BVT0230-C3	42.80
.0230		.584 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ADS0230-C3	48.30
.0230		.584 mm	.315	<b>8.00 mm</b>	(12x)	3 mm	50 mm	CHT0230-C3	52.70
.0236		.600 mm	.157	<b>4.00 mm</b>	(5x)	3 mm	50 mm	BVT0236-C3	42.80
.0236		.600 mm	.323	<b>8.20 mm</b>	(12x)	3 mm	50 mm	CHT0236-C3	52.70
.0240	#73	.609 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	DHE0240-C3	40.60
.0240	#73	.609 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BVT0240-C3	42.80
.0240	#73	.609 mm	.236	<b>6.00 mm</b>	(8x)	3 mm	50 mm	ADS0240-C3	48.30
.0240	#73	.609 mm	.283	<b>7.20 mm</b>	(10x)	3 mm	50 mm	EXP0240-C3	51.00
.0240	#73	.609 mm	.331	<b>8.40 mm</b>	(12x)	3 mm	50 mm	CHT0240-C3	52.70
.0250	#72	.635 mm	.118	<b>3.00 mm</b>	(3x)	3 mm	50 mm	DHE0250-C3	40.60
.0250	#72	.635 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BVT0250-C3	42.80
.0250	#72	.635 mm	.244	<b>6.20 mm</b>	(8x)	3 mm	50 mm	ADS0250-C3	48.30
.0250	#72	.635 mm	.291	<b>7.40 mm</b>	(10x)	3 mm	50 mm	EXP0250-C3	51.00
.0250	#72	.635 mm	.346	<b>8.80 mm</b>	(12x)	3 mm	50 mm	CHT0250-C3	52.70
.0260	#71	.660 mm	.122	<b>3.10 mm</b>	(3x)	3 mm	50 mm	DHE0260-C3	40.60
.0260	#71	.660 mm	.173	<b>4.40 mm</b>	(5x)	3 mm	50 mm	BVT0260-C3	42.80
.0260	#71	.660 mm	.252	<b>6.40 mm</b>	(8x)	3 mm	50 mm	ADS0260-C3	48.30

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# MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> -0.013mm		L <sub>2</sub> <sup>+0.25mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0260	#71	.660 mm	.307	<b>7.80 mm</b>	(10x)	3 mm	50 mm	EXP0260-C3	51.00
.0260	#71	.660 mm	.354	<b>9.00 mm</b>	(12x)	3 mm	50 mm	CHT0260-C3	52.70
.0270		.685 mm	.130	<b>3.30 mm</b>	(3x)	3 mm	50 mm	DHE0270-C3	40.60
.0270		.685 mm	.181	<b>4.60 mm</b>	(5x)	3 mm	50 mm	BVT0270-C3	42.80
.0270		.685 mm	.260	<b>6.60 mm</b>	(8x)	3 mm	50 mm	ADS0270-C3	48.30
.0270		.685 mm	.370	<b>9.40 mm</b>	(12x)	3 mm	50 mm	CHT0270-C3	52.70
.0275		.700 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BVT0275-C3	42.80
.0275		.700 mm	.378	<b>9.60 mm</b>	(12x)	3 mm	50 mm	CHT0275-C3	52.70
.0280	#70	.711 mm	.134	<b>3.40 mm</b>	(3x)	3 mm	50 mm	DHE0280-C3	40.60
.0280	#70	.711 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BVT0280-C3	42.80
.0280	#70	.711 mm	.276	<b>7.00 mm</b>	(8x)	3 mm	50 mm	ADS0280-C3	48.30
.0280	#70	.711 mm	.331	<b>8.40 mm</b>	(10x)	3 mm	50 mm	EXP0280-C3	51.00
.0280	#70	.711 mm	.386	<b>9.80 mm</b>	(12x)	3 mm	50 mm	CHT0280-C3	52.70
.0292	#69	.741 mm	.138	<b>3.50 mm</b>	(3x)	3 mm	50 mm	DHE0292-C3	40.60
.0292	#69	.741 mm	.197	<b>5.00 mm</b>	(5x)	3 mm	50 mm	BVT0292-C3	42.80
.0292	#69	.741 mm	.283	<b>7.20 mm</b>	(8x)	3 mm	50 mm	ADS0292-C3	48.30
.0292	#69	.741 mm	.346	<b>8.80 mm</b>	(10x)	3 mm	50 mm	EXP0292-C3	51.00
.0292	#69	.741 mm	.394	<b>10.00 mm</b>	(12x)	3 mm	50 mm	CHT0292-C3	52.70
.0300		.762 mm	.142	<b>3.60 mm</b>	(3x)	3 mm	50 mm	DHE0300-C3	40.60
.0300		.762 mm	.205	<b>5.20 mm</b>	(5x)	3 mm	50 mm	BVT0300-C3	42.80
.0300		.762 mm	.291	<b>7.40 mm</b>	(8x)	3 mm	50 mm	ADS0300-C3	48.30
.0300		.762 mm	.413	<b>10.50 mm</b>	(12x)	3 mm	50 mm	CHT0300-C3	52.70
.0310	#68	.787 mm	.146	<b>3.70 mm</b>	(3x)	3 mm	50 mm	DHE0310-C3	41.20
.0310	#68	.787 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0310-C3	43.20
.0310	#68	.787 mm	.299	<b>7.60 mm</b>	(8x)	3 mm	50 mm	ADS0310-C3	48.30
.0310	#68	.787 mm	.362	<b>9.20 mm</b>	(10x)	3 mm	50 mm	EXP0310-C3	51.00
.0310	#68	.787 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0310-C3	54.10
.0312 (1/32)		.793 mm	.150	<b>3.80 mm</b>	(3x)	3 mm	50 mm	DHE0312-C3	41.20
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0312-C3	43.20
.0312 (1/32)		.793 mm	.307	<b>7.80 mm</b>	(8x)	3 mm	50 mm	ADS0312-C3	48.30
.0312 (1/32)		.793 mm	.370	<b>9.40 mm</b>	(10x)	3 mm	50 mm	EXP0312-C3	51.00
.0312 (1/32)		.793 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0312-C3	54.10
.0315		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0315-C3	43.20
.0315		.800 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0315-C3	54.10
.0320	#67	.812 mm	.154	<b>3.90 mm</b>	(3x)	3 mm	50 mm	DHE0320-C3	41.20
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0320-C3	43.20
.0320	#67	.812 mm	.315	<b>8.00 mm</b>	(8x)	3 mm	50 mm	ADS0320-C3	48.30
.0320	#67	.812 mm	.378	<b>9.60 mm</b>	(10x)	3 mm	50 mm	EXP0320-C3	51.00
.0320	#67	.812 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0320-C3	54.10
.0330	#66	.838 mm	.157	<b>4.00 mm</b>	(3x)	3 mm	50 mm	DHE0330-C3	41.20
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	BVT0330-C3	43.20
.0330	#66	.838 mm	.323	<b>8.20 mm</b>	(8x)	3 mm	50 mm	ADS0330-C3	48.30
.0330	#66	.838 mm	.386	<b>9.80 mm</b>	(10x)	3 mm	50 mm	EXP0330-C3	51.00
.0330	#66	.838 mm	.453	<b>11.50 mm</b>	(12x)	3 mm	50 mm	CHT0330-C3	54.10
.0350	#65	.889 mm	.165	<b>4.20 mm</b>	(3x)	3 mm	50 mm	DHE0350-C3	41.20
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BVT0350-C3	43.20
.0350	#65	.889 mm	.339	<b>8.60 mm</b>	(8x)	3 mm	50 mm	ADS0350-C3	48.30

PREHARDENED STEELS

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# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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PREHARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A TiN COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>			L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>						
.0350	#65	.889 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	EXP0350-C3	51.00
.0350	#65	.889 mm	.472	<b>12.00 mm</b>	(12x)	3 mm	50 mm	CHT0350-C3	54.10
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BVT0354-C3	41.20
.0354		.900 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	CHT0354-C3	54.10
.0360	#64	.914 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	DHE0360-C3	41.20
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	BVT0360-C3	43.20
.0360	#64	.914 mm	.354	<b>9.00 mm</b>	(8x)	3 mm	50 mm	ADS0360-C3	48.30
.0360	#64	.914 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	EXP0360-C3	51.00
.0360	#64	.914 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	CHT0360-C3	54.10
.0370	#63	.939 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	DHE0370-C3	41.20
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	BVT0370-C3	43.20
.0370	#63	.939 mm	.362	<b>9.20 mm</b>	(8x)	3 mm	50 mm	ADS0370-C3	48.30
.0370	#63	.939 mm	.433	<b>11.00 mm</b>	(10x)	3 mm	50 mm	EXP0370-C3	51.00
.0370	#63	.939 mm	.512	<b>13.00 mm</b>	(12x)	3 mm	50 mm	CHT0370-C3	54.10
.0380	#62	.965 mm	.181	<b>4.60 mm</b>	(3x)	3 mm	50 mm	DHE0380-C3	41.20
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BVT0380-C3	43.20
.0380	#62	.965 mm	.370	<b>9.40 mm</b>	(8x)	3 mm	50 mm	ADS0380-C3	48.30
.0380	#62	.965 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	EXP0380-C3	51.00
.0380	#62	.965 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	CHT0380-C3	54.10
.0390	#61	.990 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	DHE0390-C3	41.20
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BVT0390-C3	43.20
.0390	#61	.990 mm	.378	<b>9.60 mm</b>	(8x)	3 mm	50 mm	ADS0390-C3	48.30
.0390	#61	.990 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	EXP0390-C3	51.00
.0390	#61	.990 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	CHT0390-C3	54.10
.0393		1.000 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	DHE0393-C3	45.00
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BVT0393-C3	47.40
.0393		1.000 mm	.386	<b>9.80 mm</b>	(8x)	3 mm	50 mm	ADS0393-C3	51.70
.0393		1.000 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	EXP0393-C3	54.70
.0393		1.000 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	CHT0393-C3	57.90
.0400	#60	1.016 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	DHE0400-C3	45.00
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BVT0400-C3	47.40
.0400	#60	1.016 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	ADS0400-C3	51.70
.0400	#60	1.016 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	EXP0400-C3	54.70
.0400	#60	1.016 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	CHT0400-C3	57.90
.0410	#59	1.041 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	DHE0410-C3	45.00
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	BVT0410-C3	47.40
.0410	#59	1.041 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	ADS0410-C3	51.70
.0410	#59	1.041 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	EXP0410-C3	54.70
.0410	#59	1.041 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	CHT0410-C3	57.90
.0420	#58	1.066 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	DHE0420-C3	45.00
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	BVT0420-C3	47.40
.0420	#58	1.066 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ADS0420-C3	51.70
.0420	#58	1.066 mm	.492	<b>12.50 mm</b>	(10x)	3 mm	50 mm	EXP0420-C3	54.70
.0420	#58	1.066 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	CHT0420-C3	57.90
.0430	#57	1.092 mm	.205	<b>5.20 mm</b>	(3x)	3 mm	50 mm	DHE0430-C3	45.00
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	BVT0430-C3	47.40
.0430	#57	1.092 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ADS0430-C3	51.70
.0430	#57	1.092 mm	.512	<b>13.00 mm</b>	(10x)	3 mm	50 mm	EXP0430-C3	54.70
.0430	#57	1.092 mm	.591	<b>15.00 mm</b>	(12x)	3 mm	50 mm	CHT0430-C3	57.90

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# MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	BVT0450-C3	47.40
.0450		1.143 mm	.610	<b>15.50 mm</b>	(12x)	3 mm	50 mm	CHT0450-C3	57.90
.0465	#56	1.181 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	DHE0465-C3	45.00
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BVT0465-C3	47.40
.0465	#56	1.181 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ADS0465-C3	51.70
.0465	#56	1.181 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	EXP0465-C3	54.70
.0465	#56	1.181 mm	.630	<b>16.00 mm</b>	(12x)	3 mm	63 mm	CHT0465-C3	57.90
.0468 (3/64)		1.190 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	DHE0468-C3	45.00
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BVT0468-C3	47.40
.0468 (3/64)		1.190 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ADS0468-C3	51.70
.0468 (3/64)		1.190 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	EXP0468-C3	54.70
.0468 (3/64)		1.190 mm	.650	<b>16.50 mm</b>	(12x)	3 mm	63 mm	CHT0468-C3	57.90
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BVT0492-C3	47.40
.0492		1.250 mm	.472	<b>12.00 mm</b>	(8x)	3 mm	50 mm	<b>ADS0492-C3</b>	51.70
.0492		1.250 mm	.669	<b>17.00 mm</b>	(12x)	3 mm	63 mm	CHT0492-C3	57.90
.0500		1.270 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	DHE0500-C3	45.00
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BVT0500-C3	47.40
.0500		1.270 mm	.492	<b>12.50 mm</b>	(8x)	3 mm	50 mm	ADS0500-C3	51.70
.0500		1.270 mm	.591	<b>15.00 mm</b>	(10x)	3 mm	50 mm	EXP0500-C3	54.70
.0500		1.270 mm	.689	<b>17.50 mm</b>	(12x)	3 mm	63 mm	CHT0500-C3	57.90
.0520	#55	1.320 mm	.244	<b>6.20 mm</b>	(3x)	3 mm	50 mm	DHE0520-C3	45.00
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	BVT0520-C3	47.40
.0520	#55	1.320 mm	.512	<b>13.00 mm</b>	(8x)	3 mm	50 mm	ADS0520-C3	51.70
.0520	#55	1.320 mm	.610	<b>15.50 mm</b>	(10x)	3 mm	50 mm	EXP0520-C3	54.70
.0520	#55	1.320 mm	.709	<b>18.00 mm</b>	(12x)	3 mm	63 mm	CHT0520-C3	57.90
.0550	#54	1.397 mm	.260	<b>6.60 mm</b>	(3x)	3 mm	50 mm	DHE0550-C3	45.00
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	BVT0550-C3	47.40
.0550	#54	1.397 mm	.531	<b>13.50 mm</b>	(8x)	3 mm	50 mm	ADS0550-C3	51.70
.0550	#54	1.397 mm	.650	<b>16.50 mm</b>	(10x)	3 mm	63 mm	EXP0550-C3	54.70
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	CHT0550-C3	57.90
.0590		1.500 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	DHE0590-C3	48.80
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BVT0590-C3	51.00
.0590		1.500 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ADS0590-C3	55.50
.0590		1.500 mm	.689	<b>17.50 mm</b>	(10x)	3 mm	63 mm	EXP0590-C3	58.80
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	CHT0590-C3	62.10
.0595	#53	1.511 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	DHE0595-C3	48.80
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BVT0595-C3	51.00
.0595	#53	1.511 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ADS0595-C3	55.50
.0595	#53	1.511 mm	.709	<b>18.00 mm</b>	(10x)	3 mm	63 mm	EXP0595-C3	58.80
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	CHT0595-C3	62.10
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BVT0600-C3	51.00
.0600		1.524 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	CHT0600-C3	62.10
.0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	DHE0625-C3	48.80
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BVT0625-C3	51.00
.0625 (1/16)		1.587 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ADS0625-C3	55.50
.0625 (1/16)		1.587 mm	.728	<b>18.50 mm</b>	(10x)	3 mm	63 mm	EXP0625-C3	58.80
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	CHT0625-C3	62.10

NEW

PREHARDENED STEELS

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# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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PREHARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TIN COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D1 $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L2 $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D2 (h6)	L1		
.0635	#52	1.612 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	DHE0635-C3	48.80
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	BVT0635-C3	51.00
.0635	#52	1.612 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ADS0635-C3	55.50
.0635	#52	1.612 mm	.748	<b>19.00 mm</b>	(10x)	3 mm	63 mm	EXP0635-C3	58.80
.0635	#52	1.612 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	CHT0635-C3	62.10
.0670	#51	1.701 mm	.315	<b>8.00 mm</b>	(3x)	3 mm	50 mm	DHE0670-C3	48.80
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	BVT0670-C3	51.00
.0670	#51	1.701 mm	.650	<b>16.50 mm</b>	(8x)	3 mm	63 mm	ADS0670-C3	55.50
.0670	#51	1.701 mm	.787	<b>20.00 mm</b>	(10x)	3 mm	63 mm	EXP0670-C3	58.80
.0670	#51	1.701 mm	.906	<b>23.00 mm</b>	(12x)	3 mm	63 mm	CHT0670-C3	62.10
.0700	#50	1.778 mm	.335	<b>8.50 mm</b>	(3x)	3 mm	50 mm	DHE0700-C3	48.80
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	BVT0700-C3	51.00
.0700	#50	1.778 mm	.689	<b>17.50 mm</b>	(8x)	3 mm	63 mm	ADS0700-C3	55.50
.0700	#50	1.778 mm	.827	<b>21.00 mm</b>	(10x)	3 mm	63 mm	EXP0700-C3	58.80
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	CHT0700-C3	62.10
.0730	#49	1.854 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	DHE0730-C3	48.80
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	BVT0730-C3	51.00
.0730	#49	1.854 mm	.709	<b>18.00 mm</b>	(8x)	3 mm	63 mm	ADS0730-C3	55.50
.0730	#49	1.854 mm	.866	<b>22.00 mm</b>	(10x)	3 mm	63 mm	EXP0730-C3	58.80
.0730	#49	1.854 mm	.984	<b>25.00 mm</b>	(12x)	3 mm	63 mm	CHT0730-C3	62.10
.0760	#48	1.930 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	DHE0760-C3	48.80
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	BVT0760-C3	51.00
.0760	#48	1.930 mm	.748	<b>19.00 mm</b>	(8x)	3 mm	63 mm	ADS0760-C3	55.50
.0760	#48	1.930 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	EXP0760-C3	58.80
.0760	#48	1.930 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	CHT0760-C3	62.10
.0781 (5/64)		1.984 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	DHE0781-C3	48.80
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BVT0781-C3	51.00
.0781 (5/64)		1.984 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ADS0781-C3	55.50
.0781 (5/64)		1.984 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	EXP0781-C3	57.30
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	CHT0781-C3	62.10
.0785	#47	1.993 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	DHE0785-C3	48.80
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BVT0785-C3	51.00
.0785	#47	1.993 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ADS0785-C3	55.50
.0785	#47	1.993 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	EXP0785-C3	58.80
.0785	#47	1.993 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	CHT0785-C3	62.10
.0787		2.000 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	DHE0787-C3	48.80
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BVT0787-C3	55.10
.0787		2.000 mm	.768	<b>19.50 mm</b>	(8x)	4 mm	63 mm	ADS0787-C3	59.60
.0787		2.000 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	EXP0787-C3	63.10
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	CHT0787-C3	66.50
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BVT0800-C3	55.10
.0800		2.032 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	CHT0800-C3	66.50
.0810	#46	2.057 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	DHE0810-C3	48.80
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BVT0810-C3	55.10
.0810	#46	2.057 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ADS0810-C3	59.60
.0810	#46	2.057 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	EXP0810-C3	63.10
.0810	#46	2.057 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	CHT0810-C3	66.50

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# MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TIN COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0820	#45	2.082 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	DHE0820-C3	48.80
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BVT0820-C3	55.10
.0820	#45	2.082 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ADS0820-C3	59.60
.0820	#45	2.082 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	EXP0820-C3	63.10
.0820	#45	2.082 mm	1.142	<b>29.00 mm</b>	(12x)	4 mm	75 mm	CHT0820-C3	66.50
.0860	#44	2.184 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	DHE0860-C3	48.80
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BVT0860-C3	55.10
.0860	#44	2.184 mm	.827	<b>21.00 mm</b>	(8x)	4 mm	63 mm	ADS0860-C3	59.60
.0860	#44	2.184 mm	1.024	<b>26.00 mm</b>	(10x)	4 mm	63 mm	EXP0860-C3	63.10
.0860	#44	2.184 mm	1.181	<b>30.00 mm</b>	(12x)	4 mm	75 mm	CHT0860-C3	66.50
.0890	#43	2.260 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	DHE0890-C3	48.80
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BVT0890-C3	55.10
.0890	#43	2.260 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	ADS0890-C3	59.60
.0890	#43	2.260 mm	1.063	<b>27.00 mm</b>	(10x)	4 mm	63 mm	EXP0890-C3	63.10
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	CHT0890-C3	66.50
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BVT0900-C3	55.10
.0900		2.286 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	CHT0900-C3	66.50
.0935	#42	2.374 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	DHE0935-C3	48.80
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BVT0935-C3	55.10
.0935	#42	2.374 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ADS0935-C3	59.60
.0935	#42	2.374 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	EXP0935-C3	63.10
.0935	#42	2.374 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	CHT0935-C3	66.50
.0937 (3/32)		2.381 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	DHE0937-C3	52.20
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BVT0937-C3	55.10
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ADS0937-C3	59.60
.0937 (3/32)		2.381 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	EXP0937-C3	63.10
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	CHT0937-C3	66.30
.0960	#41	2.438 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	DHE0960-C3	52.20
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BVT0960-C3	55.10
.0960	#41	2.438 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ADS0960-C3	59.60
.0960	#41	2.438 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	EXP0960-C3	63.10
.0960	#41	2.438 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	CHT0960-C3	66.30
.0980	#40	2.489 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE0980-C3	52.20
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT0980-C3	55.10
.0980	#40	2.489 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ADS0980-C3	59.60
.0980	#40	2.489 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	EXP0980-C3	63.10
.0980	#40	2.489 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	CHT0980-C3	66.30
.0984		2.500 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE0984-C3	55.20
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT0984-C3	58.60
.0984		2.500 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ADS0984-C3	63.20
.0984		2.500 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	EXP0984-C3	66.50
.0984		2.500 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	CHT0984-C3	69.90
.0995	#39	2.527 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE0995-C3	55.20
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT0995-C3	58.60
.0995	#39	2.527 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ADS0995-C3	63.20
.0995	#39	2.527 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	EXP0995-C3	66.50
.0995	#39	2.527 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	CHT0995-C3	69.90

PREHARDENED STEELS

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## MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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PREHARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED	
inch	wire	metric	inch	metric	hole depth				
	D <sub>1</sub>	$+0.00\text{mm}$ $-0.013\text{mm}$	L <sub>2</sub>	$+0.25\text{mm}$ $-0.00\text{mm}$		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.1000		2.540 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE1000-C3	55.20
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT1000-C3	58.60
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ADS1000-C3	63.20
.1000		2.540 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	EXP1000-C3	66.50
.1000		2.540 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	CHT1000-C3	69.90
.1015	#38	2.578 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE1015-C3	55.20
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT1015-C3	58.60
.1015	#38	2.578 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ADS1015-C3	63.20
.1015	#38	2.578 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	EXP1015-C3	66.50
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	CHT1015-C3	69.90
.1040	#37	2.641 mm	.492	<b>12.50 mm</b>	(3x)	4 mm	50 mm	DHE1040-C3	55.20
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BVT1040-C3	58.60
.1040	#37	2.641 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ADS1040-C3	63.20
.1040	#37	2.641 mm	1.220	<b>31.00 mm</b>	(10x)	4 mm	75 mm	EXP1040-C3	66.50
.1040	#37	2.641 mm	1.417	<b>36.00 mm</b>	(12x)	4 mm	75 mm	CHT1040-C3	69.90
.1065	#36	2.705 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	DHE1065-C3	55.20
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BVT1065-C3	58.60
.1065	#36	2.705 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ADS1065-C3	63.20
.1065	#36	2.705 mm	1.260	<b>32.00 mm</b>	(10x)	4 mm	75 mm	EXP1065-C3	66.50
.1065	#36	2.705 mm	1.457	<b>37.00 mm</b>	(12x)	4 mm	75 mm	CHT1065-C3	69.90
.1093 (7/64)		2.778 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	DHE1093-C3	55.20
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1093-C3	58.60
.1093 (7/64)		2.778 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ADS1093-C3	63.20
.1093 (7/64)		2.778 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	EXP1093-C3	66.50
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	CHT1093-C3	69.90
.1100	#35	2.794 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	DHE1100-C3	55.20
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1100-C3	58.60
.1100	#35	2.794 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ADS1100-C3	63.20
.1100	#35	2.794 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	EXP1100-C3	66.50
.1100	#35	2.794 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	CHT1100-C3	69.90
.1110	#34	2.819 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	DHE1110-C3	55.20
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1110-C3	58.60
.1110	#34	2.819 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ADS1110-C3	63.20
.1110	#34	2.819 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	EXP1110-C3	66.50
.1110	#34	2.819 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	CHT1110-C3	69.90
.1130	#33	2.870 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	DHE1130-C3	55.20
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1130-C3	58.60
.1130	#33	2.870 mm	1.102	<b>28.00 mm</b>	(8x)	4 mm	63 mm	ADS1130-C3	63.20
.1130	#33	2.870 mm	1.339	<b>34.00 mm</b>	(10x)	4 mm	75 mm	EXP1130-C3	66.50
.1130	#33	2.870 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	CHT1130-C3	69.90
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BVT1160-C3	58.60
.1160	#32	2.946 mm	1.575	<b>40.00 mm</b>	(12x)	4 mm	75 mm	CHT1160-C3	69.90
.1181		3.000 mm	.571	<b>14.50 mm</b>	(3x)	4 mm	50 mm	DHE1181-C3	55.20
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BVT1181-C3	58.60
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	ADS1181-C3	63.20
.1181		3.000 mm	1.378	<b>35.00 mm</b>	(10x)	4 mm	75 mm	EXP1181-C3	66.50
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	CHT1181-C3	69.90

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# MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-0.13mm</sub>		L <sub>2</sub> <sup>+0.75mm</sup> / <sub>-0.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.1200	#31	3.048 mm	.571	<b>14.50 mm</b>	(3x)	6 mm	63 mm	DHE1200-C3	61.90
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BVT1200-C3	65.50
.1200	#31	3.048 mm	1.181	<b>30.00 mm</b>	(8x)	6 mm	75 mm	ADS1200-C3	70.40
.1200	#31	3.048 mm	1.417	<b>36.00 mm</b>	(10x)	6 mm	100 mm	EXP1200-C3	73.80
.1200	#31	3.048 mm	1.654	<b>42.00 mm</b>	(12x)	6 mm	100 mm	CHT1200-C3	77.20
.1240		3.149 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BVT1240-C3	65.50
.1240		3.149 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1240-C3	77.20
.1250 (1/8)		3.175 mm	.591	<b>15.00 mm</b>	(3x)	6 mm	63 mm	DHE1250-C3	61.90
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BVT1250-C3	65.50
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	ADS1250-C3	70.40
.1250 (1/8)		3.175 mm	1.457	<b>37.00 mm</b>	(10x)	6 mm	100 mm	EXP1250-C3	73.80
.1250 (1/8)		3.175 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1250-C3	77.20
.1260		3.200 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BVT1260-C3	65.50
.1260		3.200 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1260-C3	77.20
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BVT1285-C3	65.50
.1285	#30	3.263 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1285-C3	77.20
.1360	#29	3.454 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	DHE1360-C3	61.90
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BVT1360-C3	65.50
.1360	#29	3.454 mm	1.339	<b>34.00 mm</b>	(8x)	6 mm	75 mm	ADS1360-C3	70.40
.1360	#29	3.454 mm	1.575	<b>40.00 mm</b>	(10x)	6 mm	100 mm	EXP1360-C3	73.80
.1360	#29	3.454 mm	1.890	<b>48.00 mm</b>	(12x)	6 mm	100 mm	CHT1360-C3	77.20
.1405	#28	3.568 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1405-C3	65.50
.1405	#28	3.568 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1405-C3	77.20
.1406 (9/64)		3.571 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	DHE1406-C3	61.90
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1406-C3	65.50
.1406 (9/64)		3.571 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	ADS1406-C3	70.40
.1406 (9/64)		3.571 mm	1.654	<b>42.00 mm</b>	(10x)	6 mm	100 mm	EXP1406-C3	73.80
.1406 (9/64)		3.571 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1406-C3	77.20
.1417		3.600 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1417-C3	65.50
.1417		3.600 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1417-C3	77.20
.1440	#27	3.657 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1440-C3	65.50
.1440	#27	3.657 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1440-C3	77.20
.1470	#26	3.733 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	DHE1470-C3	61.90
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1470-C3	65.50
.1470	#26	3.733 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	ADS1470-C3	70.40
.1470	#26	3.733 mm	1.732	<b>44.00 mm</b>	(10x)	6 mm	100 mm	EXP1470-C3	73.80
.1470	#26	3.733 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	CHT1470-C3	77.20
.1495	#25	3.797 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1495-C3	65.50
.1495	#25	3.797 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	CHT1495-C3	77.20
.1520	#24	3.860 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1520-C3	65.50
.1520	#24	3.860 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1520-C3	77.20
.1540	#23	3.911 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1540-C3	65.50
.1540	#23	3.911 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1540-C3	77.20
.1562 (5/32)		3.968 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	DHE1562-C3	61.90
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1562-C3	65.50
.1562 (5/32)		3.968 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ADS1562-C3	70.40
.1562 (5/32)		3.968 mm	1.811	<b>46.00 mm</b>	(10x)	6 mm	100 mm	EXP1562-C3	73.80
.1562 (5/32)		3.968 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1562-C3	77.20

PREHARDENED STEELS

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# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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PREHARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER		OVERALL LENGTH		A1TiN COATED	
inch	wire	metric	inch	metric	hole depth					2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.75mm</sup> / <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.1570	#22	3.987 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1570-C3	65.50		
.1570	#22	3.987 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1570-C3	77.20		
.1574		4.000 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	DHE1574-C3	61.90		
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1574-C3	65.50		
.1574		4.000 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ADS1574-C3	70.40		
.1574		4.000 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	EXP1574-C3	73.80		
.1574		4.000 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	CHT1574-C3	77.20		
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	DHE1590-C3	61.90		
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1590-C3	65.50		
.1590	#21	4.038 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ADS1590-C3	70.40		
.1590	#21	4.038 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	EXP1590-C3	73.80		
.1590	#21	4.038 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	CHT1590-C3	77.20		
.1610	#20	4.089 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1610-C3	65.50		
.1610	#20	4.089 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	CHT1610-C3	77.20		
.1660	#19	4.216 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1660-C3	65.50		
.1660	#19	4.216 mm	2.283	<b>58.00 mm</b>	(12x)	6 mm	100 mm	CHT1660-C3	77.20		
.1695	#18	4.305 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1695-C3	65.50		
.1695	#18	4.305 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	CHT1695-C3	77.20		
.1718 (11/64)		4.365 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	DHE1718-C3	61.90		
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1718-C3	65.50		
.1718 (11/64)		4.365 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ADS1718-C3	70.40		
.1718 (11/64)		4.365 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	EXP1718-C3	73.80		
.1718 (11/64)		4.365 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	CHT1718-C3	77.20		
.1730	#17	4.394 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1730-C3	65.50		
.1730	#17	4.394 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	CHT1730-C3	77.20		
.1770	#16	4.495 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	DHE1770-C3	61.90		
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1770-C3	65.50		
.1770	#16	4.495 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ADS1770-C3	70.40		
.1770	#16	4.495 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	EXP1770-C3	73.80		
.1770	#16	4.495 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	CHT1770-C3	77.20		
.1800	#15	4.572 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	DHE1800-C3	61.90		
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1800-C3	65.50		
.1800	#15	4.572 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ADS1800-C3	70.40		
.1800	#15	4.572 mm	2.126	<b>54.00 mm</b>	(10x)	6 mm	100 mm	EXP1800-C3	73.80		
.1800	#15	4.572 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	CHT1800-C3	77.20		
.1820	#14	4.622 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1820-C3	65.50		
.1820	#14	4.622 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	CHT1820-C3	77.20		
.1850	#13	4.700 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1850-C3	65.50		
.1850	#13	4.700 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	CHT1850-C3	77.20		
.1875 (3/16)		4.762 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	DHE1875-C3	61.90		
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1875-C3	65.50		
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ADS1875-C3	70.40		
.1875 (3/16)		4.762 mm	2.205	<b>56.00 mm</b>	(10x)	6 mm	100 mm	EXP1875-C3	73.80		
.1875 (3/16)		4.762 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	CHT1875-C3	77.20		
.1890	#12	4.800 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1890-C3	65.50		
.1890	#12	4.800 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	CHT1890-C3	77.20		
.1910	#11	4.851 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1910-C3	65.50		
.1910	#11	4.851 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	CHT1910-C3	77.20		

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## MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AISI COATED	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> <sup>+0.00mm</sup> -0.013mm		L <sub>2</sub> <sup>+0.75mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.1935	#10	4.914 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1935-C3	65.50
.1935	#10	4.914 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	CHT1935-C3	77.20
.1960	#9	4.978 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1960-C3	65.50
.1960	#9	4.978 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	CHT1960-C3	77.20
.1968		5.000 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	DHE1968-C3	61.90
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1968-C3	65.50
.1968		5.000 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ADS1968-C3	70.40
.1968		5.000 mm	2.283	<b>58.00 mm</b>	(10x)	6 mm	100 mm	EXP1968-C3	73.80
.1968		5.000 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	CHT1968-C3	77.20
.1990	#8	5.054 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1990-C3	65.50
.1990	#8	5.054 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	CHT1990-C3	77.20
.2009	#7	5.105 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	DHE2009-C3	61.90
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT2009-C3	65.50
.2009	#7	5.105 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ADS2009-C3	70.40
.2009	#7	5.105 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	EXP2009-C3	73.80
.2009	#7	5.105 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	CHT2009-C3	77.20
.2031 (13/64)		5.159 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	DHE2031-C3	61.90
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT2031-C3	65.50
.2031 (13/64)		5.159 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ADS2031-C3	70.40
.2031 (13/64)		5.159 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	EXP2031-C3	73.80
.2031 (13/64)		5.159 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	CHT2031-C3	77.20
.2040	#6	5.181 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT2040-C3	65.50
.2040	#6	5.181 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	CHT2040-C3	77.20
.2055	#5	5.219 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BVT2055-C3	65.50
.2055	#5	5.219 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	CHT2055-C3	77.20
.2090		5.308 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BVT2090-C3	65.50
.2090		5.308 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	CHT2090-C3	77.20
.2129	#3	5.410 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	DHE2129-C3	61.90
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BVT2129-C3	65.50
.2129	#3	5.410 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	ADS2129-C3	70.40
.2129	#3	5.410 mm	2.520	<b>64.00 mm</b>	(10x)	6 mm	125 mm	EXP2129-C3	73.80
.2129	#3	5.410 mm	2.913	<b>74.00 mm</b>	(12x)	6 mm	125 mm	CHT2129-C3	77.20
.2165		5.500 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2165-C3	65.50
.2165		5.500 mm	2.992	<b>76.00 mm</b>	(12x)	6 mm	125 mm	CHT2165-C3	77.20
.2187 (7/32)		5.556 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	DHE2187-C3	61.90
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2187-C3	65.50
.2187 (7/32)		5.556 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	ADS2187-C3	70.40
.2187 (7/32)		5.556 mm	2.598	<b>66.00 mm</b>	(10x)	6 mm	125 mm	EXP2187-C3	73.80
.2187 (7/32)		5.556 mm	2.992	<b>76.00 mm</b>	(12x)	6 mm	125 mm	CHT2187-C3	77.20
.2205		5.600 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2205-C3	65.50
.2205		5.600 mm	3.071	<b>78.00 mm</b>	(12x)	6 mm	125 mm	CHT2205-C3	77.20
.2210	#2	5.613 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2210-C3	65.50
.2210	#2	5.613 mm	3.071	<b>78.00 mm</b>	(12x)	6 mm	125 mm	CHT2210-C3	77.20
.2280	#1	5.791 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2280-C3	65.50
.2280	#1	5.791 mm	3.150	<b>80.00 mm</b>	(12x)	6 mm	125 mm	CHT2280-C3	77.20
.2340	A	5.943 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2340-C3	65.50
.2340	A	5.943 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	CHT2340-C3	77.20

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# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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PREHARDENED STEELS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.75mm</sup> / <sub>-.00mm</sub>					
.2343 (15/64)		5.953 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	DHE2343-C3	61.90
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2343-C3	65.50
.2343 (15/64)		5.953 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ADS2343-C3	70.40
.2343 (15/64)		5.953 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	EXP2343-C3	73.80
.2343 (15/64)		5.953 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	CHT2343-C3	77.20
.2362		6.000 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	DHE2362-C3	61.90
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2362-C3	65.50
.2362		6.000 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ADS2362-C3	70.40
.2362		6.000 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	EXP2362-C3	73.80
.2362		6.000 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	CHT2362-C3	77.20
.2380	B	6.045 mm	1.575	<b>40.00 mm</b>	(5x)	8 mm	100 mm	BVT2380-C3	67.80
.2380	B	6.045 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	CHT2380-C3	79.80
.2420	C	6.146 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BVT2420-C3	67.80
.2420	C	6.146 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	CHT2420-C3	79.80
.2460	D	6.248 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BVT2460-C3	67.80
.2460	D	6.248 mm	3.386	<b>86.00 mm</b>	(12x)	8 mm	150 mm	CHT2460-C3	79.80
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	DHE2500-C3	61.90
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BVT2500-C3	65.50
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	ADS2500-C3	70.40
.2500 (1/4)	E	6.350 mm	2.913	<b>74.00 mm</b>	(10x)	8 mm	125 mm	EXP2500-C3	73.80
.2500 (1/4)	E	6.350 mm	3.465	<b>88.00 mm</b>	(12x)	8 mm	150 mm	CHT2500-C3	77.20
.2570	F	6.528 mm	1.259	<b>32.00 mm</b>	(3x)	8 mm	75 mm	DHE2570-C3	61.90 <span style="color: red;">NEW</span>
.2812 (9/32)		7.142 mm	1.338	<b>34.00 mm</b>	(3x)	8 mm	75 mm	DHE2812-C3	61.90 <span style="color: red;">NEW</span>
.3125 (5/16)		7.937 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	DHE3125-C3	63.60 <span style="color: red;">NEW</span>
.3150		8.000 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	DHE3150-C3	63.60 <span style="color: red;">NEW</span>
.3750 (3/8)		9.525 mm	1.811	<b>46.00 mm</b>	(3x)	10 mm	100 mm	DHE3750-C3	76.60 <span style="color: red;">NEW</span>

### SPEEDS & FEEDS (Miniature High Performance Drills – Prehardened Steels)

**Important Note:** Values in table are in inches and are based on 3x and 5x drill lengths and a material hardness of 29-37 Rc. For longer lengths, table values of IPR must be reduced (for 8x and 10x, reduce to 75%; for 12x, reduce to 65%). For ferrous materials at 38-45 Rc, reduce IPR (for 3x and 5x, reduce to 80%; for 8x and 10x, reduce to 60%; for 12x, reduce to 52%). Pecking cycles are recommended to avoid chip packing and breakage. For materials at 29-37 Rc, initial peck depth should be 2-3x Diameter with each subsequent peck at 1-2x Diameter. For materials at 38-45 Rc, initial peck depth should be 1-2x Diameter with each subsequent peck at .5-1x Diameter. For complete speeds and feeds charts, please go to [www.harveytool.com](http://www.harveytool.com).

Material (Hardness: 29-37 Rc)	SFM	Chip Load IPR (Inches Per Revolution) By Drill Diameter									
		.015	.031	.047	.062	.078	.093	.125	.187	.250	.375
<b>Carbon Steels</b> Free Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	240	.00063	.00130	.00197	.00260	.00328	.00391	.00525	.00785	.01050	.01575
1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx	150	.00058	.00119	.00180	.00238	.00300	.00357	.00480	.00718	.00960	.01440
<b>Stainless Steels</b> 203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	180	.00063	.00130	.00197	.00260	.00328	.00391	.00525	.00785	.01050	.01575
201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 420, 429, 430, 434, 436, 442, 446, 501, 502	150	.00058	.00119	.00180	.00238	.00300	.00357	.00480	.00718	.00960	.01440
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	125	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600	.00900
<b>Tool Steels</b> A, L, O, P, W series	125	.00058	.00119	.00180	.00238	.00300	.00357	.00480	.00718	.00960	.01440
D, H, M, T, S series	90	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600	.00900
<b>Titanium Alloys</b>	100	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600	.00900
<b>High Temp Alloys</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	70	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600	.00900

# MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys



Available for 3x, 5x, 8x, 10x, & 12x Hole Depths!



Special 3 Flute Design to Maximize Chip Flow, Hole Accuracy, and Finish

- Optimized for drilling aluminum and aluminum alloys with excellent performance in unfilled plastics, copper, brass, and bronze alloys
- Special 3 flute design to maximize chip flow, hole accuracy, and finish
- 130° point angle
- Polished flute valleys and TiB<sub>2</sub> coating prevent built-up edge and extend tool life
- h6 shank tolerance for high precision tool holders
- Solid carbide • CNC ground in the USA

ALUMINUM ALLOYS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
		D <sub>1</sub> <sup>+.000mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+.25mm</sup> / <sub>-.00mm</sub>					
.0150		.381 mm	.071	<b>1.80 mm</b>	(3x)	3 mm	50 mm	AVA0150-C8	44.60
.0150		.381 mm	.102	<b>2.60 mm</b>	(5x)	3 mm	50 mm	BAF0150-C8	48.30
.0150		.381 mm	.205	<b>5.20 mm</b>	(12x)	3 mm	50 mm	DQW0150-C8	59.10
.0156 (1/64)		.396 mm	.075	<b>1.90 mm</b>	(3x)	3 mm	50 mm	AVA0156-C8	44.60
.0156 (1/64)		.396 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BAF0156-C8	48.30
.0156 (1/64)		.396 mm	.154	<b>3.90 mm</b>	(8x)	3 mm	50 mm	CBG0156-C8	53.00
.0156 (1/64)		.396 mm	.185	<b>4.70 mm</b>	(10x)	3 mm	50 mm	ERY0156-C8	56.00
.0156 (1/64)		.396 mm	.213	<b>5.40 mm</b>	(12x)	3 mm	50 mm	DQW0156-C8	59.10
.0160	#78	.406 mm	.079	<b>2.00 mm</b>	(3x)	3 mm	50 mm	AVA0160-C8	44.60
.0160	#78	.406 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BAF0160-C8	48.30
.0160	#78	.406 mm	.157	<b>4.00 mm</b>	(8x)	3 mm	50 mm	CBG0160-C8	53.00
.0160	#78	.406 mm	.189	<b>4.80 mm</b>	(10x)	3 mm	50 mm	ERY0160-C8	56.00
.0160	#78	.406 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	DQW0160-C8	59.10
.0170		.431 mm	.114	<b>2.90 mm</b>	(5x)	3 mm	50 mm	BAF0170-C8	48.30
.0170		.431 mm	.236	<b>6.00 mm</b>	(12x)	3 mm	50 mm	DQW0170-C8	59.10
.0180	#77	.457 mm	.087	<b>2.20 mm</b>	(3x)	3 mm	50 mm	AVA0180-C8	44.60
.0180	#77	.457 mm	.122	<b>3.10 mm</b>	(5x)	3 mm	50 mm	BAF0180-C8	48.30
.0180	#77	.457 mm	.177	<b>4.50 mm</b>	(8x)	3 mm	50 mm	CBG0180-C8	53.00
.0180	#77	.457 mm	.213	<b>5.40 mm</b>	(10x)	3 mm	50 mm	ERY0180-C8	56.00
.0180	#77	.457 mm	.244	<b>6.20 mm</b>	(12x)	3 mm	50 mm	DQW0180-C8	59.10
.0190		.482 mm	.130	<b>3.30 mm</b>	(5x)	3 mm	50 mm	BAF0190-C8	48.30
.0190		.482 mm	.260	<b>6.60 mm</b>	(12x)	3 mm	50 mm	DQW0190-C8	59.10
.0196		.500 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	AVA0196-C8	44.00
.0196		.500 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BAF0196-C8	47.80
.0196		.500 mm	.193	<b>4.90 mm</b>	(8x)	3 mm	50 mm	CBG0196-C8	52.50
.0196		.500 mm	.228	<b>5.80 mm</b>	(10x)	3 mm	50 mm	ERY0196-C8	55.20
.0196		.500 mm	.268	<b>6.80 mm</b>	(12x)	3 mm	50 mm	DQW0196-C8	58.30
.0200	#76	.508 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	AVA0200-C8	44.00
.0200	#76	.508 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BAF0200-C8	47.80
.0200	#76	.508 mm	.197	<b>5.00 mm</b>	(8x)	3 mm	50 mm	CBG0200-C8	52.50
.0200	#76	.508 mm	.236	<b>6.00 mm</b>	(10x)	3 mm	50 mm	ERY0200-C8	55.20
.0200	#76	.508 mm	.276	<b>7.00 mm</b>	(12x)	3 mm	50 mm	DQW0200-C8	58.30
.0210	#75	.533 mm	.098	<b>2.50 mm</b>	(3x)	3 mm	50 mm	AVA0210-C8	44.00
.0210	#75	.533 mm	.142	<b>3.60 mm</b>	(5x)	3 mm	50 mm	BAF0210-C8	47.80
.0210	#75	.533 mm	.205	<b>5.20 mm</b>	(8x)	3 mm	50 mm	CBG0210-C8	52.50
.0210	#75	.533 mm	.244	<b>6.20 mm</b>	(10x)	3 mm	50 mm	ERY0210-C8	55.20
.0210	#75	.533 mm	.291	<b>7.40 mm</b>	(12x)	3 mm	50 mm	DQW0210-C8	58.30

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# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys (cont.)

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ALUMINUM ALLOYS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth			3 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> -0.013mm		L <sub>2</sub> <sup>+0.25mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0220		.558 mm	.150	<b>3.80 mm</b>	(5x)	3 mm	50 mm	BAF0220-C8	47.80
.0220		.558 mm	.299	<b>7.60 mm</b>	(12x)	3 mm	50 mm	DQW0220-C8	58.30
.0225	#74	.571 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	AVA0225-C8	45.30
.0225	#74	.571 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BAF0225-C8	47.80
.0225	#74	.571 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	CBG0225-C8	52.50
.0225	#74	.571 mm	.268	<b>6.80 mm</b>	(10x)	3 mm	50 mm	ERY0225-C8	55.20
.0225	#74	.571 mm	.307	<b>7.80 mm</b>	(12x)	3 mm	50 mm	DQW0225-C8	58.30
.0230		.584 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BAF0230-C8	47.80
.0230		.584 mm	.315	<b>8.00 mm</b>	(12x)	3 mm	50 mm	DQW0230-C8	58.30
.0236		.600 mm	.157	<b>4.00 mm</b>	(5x)	3 mm	50 mm	BAF0236-C8	47.80
.0236		.600 mm	.323	<b>8.20 mm</b>	(12x)	3 mm	50 mm	DQW0236-C8	58.30
.0240	#73	.609 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	AVA0240-C8	44.00
.0240	#73	.609 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BAF0240-C8	47.80
.0240	#73	.609 mm	.236	<b>6.00 mm</b>	(8x)	3 mm	50 mm	CBG0240-C8	52.50
.0240	#73	.609 mm	.283	<b>7.20 mm</b>	(10x)	3 mm	50 mm	ERY0240-C8	55.20
.0240	#73	.609 mm	.331	<b>8.40 mm</b>	(12x)	3 mm	50 mm	DQW0240-C8	58.30
.0250	#72	.635 mm	.118	<b>3.00 mm</b>	(3x)	3 mm	50 mm	AVA0250-C8	44.00
.0250	#72	.635 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BAF0250-C8	47.80
.0250	#72	.635 mm	.244	<b>6.20 mm</b>	(8x)	3 mm	50 mm	CBG0250-C8	52.50
.0250	#72	.635 mm	.291	<b>7.40 mm</b>	(10x)	3 mm	50 mm	ERY0250-C8	55.20
.0250	#72	.635 mm	.346	<b>8.80 mm</b>	(12x)	3 mm	50 mm	DQW0250-C8	58.30
.0260	#71	.660 mm	.122	<b>3.10 mm</b>	(3x)	3 mm	50 mm	AVA0260-C8	44.00
.0260	#71	.660 mm	.173	<b>4.40 mm</b>	(5x)	3 mm	50 mm	BAF0260-C8	47.80
.0260	#71	.660 mm	.252	<b>6.40 mm</b>	(8x)	3 mm	50 mm	CBG0260-C8	52.50
.0260	#71	.660 mm	.307	<b>7.80 mm</b>	(10x)	3 mm	50 mm	ERY0260-C8	55.20
.0260	#71	.660 mm	.354	<b>9.00 mm</b>	(12x)	3 mm	50 mm	DQW0260-C8	58.30
.0270		.685 mm	.181	<b>4.60 mm</b>	(5x)	3 mm	50 mm	BAF0270-C8	47.80
.0270		.685 mm	.370	<b>9.40 mm</b>	(12x)	3 mm	50 mm	DQW0270-C8	58.30
.0275		.700 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BAF0275-C8	47.80
.0275		.700 mm	.378	<b>9.60 mm</b>	(12x)	3 mm	50 mm	DQW0275-C8	58.30
.0280	#70	.711 mm	.134	<b>3.40 mm</b>	(3x)	3 mm	50 mm	AVA0280-C8	44.00
.0280	#70	.711 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BAF0280-C8	47.80
.0280	#70	.711 mm	.276	<b>7.00 mm</b>	(8x)	3 mm	50 mm	CBG0280-C8	52.50
.0280	#70	.711 mm	.331	<b>8.40 mm</b>	(10x)	3 mm	50 mm	ERY0280-C8	55.20
.0280	#70	.711 mm	.386	<b>9.80 mm</b>	(12x)	3 mm	50 mm	DQW0280-C8	58.30
.0292	#69	.741 mm	.138	<b>3.50 mm</b>	(3x)	3 mm	50 mm	AVA0292-C8	45.30
.0292	#69	.741 mm	.197	<b>5.00 mm</b>	(5x)	3 mm	50 mm	BAF0292-C8	47.80
.0292	#69	.741 mm	.283	<b>7.20 mm</b>	(8x)	3 mm	50 mm	CBG0292-C8	52.50
.0292	#69	.741 mm	.346	<b>8.80 mm</b>	(10x)	3 mm	50 mm	ERY0292-C8	55.20
.0292	#69	.741 mm	.394	<b>10.00 mm</b>	(12x)	3 mm	50 mm	DQW0292-C8	58.30
.0300		.762 mm	.205	<b>5.20 mm</b>	(5x)	3 mm	50 mm	BAF0300-C8	47.80
.0300		.762 mm	.413	<b>10.50 mm</b>	(12x)	3 mm	50 mm	DQW0300-C8	58.30
.0310	#68	.787 mm	.146	<b>3.70 mm</b>	(3x)	3 mm	50 mm	AVA0310-C8	44.00
.0310	#68	.787 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0310-C8	47.80
.0310	#68	.787 mm	.299	<b>7.60 mm</b>	(8x)	3 mm	50 mm	CBG0310-C8	52.50
.0310	#68	.787 mm	.362	<b>9.20 mm</b>	(10x)	3 mm	50 mm	ERY0310-C8	55.70
.0310	#68	.787 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0310-C8	59.10
.0312 (1/32)		.793 mm	.150	<b>3.80 mm</b>	(3x)	3 mm	50 mm	AVA0312-C8	44.00
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0312-C8	47.80

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# MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
		D <sub>1</sub> <sup>+ .000mm</sup> <sub>- .013mm</sub>		L <sub>2</sub> <sup>+ .25mm</sup> <sub>- .00mm</sub>					
.0312 (1/32)		.793 mm	.307	<b>7.80 mm</b>	(8x)	3 mm	50 mm	CBG0312-C8	52.50
.0312 (1/32)		.793 mm	.370	<b>9.40 mm</b>	(10x)	3 mm	50 mm	ERY0312-C8	55.70
.0312 (1/32)		.793 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0312-C8	59.10
.0315		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0315-C8	47.80
.0315		.800 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0315-C8	59.10
.0320	#67	.812 mm	.154	<b>3.90 mm</b>	(3x)	3 mm	50 mm	AVA0320-C8	44.00
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0320-C8	47.80
.0320	#67	.812 mm	.315	<b>8.00 mm</b>	(8x)	3 mm	50 mm	CBG0320-C8	52.50
.0320	#67	.812 mm	.378	<b>9.60 mm</b>	(10x)	3 mm	50 mm	ERY0320-C8	55.70
.0320	#67	.812 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0320-C8	59.10
.0330	#66	.838 mm	.157	<b>4.00 mm</b>	(3x)	3 mm	50 mm	AVA0330-C8	44.00
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	BAF0330-C8	47.80
.0330	#66	.838 mm	.323	<b>8.20 mm</b>	(8x)	3 mm	50 mm	CBG0330-C8	52.50
.0330	#66	.838 mm	.386	<b>9.80 mm</b>	(10x)	3 mm	50 mm	ERY0330-C8	55.70
.0330	#66	.838 mm	.453	<b>11.50 mm</b>	(12x)	3 mm	50 mm	DQW0330-C8	59.10
.0350	#65	.889 mm	.165	<b>4.20 mm</b>	(3x)	3 mm	50 mm	AVA0350-C8	44.00
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BAF0350-C8	47.80
.0350	#65	.889 mm	.339	<b>8.60 mm</b>	(8x)	3 mm	50 mm	CBG0350-C8	52.50
.0350	#65	.889 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	ERY0350-C8	55.70
.0350	#65	.889 mm	.472	<b>12.00 mm</b>	(12x)	3 mm	50 mm	DQW0350-C8	59.10
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BAF0354-C8	47.80
.0354		.900 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	DQW0354-C8	59.10
.0360	#64	.914 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	AVA0360-C8	44.00
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	BAF0360-C8	47.80
.0360	#64	.914 mm	.354	<b>9.00 mm</b>	(8x)	3 mm	50 mm	CBG0360-C8	52.50
.0360	#64	.914 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	ERY0360-C8	55.70
.0360	#64	.914 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	DQW0360-C8	59.10
.0370	#63	.939 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	AVA0370-C8	45.30
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	BAF0370-C8	47.80
.0370	#63	.939 mm	.362	<b>9.20 mm</b>	(8x)	3 mm	50 mm	CBG0370-C8	52.50
.0370	#63	.939 mm	.433	<b>11.00 mm</b>	(10x)	3 mm	50 mm	ERY0370-C8	55.70
.0370	#63	.939 mm	.512	<b>13.00 mm</b>	(12x)	3 mm	50 mm	DQW0370-C8	59.10
.0380	#62	.965 mm	.181	<b>4.60 mm</b>	(3x)	3 mm	50 mm	AVA0380-C8	44.00
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BAF0380-C8	47.80
.0380	#62	.965 mm	.370	<b>9.40 mm</b>	(8x)	3 mm	50 mm	CBG0380-C8	52.50
.0380	#62	.965 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	ERY0380-C8	55.70
.0380	#62	.965 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	DQW0380-C8	59.10
.0390	#61	.990 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	AVA0390-C8	44.00
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BAF0390-C8	47.80
.0390	#61	.990 mm	.378	<b>9.60 mm</b>	(8x)	3 mm	50 mm	CBG0390-C8	52.50
.0390	#61	.990 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	ERY0390-C8	55.70
.0390	#61	.990 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	DQW0390-C8	59.10
.0393		1.000 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	AVA0393-C8	47.20
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BAF0393-C8	49.80
.0393		1.000 mm	.386	<b>9.80 mm</b>	(8x)	3 mm	50 mm	CBG0393-C8	53.80
.0393		1.000 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	ERY0393-C8	57.10
.0393		1.000 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	DQW0393-C8	60.20

ALUMINUM ALLOYS

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# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys (cont.)

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ALUMINUM ALLOYS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
		D <sub>1</sub> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$			L <sub>2</sub> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$				
.0400	#60	1.016 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	AVA0400-C8	45.90
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BAF0400-C8	49.80
.0400	#60	1.016 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	CBG0400-C8	53.80
.0400	#60	1.016 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	ERY0400-C8	57.10
.0400	#60	1.016 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	DQW0400-C8	60.20
.0410	#59	1.041 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	AVA0410-C8	45.90
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	BAF0410-C8	49.80
.0410	#59	1.041 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	CBG0410-C8	53.80
.0410	#59	1.041 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	ERY0410-C8	57.10
.0410	#59	1.041 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	DQW0410-C8	60.20
.0420	#58	1.066 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	AVA0420-C8	45.90
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	BAF0420-C8	49.80
.0420	#58	1.066 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	CBG0420-C8	53.80
.0420	#58	1.066 mm	.492	<b>12.50 mm</b>	(10x)	3 mm	50 mm	ERY0420-C8	57.10
.0420	#58	1.066 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	DQW0420-C8	60.20
.0430	#57	1.092 mm	.205	<b>5.20 mm</b>	(3x)	3 mm	50 mm	AVA0430-C8	45.90
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	BAF0430-C8	49.80
.0430	#57	1.092 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	CBG0430-C8	53.80
.0430	#57	1.092 mm	.512	<b>13.00 mm</b>	(10x)	3 mm	50 mm	ERY0430-C8	57.10
.0430	#57	1.092 mm	.591	<b>15.00 mm</b>	(12x)	3 mm	50 mm	DQW0430-C8	60.20
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	BAF0450-C8	49.80
.0450		1.143 mm	.610	<b>15.50 mm</b>	(12x)	3 mm	50 mm	DQW0450-C8	60.20
.0465	#56	1.181 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	AVA0465-C8	47.20
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BAF0465-C8	49.80
.0465	#56	1.181 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	CBG0465-C8	53.80
.0465	#56	1.181 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	ERY0465-C8	57.10
.0465	#56	1.181 mm	.630	<b>16.00 mm</b>	(12x)	3 mm	63 mm	DQW0465-C8	60.20
.0468 (3/64)		1.190 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	AVA0468-C8	45.90
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BAF0468-C8	49.80
.0468 (3/64)		1.190 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	CBG0468-C8	53.80
.0468 (3/64)		1.190 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	ERY0468-C8	57.10
.0468 (3/64)		1.190 mm	.650	<b>16.50 mm</b>	(12x)	3 mm	63 mm	DQW0468-C8	60.20
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BAF0492-C8	49.80
.0492		1.250 mm	.669	<b>17.00 mm</b>	(12x)	3 mm	63 mm	DQW0492-C8	60.20
.0500		1.270 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	AVA0500-C8	45.90
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BAF0500-C8	49.80
.0500		1.270 mm	.492	<b>12.50 mm</b>	(8x)	3 mm	50 mm	CBG0500-C8	53.80
.0500		1.270 mm	.591	<b>15.00 mm</b>	(10x)	3 mm	50 mm	ERY0500-C8	57.10
.0500		1.270 mm	.689	<b>17.50 mm</b>	(12x)	3 mm	63 mm	DQW0500-C8	60.20
.0520	#55	1.320 mm	.244	<b>6.20 mm</b>	(3x)	3 mm	50 mm	AVA0520-C8	47.20
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	BAF0520-C8	49.80
.0520	#55	1.320 mm	.512	<b>13.00 mm</b>	(8x)	3 mm	50 mm	CBG0520-C8	53.80
.0520	#55	1.320 mm	.610	<b>15.50 mm</b>	(10x)	3 mm	50 mm	ERY0520-C8	57.10
.0520	#55	1.320 mm	.709	<b>18.00 mm</b>	(12x)	3 mm	63 mm	DQW0520-C8	60.20
.0550	#54	1.397 mm	.260	<b>6.60 mm</b>	(3x)	3 mm	50 mm	AVA0550-C8	47.20
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	BAF0550-C8	49.80
.0550	#54	1.397 mm	.531	<b>13.50 mm</b>	(8x)	3 mm	50 mm	CBG0550-C8	53.80

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## MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth			3 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> -0.013mm		L <sub>2</sub> <sup>+0.25mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0550	#54	1.397 mm	.650	<b>16.50 mm</b>	(10x)	3 mm	63 mm	ERY0550-C8	57.10
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	DQW0550-C8	60.20
.0590		1.500 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	AVA0590-C8	46.40
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BAF0590-C8	50.30
.0590		1.500 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	CBG0590-C8	53.80
.0590		1.500 mm	.689	<b>17.50 mm</b>	(10x)	3 mm	63 mm	ERY0590-C8	57.60
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	DQW0590-C8	61.40
.0595	#53	1.511 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	AVA0595-C8	46.40
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BAF0595-C8	50.30
.0595	#53	1.511 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	CBG0595-C8	53.80
.0595	#53	1.511 mm	.709	<b>18.00 mm</b>	(10x)	3 mm	63 mm	ERY0595-C8	57.60
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	DQW0595-C8	61.40
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BAF0600-C8	50.30
.0600		1.524 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	DQW0600-C8	61.40
.0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	AVA0625-C8	46.40
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BAF0625-C8	50.30
.0625 (1/16)		1.587 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	CBG0625-C8	54.90
.0625 (1/16)		1.587 mm	.728	<b>18.50 mm</b>	(10x)	3 mm	63 mm	ERY0625-C8	58.00
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	DQW0625-C8	61.40
.0635	#52	1.612 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	AVA0635-C8	47.70
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	BAF0635-C8	50.30
.0635	#52	1.612 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	CBG0635-C8	54.90
.0635	#52	1.612 mm	.748	<b>19.00 mm</b>	(10x)	3 mm	63 mm	ERY0635-C8	58.00
.0635	#52	1.612 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	DQW0635-C8	61.40
.0670	#51	1.701 mm	.315	<b>8.00 mm</b>	(3x)	3 mm	50 mm	AVA0670-C8	46.40
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	BAF0670-C8	50.30
.0670	#51	1.701 mm	.650	<b>16.50 mm</b>	(8x)	3 mm	63 mm	CBG0670-C8	54.90
.0670	#51	1.701 mm	.787	<b>20.00 mm</b>	(10x)	3 mm	63 mm	ERY0670-C8	58.00
.0670	#51	1.701 mm	.906	<b>23.00 mm</b>	(12x)	3 mm	63 mm	DQW0670-C8	61.40
.0700	#50	1.778 mm	.335	<b>8.50 mm</b>	(3x)	3 mm	50 mm	AVA0700-C8	46.40
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	BAF0700-C8	50.30
.0700	#50	1.778 mm	.689	<b>17.50 mm</b>	(8x)	3 mm	63 mm	CBG0700-C8	54.90
.0700	#50	1.778 mm	.827	<b>21.00 mm</b>	(10x)	3 mm	63 mm	ERY0700-C8	58.00
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	DQW0700-C8	61.40
.0730	#49	1.854 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	AVA0730-C8	46.40
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	BAF0730-C8	50.30
.0730	#49	1.854 mm	.709	<b>18.00 mm</b>	(8x)	3 mm	63 mm	CBG0730-C8	54.90
.0730	#49	1.854 mm	.866	<b>22.00 mm</b>	(10x)	3 mm	63 mm	ERY0730-C8	58.00
.0730	#49	1.854 mm	.984	<b>25.00 mm</b>	(12x)	3 mm	63 mm	DQW0730-C8	61.40
.0760	#48	1.930 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	AVA0760-C8	46.40
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	BAF0760-C8	50.30
.0760	#48	1.930 mm	.748	<b>19.00 mm</b>	(8x)	3 mm	63 mm	CBG0760-C8	54.90
.0760	#48	1.930 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	ERY0760-C8	58.00
.0760	#48	1.930 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	DQW0760-C8	61.40
.0781 (5/64)		1.984 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	AVA0781-C8	46.40
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BAF0781-C8	50.30
.0781 (5/64)		1.984 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	CBG0781-C8	54.90

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# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys (cont.)

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ALUMINUM ALLOYS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth				
D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>			L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>			D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.0781 (5/64)		1.984 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	ERY0781-C8	58.00
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	DQW0781-C8	61.40
.0785	#47	1.993 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	AVA0785-C8	46.40
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BAF0785-C8	50.30
.0785	#47	1.993 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	CBG0785-C8	54.90
.0785	#47	1.993 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	DQW0785-C8	61.40
.0787		2.000 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	AVA0787-C8	47.70
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BAF0787-C8	51.60
.0787		2.000 mm	.768	<b>19.50 mm</b>	(8x)	4 mm	63 mm	CBG0787-C8	56.10
.0787		2.000 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	ERY0787-C8	59.20
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	DQW0787-C8	62.50
.0800		2.032 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	AVA0800-C8	47.70
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BAF0800-C8	51.60
.0800		2.032 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	CBG0800-C8	56.10
.0800		2.032 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	DQW0800-C8	62.50
.0810	#46	2.057 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	AVA0810-C8	47.70
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BAF0810-C8	51.60
.0810	#46	2.057 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	CBG0810-C8	56.10
.0810	#46	2.057 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	ERY0810-C8	59.20
.0810	#46	2.057 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	DQW0810-C8	62.50
.0820	#45	2.082 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	AVA0820-C8	47.70
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BAF0820-C8	51.60
.0820	#45	2.082 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	CBG0820-C8	56.10
.0820	#45	2.082 mm	1.142	<b>29.00 mm</b>	(12x)	4 mm	75 mm	DQW0820-C8	62.50
.0860	#44	2.184 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	AVA0860-C8	47.70
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BAF0860-C8	51.60
.0860	#44	2.184 mm	.827	<b>21.00 mm</b>	(8x)	4 mm	63 mm	CBG0860-C8	56.10
.0860	#44	2.184 mm	1.024	<b>26.00 mm</b>	(10x)	4 mm	63 mm	ERY0860-C8	59.20
.0860	#44	2.184 mm	1.181	<b>30.00 mm</b>	(12x)	4 mm	75 mm	DQW0860-C8	62.50
.0890	#43	2.260 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	AVA0890-C8	49.10
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BAF0890-C8	51.60
.0890	#43	2.260 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	CBG0890-C8	56.10
.0890	#43	2.260 mm	1.063	<b>27.00 mm</b>	(10x)	4 mm	63 mm	ERY0890-C8	59.20
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	DQW0890-C8	62.50
.0900		2.286 mm	.433	<b>11.00 mm</b>	(3x)	4 mm	50 mm	AVA0900-C8	47.70
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BAF0900-C8	51.60
.0900		2.286 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	CBG0900-C8	56.10
.0900		2.286 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	DQW0900-C8	62.50
.0935	#42	2.374 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	AVA0935-C8	47.70
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BAF0935-C8	51.60
.0935	#42	2.374 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	CBG0935-C8	56.10
.0935	#42	2.374 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	ERY0935-C8	59.20
.0935	#42	2.374 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	DQW0935-C8	62.50
.0937 (3/32)		2.381 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	AVA0937-C8	47.70
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BAF0937-C8	51.60
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	CBG0937-C8	56.10
.0937 (3/32)		2.381 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	ERY0937-C8	59.20
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	DQW0937-C8	62.50

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# MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth			3 FL	PRICE
		D <sub>1</sub> <sup>+ .000mm</sup> - .013mm		L <sub>2</sub> <sup>+ .25mm</sup> - .00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0960	#41	2.438 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	AVA0960-C8	47.70
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BAF0960-C8	51.60
.0960	#41	2.438 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	CBG0960-C8	56.10
.0960	#41	2.438 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	ERY0960-C8	59.20
.0960	#41	2.438 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	DQW0960-C8	62.50
.0980	#40	2.489 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA0980-C8	47.70
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF0980-C8	51.60
.0980	#40	2.489 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	CBG0980-C8	56.10
.0980	#40	2.489 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	ERY0980-C8	59.20
.0980	#40	2.489 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	DQW0980-C8	62.50
.0984		2.500 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA0984-C8	48.10
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF0984-C8	52.00
.0984		2.500 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	CBG0984-C8	56.50
.0984		2.500 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	ERY0984-C8	59.80
.0984		2.500 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	DQW0984-C8	62.90
.0995	#39	2.527 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA0995-C8	48.10
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF0995-C8	52.00
.0995	#39	2.527 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	CBG0995-C8	56.50
.0995	#39	2.527 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	ERY0995-C8	59.80
.0995	#39	2.527 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	DQW0995-C8	62.90
.1000		2.540 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA1000-C8	48.10
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF1000-C8	52.00
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	CBG1000-C8	56.50
.1000		2.540 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	DQW1000-C8	62.90
.1015	#38	2.578 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA1015-C8	48.10
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF1015-C8	52.00
.1015	#38	2.578 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	CBG1015-C8	56.50
.1015	#38	2.578 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	ERY1015-C8	59.80
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	DQW1015-C8	62.90
.1040	#37	2.641 mm	.492	<b>12.50 mm</b>	(3x)	4 mm	50 mm	AVA1040-C8	48.10
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BAF1040-C8	52.00
.1040	#37	2.641 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	CBG1040-C8	56.50
.1040	#37	2.641 mm	1.220	<b>31.00 mm</b>	(10x)	4 mm	75 mm	ERY1040-C8	59.80
.1040	#37	2.641 mm	1.417	<b>36.00 mm</b>	(12x)	4 mm	75 mm	DQW1040-C8	62.90
.1065	#36	2.705 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	AVA1065-C8	48.10
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BAF1065-C8	52.00
.1065	#36	2.705 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	CBG1065-C8	56.50
.1065	#36	2.705 mm	1.260	<b>32.00 mm</b>	(10x)	4 mm	75 mm	ERY1065-C8	59.80
.1065	#36	2.705 mm	1.457	<b>37.00 mm</b>	(12x)	4 mm	75 mm	DQW1065-C8	62.90
.1093 (7/64)		2.778 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	AVA1093-C8	48.10
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1093-C8	52.00
.1093 (7/64)		2.778 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	CBG1093-C8	56.50
.1093 (7/64)		2.778 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	ERY1093-C8	59.80
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	DQW1093-C8	62.90
.1100	#35	2.794 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	AVA1100-C8	48.10
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1100-C8	52.00
.1100	#35	2.794 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	CBG1100-C8	56.50
.1100	#35	2.794 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	ERY1100-C8	59.80

ALUMINUM ALLOYS

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# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys (cont.)

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ALUMINUM ALLOYS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth				
D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>			L <sub>2</sub> <sup>+25mm</sup> / <sub>-.00mm</sub>			D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.1100	#35	2.794 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	DQW1100-C8	62.90
.1110	#34	2.819 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	AVA1110-C8	48.10
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1110-C8	52.00
.1110	#34	2.819 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	CBG1110-C8	56.50
.1110	#34	2.819 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	ERY1110-C8	59.80
.1110	#34	2.819 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	DQW1110-C8	62.90
.1130	#33	2.870 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	AVA1130-C8	48.10
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1130-C8	52.00
.1130	#33	2.870 mm	1.102	<b>28.00 mm</b>	(8x)	4 mm	63 mm	CBG1130-C8	56.50
.1130	#33	2.870 mm	1.339	<b>34.00 mm</b>	(10x)	4 mm	75 mm	ERY1130-C8	59.80
.1130	#33	2.870 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	DQW1130-C8	62.90
.1160	#32	2.946 mm	.551	<b>14.00 mm</b>	(3x)	4 mm	50 mm	AVA1160-C8	48.10
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BAF1160-C8	52.00
.1160	#32	2.946 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	CBG1160-C8	56.50
.1160	#32	2.946 mm	1.575	<b>40.00 mm</b>	(12x)	4 mm	75 mm	DQW1160-C8	62.90
.1181		3.000 mm	.571	<b>14.50 mm</b>	(3x)	4 mm	50 mm	AVA1181-C8	49.10
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BAF1181-C8	53.40
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	CBG1181-C8	57.60
.1181		3.000 mm	1.378	<b>35.00 mm</b>	(10x)	4 mm	75 mm	ERY1181-C8	60.90
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	DQW1181-C8	64.10

D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>			L <sub>2</sub> <sup>+75mm</sup> / <sub>-.00mm</sub>			D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.1200	#31	3.048 mm	.571	<b>14.50 mm</b>	(3x)	6 mm	63 mm	AVA1200-C8	60.80
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BAF1200-C8	65.80
.1200	#31	3.048 mm	1.181	<b>30.00 mm</b>	(8x)	6 mm	75 mm	CBG1200-C8	69.10
.1200	#31	3.048 mm	1.654	<b>42.00 mm</b>	(12x)	6 mm	100 mm	DQW1200-C8	75.90
.1250 (1/8)		3.175 mm	.591	<b>15.00 mm</b>	(3x)	6 mm	63 mm	AVA1250-C8	60.80
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BAF1250-C8	65.80
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	CBG1250-C8	69.10
.1250 (1/8)		3.175 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	DQW1250-C8	75.90
.1260		3.200 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BAF1260-C8	65.80
.1260		3.200 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	CBG1260-C8	71.90
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BAF1285-C8	65.80
.1285	#30	3.263 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	DQW1285-C8	75.90
.1360	#29	3.454 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	AVA1360-C8	62.60
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BAF1360-C8	65.80
.1360	#29	3.454 mm	1.339	<b>34.00 mm</b>	(8x)	6 mm	75 mm	CBG1360-C8	69.10
.1360	#29	3.454 mm	1.575	<b>40.00 mm</b>	(10x)	6 mm	100 mm	ERY1360-C8	72.40
.1360	#29	3.454 mm	1.890	<b>48.00 mm</b>	(12x)	6 mm	100 mm	DQW1360-C8	75.90
.1405	#28	3.568 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BAF1405-C8	65.80
.1405	#28	3.568 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	DQW1405-C8	75.90
.1406 (9/64)		3.571 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	AVA1406-C8	60.80
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BAF1406-C8	65.80
.1406 (9/64)		3.571 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	CBG1406-C8	69.10
.1406 (9/64)		3.571 mm	1.654	<b>42.00 mm</b>	(10x)	6 mm	100 mm	ERY1406-C8	72.40
.1406 (9/64)		3.571 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	DQW1406-C8	75.90
.1440	#27	3.657 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BAF1440-C8	65.80
.1440	#27	3.657 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	DQW1440-C8	75.90

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## MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> <sup>+0.00mm</sup> -.013mm		L <sub>2</sub> <sup>+0.75mm</sup> -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.1470	#26	3.733 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	AVA1470-C8	60.80
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1470-C8	65.80
.1470	#26	3.733 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	CBG1470-C8	69.10
.1470	#26	3.733 mm	1.732	<b>44.00 mm</b>	(10x)	6 mm	100 mm	ERY1470-C8	72.40
.1470	#26	3.733 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	DQW1470-C8	75.90
.1495	#25	3.797 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1495-C8	65.80
.1495	#25	3.797 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	DQW1495-C8	75.90
.1520	#24	3.860 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1520-C8	65.80
.1520	#24	3.860 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1520-C8	75.90
.1540	#23	3.911 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1540-C8	65.80
.1540	#23	3.911 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1540-C8	75.90
.1562 (5/32)		3.968 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	AVA1562-C8	60.80
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1562-C8	65.80
.1562 (5/32)		3.968 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	CBG1562-C8	69.10
.1562 (5/32)		3.968 mm	1.811	<b>46.00 mm</b>	(10x)	6 mm	100 mm	ERY1562-C8	72.40
.1562 (5/32)		3.968 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1562-C8	75.90
.1570	#22	3.987 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1570-C8	65.80
.1570	#22	3.987 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	CBG1570-C8	69.10
.1570	#22	3.987 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1570-C8	75.90
.1574		4.000 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	AVA1574-C8	60.80
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1574-C8	65.80
.1574		4.000 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	CBG1574-C8	69.10
.1574		4.000 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	ERY1574-C8	72.40
.1574		4.000 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	DQW1574-C8	75.90
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	AVA1590-C8	60.80
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1590-C8	65.80
.1590	#21	4.038 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	CBG1590-C8	69.10
.1590	#21	4.038 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	ERY1590-C8	72.40
.1590	#21	4.038 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	DQW1590-C8	75.90
.1610	#20	4.089 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1610-C8	65.80
.1610	#20	4.089 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	DQW1610-C8	75.90
.1660	#19	4.216 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1660-C8	65.80
.1660	#19	4.216 mm	2.283	<b>58.00 mm</b>	(12x)	6 mm	100 mm	DQW1660-C8	75.90
.1695	#18	4.305 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1695-C8	65.80
.1695	#18	4.305 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	DQW1695-C8	75.90
.1718 (11/64)		4.365 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	AVA1718-C8	60.80
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1718-C8	65.80
.1718 (11/64)		4.365 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	CBG1718-C8	69.10
.1718 (11/64)		4.365 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	ERY1718-C8	72.40
.1718 (11/64)		4.365 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	DQW1718-C8	75.90
.1730	#17	4.394 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1730-C8	65.80
.1730	#17	4.394 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	DQW1730-C8	75.90
.1770	#16	4.495 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	AVA1770-C8	60.80
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1770-C8	65.80
.1770	#16	4.495 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	CBG1770-C8	69.10
.1770	#16	4.495 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	ERY1770-C8	72.40
.1770	#16	4.495 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	DQW1770-C8	75.90

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# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys (cont.)

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ALUMINUM ALLOYS

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>				D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.1800	#15	4.572 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	AVA1800-C8	60.80
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1800-C8	65.80
.1800	#15	4.572 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	CBG1800-C8	69.10
.1800	#15	4.572 mm	2.126	<b>54.00 mm</b>	(10x)	6 mm	100 mm	ERY1800-C8	72.40
.1800	#15	4.572 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	DQW1800-C8	75.90
.1820	#14	4.622 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1820-C8	65.80
.1820	#14	4.622 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	DQW1820-C8	75.90
.1850	#13	4.700 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1850-C8	65.80
.1850	#13	4.700 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	DQW1850-C8	75.90
.1875 (3/16)		4.762 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	AVA1875-C8	60.80
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1875-C8	65.80
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	CBG1875-C8	69.10
.1875 (3/16)		4.762 mm	2.205	<b>56.00 mm</b>	(10x)	6 mm	100 mm	ERY1875-C8	72.40
.1875 (3/16)		4.762 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	DQW1875-C8	75.90
.1890	#12	4.800 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1890-C8	65.80
.1890	#12	4.800 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	DQW1890-C8	75.90
.1910	#11	4.851 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1910-C8	65.80
.1910	#11	4.851 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	DQW1910-C8	75.90
.1935	#10	4.914 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1935-C8	65.80
.1935	#10	4.914 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	DQW1935-C8	75.90
.1960	#9	4.978 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1960-C8	65.80
.1960	#9	4.978 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	DQW1960-C8	75.90
.1968		5.000 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	AVA1968-C8	60.80
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1968-C8	65.80
.1968		5.000 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	CBG1968-C8	69.10
.1968		5.000 mm	2.283	<b>58.00 mm</b>	(10x)	6 mm	100 mm	ERY1968-C8	72.40
.1968		5.000 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	DQW1968-C8	75.90
.1990	#8	5.054 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1990-C8	65.80
.1990	#8	5.054 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	DQW1990-C8	75.90
.2009	#7	5.105 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	AVA2009-C8	60.80
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF2009-C8	65.80
.2009	#7	5.105 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	CBG2009-C8	69.10
.2009	#7	5.105 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	ERY2009-C8	72.40
.2009	#7	5.105 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	DQW2009-C8	75.90
.2031 (13/64)		5.159 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	AVA2031-C8	62.60
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF2031-C8	65.80
.2031 (13/64)		5.159 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	CBG2031-C8	69.10
.2031 (13/64)		5.159 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	ERY2031-C8	72.40
.2031 (13/64)		5.159 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	DQW2031-C8	75.90
.2040	#6	5.181 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF2040-C8	65.80
.2040	#6	5.181 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	DQW2040-C8	75.90
.2055	#5	5.219 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BAF2055-C8	65.80
.2055	#5	5.219 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	DQW2055-C8	75.90
.2090	#4	5.308 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BAF2090-C8	65.80
.2090	#4	5.308 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	DQW2090-C8	75.90
.2129	#3	5.410 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	AVA2129-C8	60.80
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BAF2129-C8	65.80
.2129	#3	5.410 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	CBG2129-C8	69.10
.2129	#3	5.410 mm	2.520	<b>64.00 mm</b>	(10x)	6 mm	125 mm	ERY2129-C8	72.40
.2129	#3	5.410 mm	2.913	<b>74.00 mm</b>	(12x)	6 mm	125 mm	DQW2129-C8	75.90

continued on next page



## MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys (cont.)

continued from previous page

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.75\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.2187 (7/32)		5.556 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	AVA2187-C8	60.80
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BAF2187-C8	65.80
.2187 (7/32)		5.556 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	CBG2187-C8	69.10
.2187 (7/32)		5.556 mm	2.598	<b>66.00 mm</b>	(10x)	6 mm	125 mm	ERY2187-C8	72.40
.2187 (7/32)		5.556 mm	2.992	<b>76.00 mm</b>	(12x)	6 mm	125 mm	DQW2187-C8	75.90
.2210	#2	5.613 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BAF2210-C8	65.80
.2210	#2	5.613 mm	3.071	<b>78.00 mm</b>	(12x)	6 mm	125 mm	DQW2210-C8	75.90
.2280	#1	5.791 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2280-C8	65.80
.2280	#1	5.791 mm	3.150	<b>80.00 mm</b>	(12x)	6 mm	125 mm	DQW2280-C8	75.90
.2340	A	5.943 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2340-C8	65.80
.2340	A	5.943 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	DQW2340-C8	75.90
.2343 (15/64)		5.953 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	AVA2343-C8	60.80
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2343-C8	65.80
.2343 (15/64)		5.953 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	CBG2343-C8	69.10
.2343 (15/64)		5.953 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	ERY2343-C8	72.40
.2343 (15/64)		5.953 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	DQW2343-C8	75.90
.2362		6.000 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	AVA2362-C8	60.80
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2362-C8	65.80
.2362		6.000 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	CBG2362-C8	69.10
.2362		6.000 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	ERY2362-C8	72.40
.2362		6.000 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	DQW2362-C8	75.90
.2380	B	6.045 mm	1.575	<b>40.00 mm</b>	(5x)	8 mm	100 mm	BAF2380-C8	68.00
.2380	B	6.045 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	DQW2380-C8	78.40
.2420	C	6.146 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BAF2420-C8	68.00
.2420	C	6.146 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	DQW2420-C8	78.40
.2460	D	6.248 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BAF2460-C8	68.00
.2460	D	6.248 mm	3.386	<b>86.00 mm</b>	(12x)	8 mm	150 mm	DQW2460-C8	78.40
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	AVA2500-C8	60.80
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BAF2500-C8	65.80
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	CBG2500-C8	69.10
.2500 (1/4)	E	6.350 mm	2.913	<b>74.00 mm</b>	(10x)	8 mm	125 mm	ERY2500-C8	72.40
.2500 (1/4)	E	6.350 mm	3.465	<b>88.00 mm</b>	(12x)	8 mm	150 mm	DQW2500-C8	75.90
.2510		6.375 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BAF2510-C8	74.70
.2570	F	6.528 mm	1.732	<b>44.00 mm</b>	(5x)	8 mm	100 mm	BAF2570-C8	74.70
.2812 (9/32)		7.142 mm	1.890	<b>48.00 mm</b>	(5x)	8 mm	100 mm	BAF2812-C8	74.70
.3125 (5/16)		7.937 mm	2.126	<b>54.00 mm</b>	(5x)	8 mm	100 mm	BAF3125-C8	74.70
.3150		8.000 mm	2.126	<b>54.00 mm</b>	(5x)	8 mm	100 mm	BAF3150-C8	74.70
.3750 (3/8)		9.525 mm	1.811	<b>46.00 mm</b>	(3x)	10 mm	100 mm	AVA3750-C8	118.10
.3750 (3/8)		9.525 mm	2.520	<b>64.00 mm</b>	(5x)	10 mm	125 mm	BAF3750-C8	128.20
.3770	V	9.575 mm	1.811	<b>46.00 mm</b>	(3x)	10 mm	100 mm	AVA3770-C8	118.10
.3770	V	9.575 mm	2.520	<b>64.00 mm</b>	(5x)	10 mm	125 mm	BAF3770-C8	128.20
.3937		10.000 mm	2.677	<b>68.00 mm</b>	(5x)	10 mm	125 mm	BAF3937-C8	128.20
.4375 (7/16)		11.112 mm	2.992	<b>76.00 mm</b>	(5x)	12 mm	125 mm	BAF4375-C8	162.80
.4724		12.000 mm	3.228	<b>82.00 mm</b>	(5x)	12 mm	125 mm	BAF4724-C8	162.80
.5000 (1/2)		12.700 mm	3.386	<b>86.00 mm</b>	(5x)	16 mm	150 mm	BAF5000-C8	286.30

ALUMINUM ALLOYS

PLEASE SEE SPEEDS &amp; FEEDS ON PAGE 450

# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys (cont.)

### SPEEDS & FEEDS (Miniature High Performance Drills – Aluminum Alloys)

**Important Note:** Values in table are in inches and are based on 3x and 5x drill lengths. For longer lengths, table values of IPR must be reduced (for 8x and 10x, reduce to 75%; for 12x, reduce to 65%). Pecking cycles are recommended to avoid chip packing and breakage. The initial peck depth should be 3-5x diameter with each subsequent peck at 2-3x diameter. For complete speeds and feeds charts, please go to [www.harveytool.com](http://www.harveytool.com).

ALUMINUM ALLOYS

Material (Hardness: ≤ 28 Rc)	SFM	Chip Load IPR (Inches Per Revolution) By Drill Diameter											
		.015	.031	.047	.062	.078	.093	.125	.187	.250	.375	.500	
<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	450												
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	600												
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	450												
Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	420												
Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	390	.00071	.00147	.00223	.00295	.00371	.00442	.00594	.00889	.01188	.00889	.02376	
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	350												
Wrought - 5%-8% Si (4xxx)	600												
Wrought - 8%-12% Si (4xxx)	480												
<b>Magnesium Alloys</b>	900	.00079	.00164	.00248	.00327	.00412	.00491	.00660	.00987	.01320	.01782	.02640	
<b>Zinc Alloys</b>	480												
<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxx)	170												
Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	375												
Phosphor Bronzes (Copper Tin alloys, C5xxxx)	170												
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	375	.00063	.00131	.00199	.00262	.00329	.00393	.00528	.00790	.01056	.01980	.02112	
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	375												
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	170												
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	400												
<b>Plastics:</b> Unfilled Plastics	500	.00079	.00164	.00248	.00327	.00412	.00491	.00660	.00987	.01320	.01584	.02640	
Reinforced Plastics	350	.00063	.00131	.00199	.00329	.00393	.00528	.00790	.01056	.01584	.02112	.02640	

### Check Out Our New CNC Show!

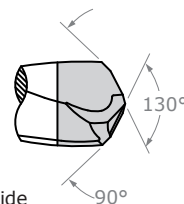


Join Harvey Performance Company National Applications Engineer Don Grandt as he dives into specific cutting tool topics, answering the questions machinists ask most, to help you accomplish more at the spindle.

[YOUTUBE.COM/INTHELOUPE TV](https://www.youtube.com/intheloupetv)

# MINIATURE HIGH PERFORMANCE DRILLS

## PCD Diamond – Double Angle



- PCD diamond brazed on entire end of solid carbide body allows for increased tool life over carbide
- Full PCD tip allows for positive cutting geometry
- Double angle point geometry for superior performance in preventing push-out and delamination in layered composites
- Recommended work piece material: aluminum, copper, brass, bronze, plastic, graphite, carbon, carbon fiber materials, green carbide, gold, silver, magnesium, zinc, green ceramics
- h6 shank tolerance for high precision tool holders

DRILL DIAMETER		FLUTE LENGTH		SHANK DIAMETER	OVERALL LENGTH	PCD DIAMOND	
inch	metric	inch	metric			2 FL	PRICE
	D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>		
.0937 (3/32)	2.381 mm	.630	<b>16.00 mm</b> (5x)	4 mm	63 mm	BCF0937	588.00
.1181	3.000 mm	.787	<b>20.00 mm</b> (5x)	4 mm	63 mm	BCF1181	588.00
	D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.75mm</sup> / <sub>-.00mm</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.1250 (1/8)	3.175 mm	.827	<b>21.00 mm</b> (5x)	6 mm	63 mm	BCF1250	540.90
.1299	3.300 mm	.866	<b>22.00 mm</b> (5x)	6 mm	63 mm	BCF1299	540.90
.1650	4.190 mm	1.102	<b>28.00 mm</b> (5x)	6 mm	75 mm	BCF1650	597.90
.1875 (3/16)	4.762 mm	1.260	<b>32.00 mm</b> (5x)	6 mm	75 mm	BCF1875	597.90
.1910	#11 4.851 mm	1.260	<b>32.00 mm</b> (5x)	6 mm	75 mm	BCF1910	597.90
.2500 (1/4)	E 6.350 mm	1.654	<b>42.00 mm</b> (5x)	8 mm	100 mm	BCF2500	688.40
.2510	6.375 mm	1.654	<b>42.00 mm</b> (5x)	8 mm	100 mm	BCF2510	688.40

For PCD End Mills, see pages 229 and 230.

### SPEEDS & FEEDS (Miniature High Performance Drills – PCD Diamond)

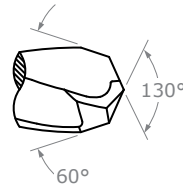
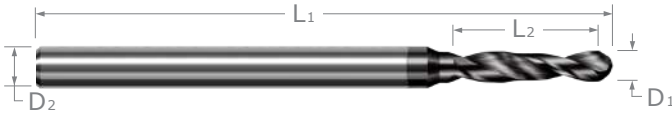
**Important Note:** Values in table are in inches and are based on 5x drill lengths. Since the melting point varies greatly from in plastics, the speed (RPM) used should be closely supervised. An additional reduction in RPM may be necessary to avoid excessive fraying, splitting and tear out of fibers. Pecking cycles are recommended to avoid chip packing and breakage. The initial peck depth should be 3-5x Diameter with each subsequent peck at 2-3x Diameter. For Metal Matrix Composites with aluminum, pecking should begin when part thickness is more than 1x Diameter and a feed reduction of 30%. For titanium, pecking should begin when part thickness is more than .5x Diameter and a feed reduction of 50% with a subsequent peck .5-1x Diameter. For complete speeds and feeds charts, please go to [www.harveytool.com](http://www.harveytool.com).

Material	Type	Hardness	SFM	Chip Load (IPR) By Drill Diameter				
				.078	.093	.125	.187	.250
<b>Unfilled Plastics</b> ETFE, FEP, HDPE, LDPE, PFA, Polyurethane, PTFE, Rulon, Teflon, UHMW	Unfilled	50 < 100 Rr, (55 < 85 Shore D)	800 - 1200	.0037	.0045	.0060	.0090	.0120
Acrylic, Acetal, Delrin, Lucite, Nylon 6, Nylon 6/6, PAI, PI, PEEK, Plexiglas, PS, PSU, Torlon 4203, Ultem 1000	Unfilled	100 > 150 Rr	500 - 800	.0041	.0049	.0066	.0099	.0132
<b>Filled Plastics</b> Vespel SP-3	Lubricant Filled (Oil, Moly, Graphite, Teflon, PTFE)	50 < 100 Rr, (55 < 85 Shore D)	800 - 1200	.0037	.0045	.0060	.0090	.0120
Nyol, Nylatron, Plavis MS, Torlon 4301	Lubricant Filled (Oil, Moly, Graphite, Teflon, PTFE)	100 > 150 Rr	500 - 800	.0041	.0049	.0066	.0099	.0132
	Carbon/Glass Filled 5% < 20%	100 > 150 Rr	400 - 600	.0041	.0049	.0066	.0099	.0132
	Carbon/Glass Filled 21% < 40%	100 > 150 Rr	350 - 500	.0034	.0040	.0054	.0081	.0108
<b>Fiber Reinforced Plastics</b> FR4, G10, G11	Carbon/Glass Fiber 5% < 20%	100 > 150 Rr	350 - 500	.0041	.0049	.0066	.0099	.0132
G30	Carbon/Glass Fiber 21% < 40%	100 > 150 Rr	200 - 300	.0034	.0040	.0054	.0081	.0108
<b>Metal Matrix Composites</b>	Aluminum/Composite Layered		320 - 500	.0041	.0049	.0066	.0099	.0132
	Titanium/Composite Layered		160 - 260	.0030	.0036	.0048	.0072	.0096
<b>Graphite</b> POCO 3			400 - 600	.0043	.0051	.0069	.0103	.0138
<b>Green Ceramic &amp; Green Carbide</b>			100 - 300	.0039	.0047	.0063	.0094	.0126

DIAMOND TOOLING

# MINIATURE HIGH PERFORMANCE DRILLS

## Composites – Double Angle



- Optimized for drilling layered composites with excellent performance in virgin plastics and other composite materials
- Double angle point geometry for superior performance in preventing push-out and delamination in layered composites
- Amorphous diamond coating for increased abrasion resistance
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA



Double Angle Point Geometry Prevents Delamination

COMPOSITES

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AMORPHOUS DIAMOND	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		$D_1 \begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		$L_2 \begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		$D_2$ (h6)	$L_1$		
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	DDA0312-C4	60.50
.0314		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	DDA0315-C4	60.50
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	DDA0320-C4	60.50
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	DDA0330-C4	60.50
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	DDA0350-C4	60.50
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	DDA0354-C4	60.50
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	DDA0360-C4	60.50
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	DDA0370-C4	60.50
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	DDA0380-C4	60.50
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	DDA0390-C4	60.50
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	DDA0393-C4	62.00
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	DDA0400-C4	62.00
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	DDA0410-C4	62.00
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	DDA0420-C4	62.00
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	DDA0430-C4	62.00
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	DDA0450-C4	62.00
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	DDA0465-C4	62.00
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	DDA0468-C4	62.00
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	DDA0492-C4	62.00
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	DDA0500-C4	62.00
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	DDA0520-C4	62.00
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	DDA0550-C4	62.00
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	DDA0590-C4	62.90
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	DDA0595-C4	62.90
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	DDA0600-C4	62.90
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	DDA0625-C4	62.90
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	DDA0635-C4	62.90
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	DDA0670-C4	62.90

continued on next page

**MINIATURE HIGH PERFORMANCE DRILLS**

Composites – Double Angle (cont.)

continued from previous page

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AMORPHOUS DIAMOND	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> <sup>+0.00mm</sup> -0.13mm		L <sub>2</sub> <sup>+0.25mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	DDA0700-C4	62.90
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	DDA0730-C4	62.90
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	DDA0760-C4	62.90
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	DDA0781-C4	62.90
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	DDA0785-C4	62.90
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	DDA0787-C4	64.00
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	DDA0800-C4	64.00
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	DDA0810-C4	64.00
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	DDA0820-C4	64.00
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	DDA0860-C4	64.00
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	DDA0890-C4	64.00
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	DDA0900-C4	64.00
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	DDA0935-C4	64.00
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	DDA0937-C4	64.00
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	AWS0937-C4	67.60
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	DDA0960-C4	64.00
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA0980-C4	64.00
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA0984-C4	64.50
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA0995-C4	64.50
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA1000-C4	64.50
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	AWS1000-C4	67.60
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA1015-C4	64.50
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	DDA1040-C4	64.50
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	DDA1065-C4	64.50
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1093-C4	64.50
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1100-C4	64.50
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1110-C4	64.50
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1130-C4	64.50
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	DDA1160-C4	64.50
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	DDA1181-C4	66.00
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	AWS1181-C4	69.60

		D <sub>1</sub> <sup>+0.00mm</sup> -0.13mm		L <sub>2</sub> <sup>+0.75mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	DDA1200-C4	78.10
.1250 (1/8)		3.175 mm	.590	<b>15.00 mm</b>	(3x)	6 mm	63 mm	BAA1250-C4	74.50
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	DDA1250-C4	78.10
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	AWS1250-C4	82.50
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	DDA1285-C4	78.10
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	DDA1360-C4	78.10
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	DDA1406-C4	78.10
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	DDA1470-C4	78.10
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	DDA1562-C4	78.10
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	DDA1574-C4	78.10
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	DDA1590-C4	78.10

COMPOSITES

continued on next page

# MINIATURE HIGH PERFORMANCE DRILLS

## Composites – Double Angle (cont.)

continued from previous page

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AMORPHOUS DIAMOND	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> -0.013mm		L <sub>2</sub> <sup>+0.75mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	DDA1718-C4	78.10
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	DDA1770-C4	78.10
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	DDA1800-C4	78.10
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	DDA1875-C4	78.10
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	AWS1875-C4	82.50
.1909		4.851 mm	.905	<b>23.00 mm</b>	(3x)	6 mm	63 mm	BAA1909-C4	74.50
.1909		4.851 mm	1.259	<b>32.00 mm</b>	(5x)	6 mm	75 mm	DDA1909-C4	78.10
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	DDA1968-C4	78.10
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	DDA2009-C4	78.10
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	DDA2031-C4	78.10
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	DDA2129-C4	78.10
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	DDA2187-C4	78.10
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	DDA2343-C4	78.10
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	DDA2362-C4	78.10
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	BAA2500-C4	74.50
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	DDA2500-C4	78.10
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	AWS2500-C4	82.50
.2570		6.528 mm	1.259	<b>32.00 mm</b>	(3x)	8 mm	75 mm	BAA2570-C4	101.70
.2812		7.142 mm	1.338	<b>34.00 mm</b>	(3x)	8 mm	75 mm	BAA2812-C4	101.70
.3125 (5/16)		7.937 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	BAA3125-C4	101.70
.3150		8.000 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	BAA3150-C4	101.70
.3750 (3/8)		9.525 mm	1.811	<b>46.00 mm</b>	(3x)	10 mm	100 mm	BAA3750-C4	133.00

COMPOSITES

NEW  
NEW

NEW  
NEW  
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NEW

### SPEEDS & FEEDS (Miniature High Performance Drills – Composites)

**Important Note:** Posted chiploads are for the double angle drills. For Brad point drills, reduce chiploads by approx. 10%. Since the melting point varies greatly from plastic to plastic, the speed (RPM) used should be closely supervised. An additional reduction in RPM may be necessary to avoid excessive fraying, splitting and tear out of fibers. Pecking cycles are recommended to avoid chip packing and breakage. The initial peck depth should be 3-5x Diameter with each subsequent peck at 2-3x Diameter. Look at our online speeds and feeds for more information. For complete speeds and feeds charts, please go to [www.harveytool.com](http://www.harveytool.com).

	Material Type	Type	Hardness	SFM	Chip Load Per Revolution (IPR) By Cutter Diameter									
					.015	.031	.047	.062	.078	.093	.125	.187	.250	.375
Unfilled Plastics	ETFE, FEP, HDPE, LDPE, PFA, Polyurethane, PTFE, Rulon, Teflon, UHMW	Unfilled	50 < 100 Rr, 55 < 85 Shore D	800-1200	.0006	.0013	.0020	.0027	.0034	.0040	.0054	.0081	.0108	.0162
	Acrylic, Acetal, Delrin, Lucite, Nylon 6, Nylon 6/6, PAI, PI, PEEK, Plexiglas, PS, PSU, Torlon 4203, Ultem 1000	Unfilled	100 > 150 Rr	500-800	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0089	.0119	.0178
Filled Plastics	Vespel SP-3	Lubricant Filled (Oil, Moly, Graphite, Teflon, PTFE)	50 < 100 Rr, 55 < 85 Shore D	800-1200	.0006	.0013	.0020	.0027	.0034	.0040	.0054	.0081	.0108	.0162
	Nyolil, Nylatron, Plavis MS, Torlon 4301	Lubricant Filled (Oil, Moly, Graphite, Teflon, PTFE)	100 > 150 Rr	500-800	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0089	.0119	.0178
		Carbon/Glass Filled 5% < 20%	100 > 150 Rr	400-600	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0089	.0119	.0178
	Carbon/Glass Filled 21% < 40%	100 > 150 Rr	350-500	.0006	.0012	.0018	.0024	.0030	.0036	.0049	.0073	.0097	.0146	
Fiber Reinforced	FR4, G10, G11	Carbon/Glass Fiber 5% < 20%	100 > 150 Rr	350-500	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0089	.0119	.0178
	G30	Carbon/Glass Fiber 21% < 40%	100 > 150 Rr	200-300	.0006	.0012	.0018	.0024	.0030	.0036	.0049	.0073	.0097	.0146



Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable from [Harveytool.com](http://Harveytool.com)

# MINIATURE HIGH PERFORMANCE DRILLS

Composites – Brad Point



Brad Point Prevents Fraying & Tear Out

- Optimized for drilling glass or carbon fiber filled and reinforced composites with excellent performance in other filled, layered, and woven composite materials
- Center and OD spur point geometry for accurate scoring action, prevents fraying, uncut fibers, and tear out
- Amorphous diamond coating for increased abrasion resistance
- h6 shank tolerance for high precision tool holders
- Solid carbide • CNC ground in the USA

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AMORPHOUS DIAMOND	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BSW0312-C4	52.10
.0315		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BSW0315-C4	52.10
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BSW0320-C4	52.10
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	BSW0330-C4	52.10
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BSW0350-C4	52.10
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BSW0354-C4	52.10
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	BSW0360-C4	52.10
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	BSW0370-C4	52.10
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BSW0380-C4	52.10
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BSW0390-C4	52.10
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BSW0393-C4	54.50
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BSW0400-C4	54.50
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	BSW0410-C4	54.50
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	BSW0420-C4	54.50
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	BSW0430-C4	54.50
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	BSW0450-C4	54.50
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BSW0465-C4	54.50
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BSW0468-C4	54.50
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BSW0492-C4	54.50
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BSW0500-C4	54.50
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	BSW0520-C4	54.50
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	BSW0550-C4	54.50
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BSW0590-C4	54.50
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BSW0595-C4	54.50
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BSW0600-C4	54.50
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BSW0625-C4	54.50
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	BSW0635-C4	54.50
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	BSW0670-C4	54.50
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	BSW0700-C4	54.50
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	BSW0730-C4	54.50
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	BSW0760-C4	54.50
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BSW0781-C4	54.50
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BSW0785-C4	54.50
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BSW0787-C4	56.70
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BSW0800-C4	56.70
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BSW0810-C4	56.70
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BSW0820-C4	56.70

COMPOSITES

continued on next page

# MINIATURE HIGH PERFORMANCE DRILLS

## Composites – Brad Point (cont.)

continued from previous page

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AMORPHOUS DIAMOND	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> +.000mm -.013mm		L <sub>2</sub> +.25mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BSW0860-C4	56.70
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BSW0890-C4	56.70
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BSW0900-C4	56.70
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BSW0935-C4	57.40
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BSW0937-C4	57.40
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BSW0960-C4	57.40
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW0980-C4	57.40
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW0984-C4	57.90
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW0995-C4	57.90
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW1000-C4	57.90
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW1015-C4	57.90
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BSW1040-C4	57.90
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BSW1065-C4	57.90
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1093-C4	57.90
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1100-C4	57.90
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1110-C4	57.90
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1130-C4	57.90
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BSW1160-C4	57.90
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BSW1181-C4	57.90

COMPOSITES

		D <sub>1</sub> +.000mm -.013mm		L <sub>2</sub> +.25mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BSW1200-C4	66.80
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BSW1250-C4	66.80
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BSW1285-C4	66.80
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BSW1360-C4	66.80
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BSW1406-C4	66.80
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BSW1470-C4	66.80
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BSW1562-C4	66.80
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BSW1574-C4	66.80
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BSW1590-C4	66.80
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BSW1718-C4	66.80
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BSW1770-C4	66.80
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BSW1800-C4	66.80
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BSW1875-C4	66.80
.1909		4.851 mm	1.259	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BSW1909-C4	66.80
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BSW1968-C4	66.80
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BSW2009-C4	66.80
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BSW2031-C4	66.80
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BSW2129-C4	66.80
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BSW2187-C4	66.80
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BSW2343-C4	66.80
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BSW2362-C4	66.80
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BSW2500-C4	66.80
.2570		6.528 mm	1.259	<b>32.00 mm</b>	(3x)	8 mm	75 mm	BSX2570-C4	102.20
.2812		7.142 mm	1.338	<b>34.00 mm</b>	(3x)	8 mm	75 mm	BSX2812-C4	111.60
.3125 (5/16)		7.937 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	BSX3125-C4	111.60
.3150		8.000 mm	1.496	<b>38.00 mm</b>	(3x)	8 mm	100 mm	BSX3150-C4	133.20
.3750 (3/8)		9.525 mm	1.811	<b>46.00 mm</b>	(3x)	10 mm	100 mm	BSX3750-C4	139.40

NEW

NEW

NEW

NEW

NEW

NEW

PLEASE SEE SPEEDS & FEEDS ON PAGE 454



# MINIATURE HIGH PERFORMANCE DRILLS

Flat Bottom



◀ Ideal for Inclined & Rounded Surfaces

- Flat bottom design (no point angle and no dish) allows for drilling on irregular surfaces and reduces burrs on break through
- Ideal for drilling on inclined and rounded surfaces, creating flat bottom holes, tilted drilling for angled holes, and drilling intersecting holes, half holes, shoulders, or thin plates
- h6 shank tolerance for high precision tool holders
- Solid carbide
- CNC ground in the USA



No Point Angle & No Dish Allows for Drilling on Irregular Surfaces

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiN COATED		TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
	D <sub>1</sub>	$\begin{matrix} +.000\text{mm} \\ -.013\text{mm} \end{matrix}$		L <sub>2</sub>	$\begin{matrix} +.25\text{mm} \\ -.00\text{mm} \end{matrix}$						
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	FBD0312-C3	48.70	FBD0312-C8	52.00
.0314		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	FBD0315-C3	48.70	FBD0315-C8	52.00
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	FBD0320-C3	48.70	FBD0320-C8	52.00
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	FBD0330-C3	48.70	FBD0330-C8	52.00
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	FBD0350-C3	48.70	FBD0350-C8	52.00
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	FBD0354-C3	48.70	FBD0354-C8	52.00
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	FBD0360-C3	48.70	FBD0360-C8	52.00
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	FBD0370-C3	48.70	FBD0370-C8	52.00
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	FBD0380-C3	48.70	FBD0380-C8	52.00
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	FBD0390-C3	48.70	FBD0390-C8	52.00
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	FBD0393-C3	53.40	FBD0393-C8	56.80
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	FBD0400-C3	53.40	FBD0400-C8	56.80
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	FBD0410-C3	53.40	FBD0410-C8	56.80
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	FBD0420-C3	53.40	FBD0420-C8	56.80
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	FBD0430-C3	53.40	FBD0430-C8	56.80
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	FBD0450-C3	53.40	FBD0450-C8	56.80
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	FBD0465-C3	53.40	FBD0465-C8	56.80
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	FBD0468-C3	53.40	FBD0468-C8	56.80
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	FBD0492-C3	53.40	FBD0492-C8	56.80
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	FBD0500-C3	53.40	FBD0500-C8	56.80
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	FBD0520-C3	53.40	FBD0520-C8	56.80
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	FBD0550-C3	53.40	FBD0550-C8	56.80
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	FBD0590-C3	57.40	FBD0590-C8	60.80
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	FBD0595-C3	57.40	FBD0595-C8	60.80
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	FBD0600-C3	57.40	FBD0600-C8	60.80
.0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	FBF0625-C3	54.50	FBF0625-C8	57.70
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	FBD0625-C3	57.40	FBD0625-C8	60.80
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	FBD0635-C3	57.40	FBD0635-C8	60.80
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	FBD0670-C3	57.40	FBD0670-C8	60.80
.0700	#50	1.778 mm	.334	<b>8.50 mm</b>	(3x)	3 mm	50 mm	FBF0700-C3	54.50	FBF0700-C8	57.70
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	FBD0700-C3	57.40	FBD0700-C8	60.80

FLAT BOTTOM

continued on next page

# MINIATURE HIGH PERFORMANCE DRILLS

## Flat Bottom (cont.)

continued from previous page

FLAT BOTTOM

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	TiN COATED		TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth						
D <sub>1</sub> $\begin{matrix} +.000\text{mm} \\ -.013\text{mm} \end{matrix}$			L <sub>2</sub> $\begin{matrix} +.25\text{mm} \\ -.00\text{mm} \end{matrix}$			D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	FBD0730-C3	57.40	FBD0730-C8	60.80
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	FBD0760-C3	57.40	FBD0760-C8	60.80
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	FBD0781-C3	57.40	FBD0781-C8	60.80
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	FBD0785-C3	57.40	FBD0785-C8	60.80
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	FBD0787-C3	62.00	FBD0787-C8	65.20
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	FBD0800-C3	62.00	FBD0800-C8	65.20
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	FBD0810-C3	62.00	FBD0810-C8	65.20
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	FBD0820-C3	62.00	FBD0820-C8	65.20
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	FBD0860-C3	62.00	FBD0860-C8	65.20
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	FBD0890-C3	62.00	FBD0890-C8	65.20
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	FBD0900-C3	62.00	FBD0900-C8	65.20
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	FBD0935-C3	62.00	FBD0935-C8	65.20
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	FBD0937-C3	62.00	FBD0937-C8	65.20
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	FBD0960-C3	62.00	FBD0960-C8	65.20
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD0980-C3	62.00	FBD0980-C8	65.20
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD0984-C3	65.70	FBD0984-C8	69.10
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD0995-C3	65.70	FBD0995-C8	69.10
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD1000-C3	65.70	FBD1000-C8	69.10
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD1015-C3	65.70	FBD1015-C8	69.10
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	FBD1040-C3	65.70	FBD1040-C8	69.10
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	FBD1065-C3	65.70	FBD1065-C8	69.10
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1093-C3	65.70	FBD1093-C8	69.10
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1100-C3	65.70	FBD1100-C8	69.10
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1110-C3	65.70	FBD1110-C8	69.10
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1130-C3	65.70	FBD1130-C8	69.10
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	FBD1160-C3	65.70	FBD1160-C8	69.10
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	FBD1181-C3	65.70	FBD1181-C8	69.10
D <sub>1</sub> $\begin{matrix} +.000\text{mm} \\ -.013\text{mm} \end{matrix}$			L <sub>2</sub> $\begin{matrix} +.75\text{mm} \\ -.00\text{mm} \end{matrix}$			D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.1200	#31	3.048 mm	.570	<b>14.50 mm</b>	(3x)	6 mm	63 mm	FBF1200-C3	70.20	FBF1200-C8	73.40
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	FBD1200-C3	73.60	FBD1200-C8	76.90
.1250 (1/8)		3.175 mm	.590	<b>15.00 mm</b>	(3x)	6 mm	63 mm	FBF1250-C3	70.20	FBF1250-C8	73.40
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	FBD1250-C3	73.60	FBD1250-C8	76.90
.1360	#29	3.454 mm	.629	<b>16.00 mm</b>	(3x)	6 mm	63 mm	FBF1360-C3	70.20	FBF1360-C8	73.40
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	FBD1360-C3	73.60	FBD1360-C8	76.90
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	FBD1406-C3	73.60	FBD1406-C8	76.90
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	FBD1470-C3	73.60	FBD1470-C8	76.90
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	FBD1562-C3	73.60	FBD1562-C8	76.90
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	FBD1574-C3	73.60	FBD1574-C8	76.90
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	75 mm	FBF1590-C3	70.20	FBF1590-C8	73.40
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	FBD1590-C3	73.60	FBD1590-C8	76.90
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	FBD1718-C3	73.60	FBD1718-C8	76.90
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	FBD1770-C3	73.60	FBD1770-C8	76.90
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	FBD1800-C3	73.60	FBD1800-C8	76.90
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	FBD1875-C3	73.60	FBD1875-C8	76.90
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	FBD1968-C3	73.60	FBD1968-C8	76.90
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	FBD2009-C3	73.60	FBD2009-C8	76.90

continued on next page

# MINIATURE HIGH PERFORMANCE DRILLS

Flat Bottom (cont.)

continued from previous page

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AITIN COATED		TiB <sub>2</sub> COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> -0.13mm		L <sub>2</sub> <sup>+0.75mm</sup> -0.00mm							
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	FBD2031-C3	73.60	FBD2031-C8	76.90
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	FBD2129-C3	73.60	FBD2129-C8	76.90
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	FBD2187-C3	73.60	FBD2187-C8	76.90
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	FBD2343-C3	73.60	FBD2343-C8	76.90
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	FBD2362-C3	73.60	FBD2362-C8	76.90
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	100 mm	FBF2500-C3	70.20	FBF2500-C8	73.40
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	FBD2500-C3	73.60	FBD2500-C8	76.90

## SPEEDS & FEEDS (Miniature High Performance Drills – Flat Bottom)

**Important Note:** Values in table are for a fully enclosed tool that is 1x diameter into the workpiece. A starting hole is required on a flat surface. For drilling on inclined or rounded surfaces please refer to the complete speeds and feeds chart available online at [www.harveytool.com](http://www.harveytool.com). Values in table are also based on a material hardness of 29-37 Rc for Ferrous Materials and up to 28 Rc for Non-Ferrous Materials. For higher hardness materials, table values of IPR must be reduced. For Ferrous materials at 38-45 Rc reduce IPR to 80% of the chart value. Pecking cycles are recommended to avoid chip packing and breakage. Initial Peck must fully submerge the drill point into the material. Do not use a pecking cycle for half-hole drilling or any situation where the drill is not fully enclosed in the material during the drilling operation. For steels at 29-37 Rc, an initial peck should be 2-3x Diameter, and each subsequent peck should be 1-2x Diameter. For harder steels at 38-45 Rc, 1-2x Diameter is recommended for an initial peck, and each subsequent peck should be .5-1x Diameter. For Non-Ferrous Materials, an initial peck should be 3-5x Diameter, and each subsequent peck should be 2-3x Diameter.

Coating	Material	SFM	Chip Load IPR (Inches Per Revolution) By Drill Diameter								
			.015	.031	.047	.062	.078	.093	.125	.187	.250
AITN Hardness: 29-37 Rc (279-344 HBn)	<b>Carbon Steels</b> Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	240	.00063	.00130	.00197	.00260	.00328	.00391	.00525	.00785	.01050
	1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx	150	.00058	.00119	.00180	.00238	.00300	.00357	.00480	.00718	.00960
	<b>Stainless Steels</b> 203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	180	.00063	.00130	.00197	.00260	.00328	.00391	.00525	.00785	.01050
	201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 420, 429, 430, 434, 436, 442, 446, 501, 502	150	.00058	.00119	.00180	.00238	.00300	.00357	.00480	.00718	.00960
	414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	125	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600
	<b>Tool Steels</b> A, L, O, P, W series	125	.00058	.00119	.00180	.00238	.00300	.00357	.00480	.00718	.00960
	D, H, M, T, S series	90	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600
	<b>Titanium Alloys</b>	100	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600
	<b>High Temp Alloys</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy	70	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600
	TiB <sub>2</sub> Hardness: ≤ 28 Rc (≤ 271 HBn)	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	450	.00065	.00134	.00203	.00268	.00337	.00402	.00540	.00808
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)		600									
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		450									
Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		420									
Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		390									
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		350									
Wrought - 5%-8% Si (4xxx)		600									
Wrought - 8%-12% Si (4xxx)		480									
<b>Magnesium Alloys</b>		900									
<b>Zinc Alloys</b>		480									
<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxx)		170									
Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)		375									
Phosphor Bronzes (Copper Tin alloys, C5xxxx)		170									
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)		375									
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)		375									
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)		170									
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)		400									
<b>Plastics:</b> Unfilled Plastics	500										
Reinforced Plastics	350										

FLAT BOTTOM

# MINIATURE HIGH PERFORMANCE DRILLS

## Deep Hole – Coolant-Through



Available in  
 ◀ 12x & 20x Flute  
 Lengths!

- Drill up to 20x diameter in depth
- Coolant through design for improved chip removal and heat reduction at the drill tip
- 140° point angle
- Specialized flute shape for improved chip evacuation and maximum rigidity
- h6 shank tolerance for high precision tool holders
- AlTiN coated for improved lubricity and heat resistance
- CNC ground in Germany
- Solid carbide



Coolant Through Design for Improved Chip Removal

COOLANT-THROUGH

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0520	#55	1.320 mm	.709	<b>18.00 mm</b>	(12x)	3 mm	63 mm	ACD0520-C3	191.40
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	ACD0550-C3	191.40
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	ACD0590-C3	191.40
.0590		1.500 mm	1.280	<b>32.50 mm</b>	(20x)	3 mm	75 mm	CXZ0590-C3	233.20
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	ACD0595-C3	191.40
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	ACD0625-C3	191.40
.0625 (1/16)		1.587 mm	1.358	<b>34.50 mm</b>	(20x)	3 mm	75 mm	CXZ0625-C3	233.20
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	ACD0700-C3	191.40
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	ACD0781-C3	191.40
.0781 (5/64)		1.984 mm	1.693	<b>43.00 mm</b>	(20x)	3 mm	100 mm	CXZ0781-C3	233.20
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	ACD0787-C3	198.20
.0787		2.000 mm	1.732	<b>44.00 mm</b>	(20x)	4 mm	100 mm	CXZ0787-C3	258.60
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	ACD0890-C3	198.20
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	ACD0937-C3	198.20
.0937 (3/32)		2.381 mm	2.047	<b>52.00 mm</b>	(20x)	4 mm	100 mm	CXZ0937-C3	258.60
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	ACD1015-C3	198.20
.1065	#36	2.705 mm	1.457	<b>37.00 mm</b>	(12x)	4 mm	75 mm	ACD1065-C3	198.20
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	ACD1093-C3	198.20
.1093 (7/64)		2.778 mm	2.362	<b>60.00 mm</b>	(20x)	4 mm	100 mm	CXZ1093-C3	258.60
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	ACD1181-C3	198.20
.1181		3.000 mm	2.559	<b>65.00 mm</b>	(20x)	4 mm	100 mm	CXZ1181-C3	258.60

**PLEASE SEE SPEEDS & FEEDS ON PAGE 461**

# MINIATURE HIGH PERFORMANCE DRILLS

## Deep Hole – Coolant-Through (cont.)

### SPEEDS & FEEDS (Miniature High Performance Drills – Deep Hole)

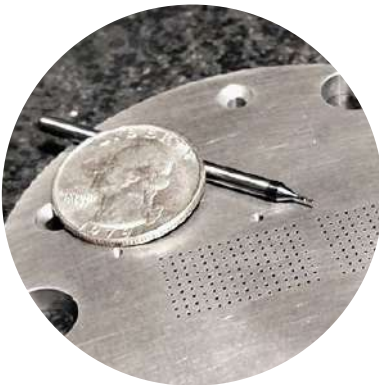
**Important Note:** Values in table are in inches and are based on 12x length drills and a material hardness of 29-37 Rc. For longer lengths and higher hardness materials, table values of IPR must be reduced (for 20x, reduce to 75%). For ferrous materials at 38-45 Rc, reduce IPR to 80%. For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

Material (Hardness: 29-37 Rc)	SFM	Chip Load IPR (Inches Per Revolution) By Drill Diameter							
		.031	.047	.062	.078	.093	.125	.187	.250
<b>Carbon Steels</b> Free Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	240	.00110	.00167	.00220	.00277	.00330	.00444	.00664	.00887
1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx	150	.00101	.00153	.00201	.00253	.00302	.00406	.00607	.00811
<b>Stainless Steels</b> 203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	180	.00110	.00167	.00220	.00277	.00330	.00444	.00664	.00887
201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 420, 429, 430, 434, 436, 442, 446, 501, 502	150	.00101	.00153	.00201	.00253	.00302	.00406	.00607	.00811
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	125	.00063	.00095	.00126	.00158	.00189	.00254	.00379	.00507
<b>Tool Steels</b> A, L, O, P, W series	125	.00101	.00153	.00201	.00253	.00302	.00406	.00607	.00811
D, H, M, T, S series	90	.00063	.00095	.00126	.00158	.00189	.00254	.00379	.00507
<b>Titanium Alloys</b>	100	.00063	.00095	.00126	.00158	.00189	.00254	.00379	.00507
<b>High Temp Alloys</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	70	.00063	.00095	.00126	.00158	.00189	.00254	.00379	.00507

### Deep Hole Drilling Guidelines

For best results, the following steps are recommended:

- For hole depths of 12x Diameter or greater, drill a pilot hole up to 1.5x D in depth using a drill with 3x LOF or shorter.
- Insert primary drill at low speed (~500 rpm) and start coolant flow.
- Increase speed and feed to recommended parameters.
- Under optimal conditions, it is possible to feed to full hole depth without pecking. If necessary, use 2-4 pecks to get to full hole depth.
- After reaching desired hole depth, reduce speed (~500 RPM) before retracting the drill.
- Cutting oil is recommended. As an alternative, it is possible to use emulsions with EP additives. Use a fine mesh prefilter (=5µm) on spindle through coolant to prevent a blockage of the coolant hole. A minimum coolant pressure of 600-800 PSI is recommended.

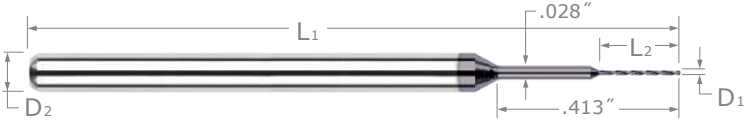


### Selecting the Right Harvey Tool Miniature Drill

With so many different types of miniature drills to choose from, it can be tough to identify the right solution for your specific job. Learn how to choose right the first time in our "In the Loupe" blog post **Selecting the Right Miniature Drill**.

[Read more on harveyperformance.com/in-the-loupe/](http://www.harveyperformance.com/in-the-loupe/)

# MINIATURE DRILLS



Miniature Drills Down to .002"

- For tools .020" and smaller, there is an intermediate neck diameter as pictured above
- 130° drill point
- Carbide
- CNC ground in Germany

MINIATURE DRILLS

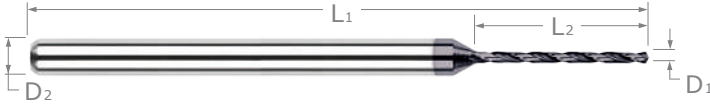
DRILL DIAMETER inch wire metric	FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
D1 <sup>+ .0000"</sup> / <sub>- .0003"</sub> *	L2	D2	L1						
.0020	.014	1/8	1-1/2	810020**	39.30				
.0020	.028	1/8	1-1/2	20020	39.30				
.0039 #102	.026	1/8	1-1/2	810039**	27.90				
.0039 #102	.039	1/8	1-1/2	20039	27.90				
.0051 #99	.034	1/8	1-1/2	810051**	26.90				
.0051 #99	.056	1/8	1-1/2	20051	27.20				
.0059 #97	.040	1/8	1-1/2	810059**	25.10				
.0059 #97	.066	1/8	1-1/2	20059	25.10				
.0063 #96	.042	1/8	1-1/2	810063	25.10				
.0063 #96	.066	1/8	1-1/2	20063	25.10				
.0067 #95	.066	1/8	1-1/2	20067	25.10				
.0069 .175 mm	.066	1/8	1-1/2	20069	25.10				
.0071 #94	.106	1/8	1-1/2	20071	22.80				
.0075 #93	.106	1/8	1-1/2	20075	22.80				
.0079 #92 .200 mm	.054	1/8	1-1/2	810079**	19.10	810079-C3**	24.30		
.0079 #92 .200 mm	.160	1/8	1-1/2	20079	19.10	20079-C3	24.30	20079-C4	32.20 NEW
.0083 #91	.160	1/8	1-1/2	20083	19.10	20083-C3	24.30		
.0087 #90	.126	1/8	1-1/2	20087	19.10	20087-C3	24.30		
.0089 .225 mm	.160	1/8	1-1/2	20089	19.10	20089-C3	24.30		
.0091 #89	.160	1/8	1-1/2	20091	18.70	20091-C3	23.90		
.0095 #88	.064	1/8	1-1/2	810095**	18.70	810095-C3**	23.90		
.0095 #88	.160	1/8	1-1/2	20095	18.70	20095-C3	23.90		
.0098 .250 mm	.066	1/8	1-1/2	810098**	18.70	810098-C3**	23.90		
.0098 .250 mm	.160	1/8	1-1/2	20098	18.70	20098-C3	23.90		
.0100 #87	.068	1/8	1-1/2	810100**	18.70	810100-C3**	23.90		
.0100 #87	.160	1/8	1-1/2	20100	18.70	20100-C3	23.90	20100-C4	31.80 NEW
.0105 #86	.160	1/8	1-1/2	20105	18.70	20105-C3	23.90		
.0108 .275 mm	.160	1/8	1-1/2	20108	18.70	20108-C3	23.90		
.0110 #85	.160	1/8	1-1/2	20110	18.70	20110-C3	23.90	20110-C4	31.80
.0115 #84	.180	1/8	1-1/2	20115	18.70	20115-C3	23.90		
.0118 .300 mm	.180	1/8	1-1/2	20118	18.70	20118-C3	23.90		

\* Tolerance for all AITIN coating is +.0002"/-.0003". \*\* Total overhang from shank transition is .250"

continued on next page

**MINIATURE DRILLS**

(cont.)



continued from previous page

	DRILL DIAMETER			FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AlTiN COATED		AMORPHOUS DIAMOND	
	inch	wire	metric				2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
	D <sub>1</sub> <sup>+ .0009"</sup> <sub>- .0003"</sub> *			L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
NEW	.0120	#83		.080	1/8	1-1/2	810120**	16.80	810120-C3**	22.00		
	.0120	#83		.230	1/8	1-1/2	20120	16.80	20120-C3	22.00	20120-C4	29.90
	.0125	#82		.230	1/8	1-1/2	20125	16.80	20125-C3	22.00		
NEW	.0130	#81		.230	1/8	1-1/2	20130	16.80	20130-C3	22.00	20130-C4	29.90
	.0135	#80		.270	1/8	1-1/2	20135	16.40	20135-C3	21.60		
	.0138		.350 mm	.270	1/8	1-1/2	20138	16.40	20138-C3	21.60		
	.0145	#79		.100	1/8	1-1/2	810145**	16.40	810145-C3**	21.60		
	.0145	#79		.270	1/8	1-1/2	20145	16.40	20145-C3	21.60	20145-C4	29.50
	.0157		.400 mm	.105	1/8	1-1/2	810157**	16.40	810157-C3**	21.60		
	.0157		.400 mm	.270	1/8	1-1/2	20157	16.40	20157-C3	21.60		
NEW	.0160	#78		.270	1/8	1-1/2	20160	16.40	20160-C3	21.60	20160-C4	29.50
	.0168			.270	1/8	1-1/2	20168	16.40	20168-C3	21.60		
	.0177		.450 mm	.270	1/8	1-1/2	20177	16.40	20177-C3	21.60		
	.0180	#77		.120	1/8	1-1/2	810180**	15.30	810180-C3**	20.50		
NEW	.0180	#77		.270	1/8	1-1/2	20180	15.30	20180-C3	20.50	20180-C4	28.40
	.0197		.500 mm	.275	1/8	1-1/2	20197	15.30	20197-C3	20.50		
	.0200	#76		.135	1/8	1-1/2	810200**	15.30	810200-C3**	20.50		
	.0200	#76		.275	1/8	1-1/2	20200	15.30	20200-C3	20.50	20200-C4	28.40
NEW	.0210	#75		.275	1/8	1-1/2	20205	15.30	20205-C3	20.50	20205-C4	28.40
	.0225	#74		.150	1/8	1-1/2	810210	15.30	810210-C3	20.50		
	.0225	#74		.275	1/8	1-1/2	20210	15.30	20210-C3	20.50		
	.0236		.600 mm	.275	1/8	1-1/2	20214	15.30	20214-C3	20.50		
	.0240	#73		.275	1/8	1-1/2	20215	15.30	20215-C3	20.50		
	.0250	#72		.170	1/8	1-1/2	810220	15.30	810220-C3	20.50		
NEW	.0250	#72		.275	1/8	1-1/2	20220	15.30	20220-C3	20.50	20220-C4	28.40
	.0260	#71		.275	1/8	1-1/2	20225	15.30	20225-C3	20.50		
	.0276		.700 mm	.335	1/8	1-1/2	20229	15.30	20229-C3	20.50		
	.0280	#70		.335	1/8	1-1/2	20230	15.30	20230-C3	20.50		
NEW	.0292	#69		.335	1/8	1-1/2	20235	15.30	20235-C3	20.50	20235-C4	28.40
	.0302			.395	1/8	1-1/2	20240	15.30	20240-C3	20.50		
	.0310	#68		.210	1/8	1-1/2	810245	14.30	810245-C3	19.50		
NEW	.0310	#68		.395	1/8	1-1/2	20245	14.30	20245-C3	19.50	20245-C4	27.40
	.0312 (1/32)			.210	1/8	1-1/2	810250	14.30	810250-C3	19.50		
	.0312 (1/32)			.395	1/8	1-1/2	20250	14.30	20250-C3	19.50	20250-C4	27.40
	.0315		.800 mm	.395	1/8	1-1/2	20253	14.30	20253-C3	19.50		
NEW	.0320	#67		.395	1/8	1-1/2	20255	14.30	20255-C3	19.50	20255-C4	27.40

\* Tolerance for all AlTiN coating is +.0002"/-.0003". \*\* Total overhang from shank transition is .250"

continued on next page

MINIATURE DRILLS

# MINIATURE DRILLS

(cont.)

continued from previous page

DRILL DIAMETER inch wire metric	FLUTE LENGTH L <sub>2</sub>	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		A TiN COATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.0000"</sup> / <sub>-0.0003"</sub> *	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
.0330 #66	.395	1/8	1-1/2	20260	14.30	20260-C3	19.50		
.0350 #65	.395	1/8	1-1/2	20265	14.30	20265-C3	19.50	20265-C4	27.40
.0354 .900 mm	.395	1/8	1-1/2	20267	14.30	20267-C3	19.50		
.0360 #64	.395	1/8	1-1/2	20270	14.30	20270-C3	19.50		
.0370 #63	.395	1/8	1-1/2	20275	14.30	20275-C3	19.50		
.0380 #62	.395	1/8	1-1/2	20280	14.30	20280-C3	19.50		
.0390 #61	.395	1/8	1-1/2	20285	14.30	20285-C3	19.50		
.0394 1.000 mm	.395	1/8	1-1/2	20290	14.30	20290-C3	19.50	20290-C4	27.40
.0400 #60	.395	1/8	1-1/2	20295	14.30	20295-C3	19.50		
.0410 #59	.395	1/8	1-1/2	20300	14.30	20300-C3	19.50		
.0420 #58	.395	1/8	1-1/2	20305	14.30	20305-C3	19.50		
.0430 #57	.395	1/8	1-1/2	20310	14.30	20310-C3	19.50		
.0433 1.100 mm	.395	1/8	1-1/2	20311	14.30	20311-C3	19.50		
.0440	.395	1/8	1-1/2	20315	14.30	20315-C3	19.50		
.0465 #56	.395	1/8	1-1/2	20320	14.30	20320-C3	19.50		
.0469 (3/64)	.395	1/8	1-1/2	20325	14.30	20325-C3	19.50		
.0472 1.200 mm	.395	1/8	1-1/2	20327	14.30	20327-C3	19.50		
.0492 1.250 mm	.395	1/8	1-1/2	20330	14.30	20330-C3	19.50		
.0500 1.270 mm	.395	1/8	1-1/2	20332	14.30	20332-C3	19.50		
.0512 1.300 mm	.413	1/8	1-1/2	20335	14.30	20335-C3	19.50		
.0520 #55	.413	1/8	1-1/2	20340	14.30	20340-C3	19.50		
.0520 #55	.500	1/8	1-1/2	815340	14.30	815340-C3	19.50		
.0531 1.350 mm	.413	1/8	1-1/2	20345	14.30	20345-C3	19.50		
.0550 #54	.413	1/8	1-1/2	20350	14.30	20350-C3	19.50	20350-C4	27.40
.0550 #54	.525	1/8	1-1/2	815350	14.30	815350-C3	19.50		
.0571 1.450 mm	.413	1/8	1-1/2	20355	14.30	20355-C3	19.50		
.0591 1.500 mm	.413	1/8	1-1/2	20360	14.30	20360-C3	19.50		
.0595 #53	.413	1/8	1-1/2	20365	14.30	20365-C3	19.50		
.0595 #53	.575	1/8	2	815365	15.10	815365-C3	20.30		
.0610 1.550 mm	.413	1/8	1-1/2	20370	14.30	20370-C3	19.50		
.0625 (1/16)	.413	1/8	1-1/2	20375	14.30	20375-C3	19.50	20375-C4	27.40
.0625 (1/16)	.600	1/8	2	815375	15.10	815375-C3	20.30		
D <sub>1</sub> <sup>+0.0000"</sup> / <sub>-0.0005"</sub> ***	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
.0630 1.600 mm	.413	1/8	1-1/2	20376	14.30	20376-C3	19.50		
.0635 #52	.413	1/8	1-1/2	20377	14.30	20377-C3	19.50		
.0635 #52	.600	1/8	2	815377	15.10	815377-C3	20.30		
.0670 #51	.413	1/8	1-1/2	20384	14.30	20384-C3	19.50		
.0670 #51	.650	1/8	2	815384	15.10	815384-C3	20.30		

MINIATURE DRILLS

NEW

NEW

\* Tolerance for all A TiN coating is +.0002"/-.0003". \*\*\* Tolerance for A TiN coating is +.0002"/-.0005".

continued on next page



**MINIATURE DRILLS**

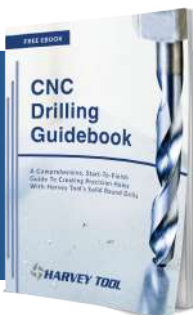
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DRILL DIAMETER			FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
inch	wire	metric				2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> +.0000" *** -.0005"			L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>						
.0700	#50		.413	1/8	1-1/2	20390	14.30	20390-C3	19.50		
.0700	#50		.700	1/8	2	815390	15.10	815390-C3	20.30		
.0730	#49		.413	1/8	1-1/2	20396	14.30	20396-C3	19.50		
.0760	#48		.413	1/8	1-1/2	20402	14.30	20402-C3	19.50		
.0760	#48		.750	1/8	2	815402	15.10	815402-C3	20.30		
.0781 (5/64)			.413	1/8	1-1/2	20407	14.30	20407-C3	19.50		
.0781 (5/64)			.750	1/8	2	815407	15.10	815407-C3	20.30		
.0785	#47		.413	1/8	1-1/2	20408	14.30	20408-C3	19.50		
.0787		2.000 mm	.413	1/8	1-1/2	20409	14.30	20409-C3	19.50		
.0810	#46		.413	1/8	1-1/2	20414	14.30	20414-C3	19.50		
.0810	#46		.800	1/8	2	815414	15.10	815414-C3	20.30		
.0820	#45		.413	1/8	1-1/2	20416	14.30	20416-C3	19.50		
.0860	#44		.413	1/8	1-1/2	20424	14.30	20424-C3	19.50		
.0890	#43		.413	1/8	1-1/2	20430	14.30	20430-C3	19.50		
.0890	#43		.850	1/8	2	815430	15.10	815430-C3	20.30		
.0935	#42		.413	1/8	1-1/2	20439	14.30	20439-C3	19.50		
.0938 (3/32)			.413	1/8	1-1/2	20440	14.30	20440-C3	19.50		
.0938 (3/32)			.900	1/8	2	815440	15.10	815440-C3	20.30		
.0960	#41		.413	1/8	1-1/2	20445	14.30	20445-C3	19.50		
.0980	#40		.413	1/8	1-1/2	20449	14.30	20449-C3	19.50		
.0984		2.500 mm	.413	1/8	1-1/2	20450	14.30	20450-C3	19.50		
.0995	#39		.413	1/8	1-1/2	20453	14.30	20453-C3	19.50		
.1015	#38		.413	1/8	1-1/2	20457	14.30	20457-C3	19.50		
.1040	#37		.413	1/8	1-1/2	20462	14.30	20462-C3	19.50		
.1065	#36		.413	1/8	1-1/2	20467	14.30	20467-C3	19.50		
.1094 (7/64)			.413	1/8	1-1/2	20473	14.30	20473-C3	19.50		
.1094 (7/64)			1.100	1/8	2-1/2	815473	15.10	815473-C3	20.30		
.1100	#35		.413	1/8	1-1/2	20475	14.30	20475-C3	19.50		
.1110	#34		.413	1/8	1-1/2	20477	14.30	20477-C3	19.50		
.1130	#33		.413	1/8	1-1/2	20481	14.30	20481-C3	19.50		
.1160	#32		.413	1/8	1-1/2	20487	14.30	20487-C3	19.50		
.1181		3.000 mm	.413	1/8	1-1/2	20491	14.30	20491-C3	19.50		
.1200	#31		.413	1/8	1-1/2	20493	14.30	20493-C3	19.50		
.1250 (1/8)			.413	1/8	1-1/2	20498	14.30	20498-C3	19.50		
.1250 (1/8)			1.200	1/8	2-1/2	815498	15.10	815498-C3	20.30		

\*\*\* Tolerance for AITIN coating is +.0002"/-.0005".

MINIATURE DRILLS



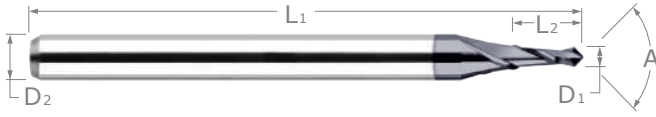
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# MINIATURE DRILLS

## Spotting Drills



Stocked in 10 Included Angles


- Thinned web to reduce walking
- Self-centering point geometry
- 2 flutes
- Solid carbide
- CNC ground in the USA

INCLUDED ANGLE	DRILL DIAMETER	FLUTE LENGTH	WEB THICKNESS	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							2 FL	PRICE	2 FL	PRICE
A <sup>+1°</sup> <sub>-1°</sub>	D <sub>1</sub>	L <sub>2</sub>			D <sub>2</sub>	L <sub>1</sub>				
60°	.020	.060 (3x)	.0020	I	1/8	1-1/2	932720	31.10	932720-C3	36.30
	.030	.090 (3x)	.0030	I	1/8	1-1/2	932730	30.40	932730-C3	35.60
	.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	932731	30.40	932731-C3	35.60
	.045	.135 (3x)	.0030	I	1/8	1-1/2	932745	26.30	932745-C3	31.50
	.060	.180 (3x)	.0050	I	1/8	1-1/2	932760	30.40	932760-C3	35.60
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	932762	30.40	932762-C3	35.60
	.090	.270 (3x)	.0050	I	1/8	1-1/2	932790	30.40	932790-C3	35.60
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	932793	30.40	932793-C3	35.60
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	932808	30.40	932808-C3	35.60
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	932811	30.40	932811-C3	35.60
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	932812	27.20	932812-C3	32.80
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	932816	32.90	932816-C3	40.50
.375 (3/8)	1.000 (3x)	.0270	II	3/8	2-1/2	932824	58.20	932824-C3	68.30	
82°	.010	.030 (3x)	.0015	I	1/8	1-1/2	983110	37.40	983110-C3	42.60
	.020	.060 (3x)	.0020	I	1/8	1-1/2	983120	32.00	983120-C3	37.20
	.030	.090 (3x)	.0030	I	1/8	1-1/2	983130	29.30	983130-C3	34.50
	.045	.135 (3x)	.0030	I	1/8	1-1/2	983145	26.30	983145-C3	31.50
	.060	.180 (3x)	.0050	I	1/8	1-1/2	983160	26.00	983160-C3	31.20
	.090	.270 (3x)	.0050	I	1/8	1-1/2	983190	24.90	983190-C3	30.10
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	983208	23.50	983208-C3	28.70
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	965208	23.50	965208-C3	28.70
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	965212	27.20	965212-C3	32.80
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	965216	34.30	965216-C3	41.90	
90°	.008	.024 (3x)	.0015	I	1/8	1-1/2	11408	44.20	11408-C3	49.40
	.010	.030 (3x)	.0015	I	1/8	1-1/2	11410	35.20	11410-C3	40.40
	.010	.030 (3x)	.0015	I	1/8	3	987910	43.40	987910-C3	48.60
	.012	.036 (3x)	.0015	I	1/8	1-1/2	11412	44.20	11412-C3	49.40
	.015 (1/64)	.045 (3x)	.0015	I	1/8	1-1/2	11415	35.20	11415-C3	40.40
	.020	.030 (1.5x)	.0020	I	1/8	1-1/2	816020	30.40	816020-C3	35.60
	.020	.060 (3x)	.0020	I	1/8	1-1/2	11420	30.40	11420-C3	35.60
	.020	.060 (3x)	.0020	I	1/8	3	987920	37.40	987920-C3	42.60
	.025	.075 (3x)	.0020	I	1/8	1-1/2	11425	30.40	11425-C3	35.60
	.030	.045 (1.5x)	.0030	I	1/8	1-1/2	816030	28.10	816030-C3	35.40
	.030	.090 (3x)	.0030	I	1/8	1-1/2	11430	28.10	11430-C3	33.30
	.030	.090 (3x)	.0030	I	1/8	3	987930	36.50	987930-C3	41.70
	.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	11431	28.10	11431-C3	33.30
	.035	.105 (3x)	.0030	I	1/8	1-1/2	11435	28.10	11435-C3	33.30
.039 (1 mm)	.117 (3x)	.0030	I	1/8	1-1/2	11439	28.10	11439-C3	33.30	

NEW

SPOTTING DRILLS


continued on next page



**TYPE I**

On center design reduces walking and minimizes flat at bottom of spot. Ideally suited for starting smaller diameter drills and shallow spots.

End View



**TYPE II**

Ahead of center design improves tip strength. Ideally suited for larger diameter drills and tougher materials.

End View

**MINIATURE DRILLS**

**Spotting Drills (cont.)**

continued from previous page

INCLUDED ANGLE	DRILL DIAMETER	FLUTE LENGTH	WEB THICKNESS	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							2 FL	PRICE	2 FL	PRICE
90°	A <sub>-1°</sub> <sup>+1°</sup>	D <sub>1</sub>	L <sub>2</sub>		D <sub>2</sub>	L <sub>1</sub>				
	.040	.120 (3x)	.0030	I	1/8	1-1/2	11440	25.70	11440-C3	30.90
	.045	.068 (1.5x)	.0030	I	1/8	1-1/2	816045	25.70	816045-C3	30.90
	.045	.135 (3x)	.0030	I	1/8	1-1/2	11445	25.70	11445-C3	30.90
	.045	.135 (3x)	.0030	I	1/8	3 <b>LONG!</b>	987945	32.90	987945-C3	38.10
	.047 (3/64)	.141 (3x)	.0040	I	1/8	1-1/2	11447	25.70	11447-C3	30.90
	.050	.150 (3x)	.0040	I	1/8	1-1/2	11450	25.70	11450-C3	30.90
	.055	.165 (3x)	.0040	I	1/8	1-1/2	11455	25.70	11455-C3	30.90
	.060	.090 (1.5x)	.0050	I	1/8	1-1/2	816060	25.40	816060-C3	30.60
	.060	.180 (3x)	.0050	I	1/8	1-1/2	11460	25.40	11460-C3	30.60
	.060	.180 (3x)	.0050	I	1/8	3 <b>LONG!</b>	987960	32.50	987960-C3	37.70
	.062 (1/16)	.093 (1.5x)	.0050	I	1/8	1-1/2	816062	25.40	816062-C3	30.60
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	11462	25.40	11462-C3	30.60
	.070	.210 (3x)	.0050	I	1/8	1-1/2	11470	25.40	11470-C3	30.60
	.075	.225 (3x)	.0050	I	1/8	1-1/2	11475	25.40	11475-C3	30.60
	.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	11478	25.40	11478-C3	30.60
	.080	.240 (3x)	.0050	I	1/8	1-1/2	11480	25.40	11480-C3	30.60
	.090	.135 (1.5x)	.0050	I	1/8	1-1/2	816090	23.80	816090-C3	29.00
	.090	.270 (3x)	.0050	I	1/8	1-1/2	11490	23.80	11490-C3	29.00
	.090	.270 (3x)	.0050	I	1/8	3 <b>LONG!</b>	987990	31.30	987990-C3	36.50
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	11493	23.80	11493-C3	29.00
	.100	.300 (3x)	.0060	I	1/8	1-1/2	11500	23.80	11500-C3	29.00
	.109 (7/64)	.327 (3x)	.0080	I	1/8	1-1/2	11509	23.80	11509-C3	29.00
	.118 (3 mm)	.354 (3x)	.0080	I	1/8	1-1/2	1153M	23.80	1153M-C3	29.00
	.125 (1/8)	.188 (1.5x)	.0100	I	1/8	1-1/2	816108	22.30	816108-C3	27.50
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	11525	22.30	11525-C3	27.50
	.125 (1/8)	.375 (3x)	.0100	I	1/8	3 <b>LONG!</b>	988008	30.40	988008-C3	35.60
	.125 (1/8)	.188 (1.5x)	.0100	II	1/8	1-1/2	787708	22.30	787708-C3	27.50
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	37508	22.30	37508-C3	27.50
	.125 (1/8)	.375 (3x)	.0100	II	1/8	4 <b>LONG!</b>	55808	32.30	55808-C3	37.90
	.140 (9/64)	.375 (2.5x)	.0100	II	3/16	2	37509	31.90	37509-C3	37.50
	.156 (5/32)	.375 (2.5x)	.0110	II	3/16	2	37510	26.50	37510-C3	32.10
.187 (3/16)	.625 (3.5x)	.0130	I	3/16	2	803912	25.70	803912-C3	31.30	
.187 (3/16)	.312 (1.5x)	.0130	II	3/16	2	787712	25.70	787712-C3	31.30	
.187 (3/16)	.625 (3.5x)	.0130	II	3/16	2	37512	25.70	37512-C3	31.30	
.187 (3/16)	.625 (3.5x)	.0130	II	3/16	4 <b>LONG!</b>	55812	39.70	55812-C3	47.30	
.218 (7/32)	.750 (3.5x)	.0150	II	1/4	2-1/2	37514	40.80	37514-C3	48.40	
.236 (6 mm)	.750 (3x)	.0160	II	1/4	2-1/2	37515	40.80	37515-C3	48.40	
.250 (1/4)	.750 (3x)	.0180	I	1/4	2-1/2	803916	32.00	803916-C3	39.60	
.250 (1/4)	.375 (1.5x)	.0180	II	1/4	2-1/2	787716	32.00	787716-C3	39.60	
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	37516	32.30	37516-C3	39.90	
.250 (1/4)	.750 (3x)	.0180	II	1/4	6 <b>LONG!</b>	55816	53.70	55816-C3	63.80	
.312 (5/16)	.750 (2.5x)	.0220	II	5/16	2-1/2	37520	55.00	37520-C3	63.90	
.375 (3/8)	.500 (1.5x)	.0270	II	3/8	2-1/2	787724	58.20	787724-C3	68.30	
.375 (3/8)	1.000 (2.5x)	.0270	II	3/8	2-1/2	37524	58.20	37524-C3	68.30	
.500 (1/2)	1.000 (2x)	.0350	II	1/2	3	37532	100.70	37532-C3	115.80	
100°	.030	.090 (3x)	.0030	I	1/8	1-1/2	975830	30.20	975830-C3	35.40
	.060	.180 (3x)	.0050	I	1/8	1-1/2	975860	26.00	975860-C3	31.20
	.090	.270 (3x)	.0050	I	1/8	1-1/2	975890	26.30	975890-C3	31.50
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	975908	23.50	975908-C3	28.70
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	955908	23.50	955908-C3	28.70
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	955912	27.20	955912-C3	32.80
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	955916	33.90	955916-C3	41.50

SPOTTING DRILLS

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# MINIATURE DRILLS

## Spotting Drills (cont.)

continued from previous page

INCLUDED ANGLE	DRILL DIAMETER	FLUTE LENGTH	WEB THICKNESS	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED		
							2 FL	PRICE	2 FL	PRICE	
A ±1°	D <sub>1</sub>	L <sub>2</sub>			D <sub>2</sub>	L <sub>1</sub>					
	120°	.010	.030 (3x)	.0015	I	1/8	1-1/2	11610	35.20	11610-C3	40.40
		.015 (1/64)	.045 (3x)	.0015	I	1/8	1-1/2	11615	35.20	11615-C3	40.40
		.020	.060 (3x)	.0020	I	1/8	1-1/2	11620	30.40	11620-C3	35.60
		.025	.075 (3x)	.0020	I	1/8	1-1/2	11625	30.40	11625-C3	35.60
		.030	.090 (3x)	.0030	I	1/8	1-1/2	11630	28.10	11630-C3	33.30
		.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	11631	28.10	11631-C3	33.30
		.040	.120 (3x)	.0030	I	1/8	1-1/2	11640	25.70	11640-C3	30.90
		.045	.135 (3x)	.0030	I	1/8	1-1/2	11645	25.70	11645-C3	30.90
		.047 (3/64)	.141 (3x)	.0040	I	1/8	1-1/2	11647	25.70	11647-C3	30.90
		.050	.150 (3x)	.0040	I	1/8	1-1/2	11650	25.70	11650-C3	30.90
		.055	.165 (3x)	.0040	I	1/8	1-1/2	11655	25.70	11655-C3	30.90
		.060	.180 (3x)	.0050	I	1/8	1-1/2	11660	25.40	11660-C3	30.60
		.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	11662	25.40	11662-C3	30.60
		.070	.210 (3x)	.0050	I	1/8	1-1/2	11670	25.40	11670-C3	30.60
		.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	11678	25.40	11678-C3	30.60
		.090	.270 (3x)	.0050	I	1/8	1-1/2	11690	23.80	11690-C3	29.00
		.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	11693	23.80	11693-C3	29.00
		.100	.300 (3x)	.0060	I	1/8	1-1/2	11700	23.80	11700-C3	29.00
.118 (3 mm)		.354 (3x)	.0080	I	1/8	1-1/2	1173M	23.80	1173M-C3	29.00	
.125 (1/8)		.375 (3x)	.0100	I	1/8	1-1/2	11725	22.30	11725-C3	27.50	
.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	38208	22.30	38208-C3	27.50		
.156 (5/32)	.375 (2.5x)	.0110	II	3/16	2	38210	49.80	38210-C3	55.40		
.187 (3/16)	.625 (3.5x)	.0130	I	3/16	2	804012	25.70	804012-C3	31.30		
.187 (3/16)	.625 (3.5x)	.0130	II	3/16	2	38212	25.70	38212-C3	31.30		
.250 (1/4)	.750 (3x)	.0180	I	1/4	2-1/2	804016	32.00	804016-C3	39.60		
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	38216	32.30	38216-C3	39.90		
.375 (3/8)	1.000 (2.5x)	.0270	II	3/8	2-1/2	38224	58.20	38224-C3	68.30		
130°	.030	.090 (3x)	.0030	I	1/8	1-1/2	839530	33.20	839530-C3	37.10	
	.060	.180 (3x)	.0050	I	1/8	1-1/2	839560	32.30	839560-C3	37.10	
	.090	.270 (3x)	.0050	I	1/8	1-1/2	839590	32.30	839590-C3	37.10	
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	839608	33.90	839608-C3	38.60	
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	847016	35.40	847016-C3	43.00	
140°	.010	.030 (3x)	.0015	I	1/8	1-1/2	39810	36.30	39810-C3	41.50	
	.015 (1/64)	.045 (3x)	.0015	I	1/8	1-1/2	39815	36.30	39815-C3	41.50	
	.020	.030 (1.5x)	.0020	I	1/8	1-1/2	815820	31.10	815820-C3	36.30	
	.020	.060 (3x)	.0020	I	1/8	1-1/2	39820	31.10	39820-C3	36.30	
	.025	.075 (3x)	.0020	I	1/8	1-1/2	39825	31.10	39825-C3	36.30	
	.030	.045 (1.5x)	.0030	I	1/8	1-1/2	815830	29.30	815830-C3	34.50	
	.030	.090 (3x)	.0030	I	1/8	1-1/2	39830	29.30	39830-C3	34.50	
	.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	39831	29.30	39831-C3	34.50	
	.039	.117 (3x)	.0030	I	1/8	1-1/2	39839	26.30	39839-C3	31.50	
	.040	.060 (1.5x)	.0030	I	1/8	1-1/2	815840	26.30	815840-C3	31.50	
	.040	.120 (3x)	.0030	I	1/8	1-1/2	39840	26.30	39840-C3	31.50	
	.045	.135 (3x)	.0030	I	1/8	1-1/2	39845	26.30	39845-C3	31.50	
	.047 (3/64)	.141 (3x)	.0040	I	1/8	1-1/2	39847	26.30	39847-C3	31.50	
	.050	.150 (3x)	.0040	I	1/8	1-1/2	39850	26.30	39850-C3	31.50	
	.055	.165 (3x)	.0040	I	1/8	1-1/2	39855	26.30	39855-C3	31.50	
	.060	.090 (1.5x)	.0050	I	1/8	1-1/2	815860	26.00	815860-C3	31.20	
	.060	.180 (3x)	.0050	I	1/8	1-1/2	39860	26.00	39860-C3	31.20	
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	39862	26.00	39862-C3	31.20	

NEW

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SPOTTING DRILLS

**MINIATURE DRILLS**

**Spotting Drills (cont.)**

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INCLUDED ANGLE	DRILL DIAMETER	FLUTE LENGTH	WEB THICKNESS	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
							2 FL	PRICE	2 FL	PRICE
<b>140°</b>	D <sub>1</sub>	L <sub>2</sub>			D <sub>2</sub>	L <sub>1</sub>				
	.070	.210 (3x)	.0050	I	1/8	1-1/2	39870	26.00	39870-C3	31.20
	.075	.225 (3x)	.0050	I	1/8	1-1/2	39875	26.00	39875-C3	31.20
	.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	39878	26.00	39878-C3	31.20
	.090	.135 (1.5x)	.0050	I	1/8	1-1/2	815890	24.90	815890-C3	30.10
	.090	.270 (3x)	.0050	I	1/8	1-1/2	39890	24.90	39890-C3	30.10
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	39893	24.90	39893-C3	30.10
	.100	.300 (3x)	.0060	I	1/8	1-1/2	39900	24.90	39900-C3	30.10
	.118 (3mm)	.354 (3x)	.0080	I	1/8	1-1/2	3993M	24.90	3993M-C3	30.10
	.125 (1/8)	.188 (1.5x)	.0100	I	1/8	1-1/2	815908	23.50	815908-C3	28.70
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	39925	23.50	39925-C3	28.70
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	41008	23.50	41008-C3	28.70
	.140 (9/64)	.375 (2.5x)	.0100	II	3/16	2	41009	27.20	41009-C3	32.80
	.156 (5/32)	.375 (2.5x)	.0110	II	3/16	2	41010	27.50	41010-C3	33.10
	.187 (3/16)	.625 (3x)	.0130	I	3/16	2	804112	27.20	804112-C3	32.80
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	41012	27.20	41012-C3	32.80
	.250 (1/4)	.750 (3x)	.0180	I	1/4	2-1/2	804116	33.90	804116-C3	41.50
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	41016	33.90	41016-C3	41.50
.375 (3/8)	1.000 (2.5x)	.0270	II	3/8	2-1/2	41024	59.90	41024-C3	70.00	
<b>142°</b>	.060	.180 (3x)	.005	I	1/8	1-1/2	752560	29.90	752560-C3	35.10
	.090	.270 (3x)	.005	I	1/8	1-1/2	752590	30.50	752590-C3	35.70
	.125 (1/8)	.375 (3x)	.010	I	1/8	1-1/2	752608	30.50	752608-C3	35.70
	.125 (1/8)	.375 (3x)	.010	II	1/8	1-1/2	737808	29.90	737808-C3	35.10
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	737812	32.30	737812-C3	39.50
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	737816	37.90	737816-C3	45.50	
<b>150°</b>	.020	.060 (3x)	.0020	I	1/8	1-1/2	961120	30.20	961120-C3	35.40
	.030	.090 (3x)	.0030	I	1/8	1-1/2	961130	29.30	961130-C3	34.50
	.040	.120 (3x)	.0030	I	1/8	1-1/2	961140	26.30	961140-C3	31.50
	.045	.135 (3x)	.0030	I	1/8	1-1/2	961145	26.30	961145-C3	31.50
	.047	.141 (3x)	.0040	I	1/8	1-1/2	961147	27.10	961147-C3	32.30
	.060	.180 (3x)	.0050	I	1/8	1-1/2	961160	26.00	961160-C3	31.20
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	961162	26.30	961162-C3	31.50
	.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	961178	26.30	961178-C3	31.50
	.090	.270 (3x)	.0050	I	1/8	1-1/2	961190	26.30	961190-C3	31.50
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	961193	26.30	961193-C3	31.50
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	961208	23.50	961208-C3	28.70
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	949508	23.50	949508-C3	28.70
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	949512	27.20	949512-C3	32.80
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	949516	33.90	949516-C3	41.50	
<b>170°</b>	.060	.180 (3x)	.0050	I	1/8	1-1/2	893660	27.10	893660-C3	32.30
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	893708	27.10	893708-C3	32.30
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	893716	34.30	893716-C3	41.90

NEW  
NEW  
NEW

SPOTTING DRILLS



Access Simulation Files in DXF Format for Every Harvey Tool Product

[harveytool.com/resources/simulation-files](http://harveytool.com/resources/simulation-files)

# MINIATURE REAMERS



	D <sub>1</sub> Tolerances
Uncoated	+ .0000" - .0002"
AlTiN Coated	+ .0002" - .0000"

- Available uncoated or with AlTiN coating for improved lubricity and heat resistance
- Straight flutes for through and blind hole applications
- Oversized, common shanks to maintain strength, stiffness, and accuracy • 45° chamfer angle
- h6 shank tolerance for high precision tool holders • Solid carbide • CNC ground in the USA

REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AlTiN COATED	
D <sub>1</sub> *		L <sub>2</sub> <sup>+ .020"</sup> <sub>- .000"</sub>	L <sub>3</sub> <sup>+ .020"</sup> <sub>- .000"</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.0080		.062	.100	.0013	4	1/8	1-1/2	RSB0080	53.50	RSB0080-C3	58.20
.0083	#91	.062	.100	.0014	4	1/8	1-1/2	RSB0083	55.10	RSB0083-C3	58.20
.0085		.062	.109	.0014	4	1/8	1-1/2	RSB0085	55.10	RSB0085-C3	59.90
.0087	#90	.062	.109	.0015	4	1/8	1-1/2	RSB0087	55.10	RSB0087-C3	59.90
.0090		.062	.118	.0015	4	1/8	1-1/2	RSB0090	53.50	RSB0090-C3	58.20
.0091	#89	.062	.118	.0015	4	1/8	1-1/2	RSB0091	55.10	RSB0091-C3	59.90
.0095	#88	.062	.118	.0016	4	1/8	1-1/2	RSB0095	53.50	RSB0095-C3	58.20
.0100	#87	.078	.125	.0017	4	1/8	1-1/2	RSB0100	53.50	RSB0100-C3	58.20
.0105	#86	.078	.125	.0018	4	1/8	1-1/2	RSB0105	53.50	RSB0105-C3	58.20
.0110	#85	.078	.141	.0018	4	1/8	1-1/2	RSB0110	55.10	RSB0110-C3	58.20
.0115	#84	.078	.141	.0019	4	1/8	1-1/2	RSB0115	55.10	RSB0115-C3	58.20
.0120	#83	.093	.156	.0020	4	1/8	1-1/2	RSB0120	53.50	RSB0120-C3	58.20
.0125	#82	.093	.172	.0021	4	1/8	1-1/2	RSB0125	55.10	RSB0125-C3	58.20
.0130	#81	.093	.172	.0022	4	1/8	1-1/2	RSB0130	53.50	RSB0130-C3	58.20
.0135	#80	.109	.187	.0023	4	1/8	1-1/2	RSB0135	55.10	RSB0135-C3	58.20
.0140		.109	.187	.0023	4	1/8	1-1/2	RSB0140	53.50	RSB0140-C3	58.20
.0145	#79	.109	.187	.0024	4	1/8	1-1/2	RSB0145	53.50	RSB0145-C3	59.90
.0150		.109	.187	.0025	4	1/8	1-1/2	RSB0150	53.50	RSB0150-C3	58.20
.0155		.109	.187	.0026	4	1/8	1-1/2	RSB0155	53.50	RSB0155-C3	58.20
.0160	#78	.125	.218	.0027	4	1/8	1-1/2	RSB0160	40.30	RSB0160-C3	45.00
.0165		.125	.218	.0019	4	1/8	1-1/2	RSB0165	40.30	RSB0165-C3	45.00
.0170		.125	.218	.0020	4	1/8	1-1/2	RSB0170	40.30	RSB0170-C3	45.00
.0175		.125	.218	.0020	4	1/8	1-1/2	RSB0175	40.30	RSB0175-C3	45.00
.0180	#77	.140	.250	.0021	4	1/8	1-1/2	RSB0180	40.30	RSB0180-C3	45.00
.0185		.140	.250	.0021	4	1/8	1-1/2	RSB0185	40.30	RSB0185-C3	45.00
.0190		.140	.250	.0022	4	1/8	1-1/2	RSB0190	40.30	RSB0190-C3	45.00
.0195		.140	.250	.0022	4	1/8	1-1/2	RSB0195	40.30	RSB0195-C3	45.00
.0200	#76	.140	.250	.0023	4	1/8	1-1/2	RSB0200	40.30	RSB0200-C3	45.00
.0205		.140	.250	.0024	4	1/8	1-1/2	RSB0205	40.30	RSB0205-C3	45.00
.0210	#75	.172	.281	.0024	4	1/8	1-1/2	RSB0210	40.30	RSB0210-C3	45.00
.0215		.172	.281	.0025	4	1/8	1-1/2	RSB0215	40.30	RSB0215-C3	45.00
.0220		.172	.281	.0025	4	1/8	1-1/2	RSB0220	40.30	RSB0220-C3	45.00
.0225	#74	.172	.281	.0026	4	1/8	1-1/2	RSB0225	40.30	RSB0225-C3	45.00
.0230		.172	.281	.0026	4	1/8	1-1/2	RSB0230	40.30	RSB0230-C3	45.00
.0235		.172	.281	.0027	4	1/8	1-1/2	RSB0235	40.30	RSB0235-C3	45.00
.0240	#73	.187	.312	.0028	4	1/8	1-1/2	RSB0240	41.50	RSB0240-C3	45.00
.0245		.187	.312	.0028	4	1/8	1-1/2	RSB0245	40.30	RSB0245-C3	46.30
.0250	#72	.187	.312	.0029	4	1/8	1-1/2	RSB0250	40.30	RSB0250-C3	45.00

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AlTiN coating is +.0002"/-.0000".

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REAMERS

# MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+ .020"</sup> <sub>- .000"</sub>	L <sub>3</sub> <sup>+ .020"</sup> <sub>- .000"</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.0255		.187	.312	.0029	4	1/8	1-1/2	RSB0255	40.30	RSB0255-C3	45.00
.0260	#71	.187	.312	.0030	4	1/8	1-1/2	RSB0260	40.30	RSB0260-C3	45.00
.0265		.187	.312	.0030	4	1/8	1-1/2	RSB0265	41.50	RSB0265-C3	45.00
.0270		.218	.375	.0031	4	1/8	2	RSB0270	41.50	RSB0270-C3	45.00
.0275		.218	.375	.0032	4	1/8	2	RSB0275	40.30	RSB0275-C3	46.30
.0280	#70	.218	.375	.0032	4	1/8	2	RSB0280	40.30	RSB0280-C3	45.00
.0285		.218	.375	.0033	4	1/8	2	RSB0285	41.50	RSB0285-C3	45.00
.0290		.218	.375	.0033	4	1/8	2	RSB0290	40.30	RSB0290-C3	45.00
.0292	#69	.218	.375	.0034	4	1/8	2	RSB0292	41.50	RSB0292-C3	45.00
.0295 (.75 mm)		.218	.375	.0034	4	1/8	2	RSB0295	40.30	RSB0295-C3	45.00
.0300		.218	.375	.0035	4	1/8	2	RSB0300	40.30	RSB0300-C3	45.00
.0305		.218	.375	.0035	4	1/8	2	RSB0305	40.30	RSB0305-C3	45.00
.0310	#68	.218	.375	.0036	4	1/8	2	RSB0310	40.30	RSB0310-C3	45.00
.0315 (.80 mm)		.218	.375	.0036	4	1/8	2	RSB0315	40.30	RSB0315-C3	45.00
.0320	#67	.250	.437	.0037	4	1/8	2	RSB0320	40.30	RSB0320-C3	45.00
.0325		.250	.437	.0037	4	1/8	2	RSB0325	40.30	RSB0325-C3	45.00
.0330	#66	.250	.437	.0038	4	1/8	2	RSB0330	40.30	RSB0330-C3	45.00
.0335 (.85 mm)		.250	.437	.0039	4	1/8	2	RSB0335	40.30	RSB0335-C3	45.00
.0340		.250	.437	.0039	4	1/8	2	RSB0340	40.30	RSB0340-C3	45.00
.0345		.250	.437	.0040	4	1/8	2	RSB0345	40.30	RSB0345-C3	45.00
.0350	#65	.250	.437	.0040	4	1/8	2	RSB0350	40.30	RSB0350-C3	45.00
.0355		.250	.437	.0041	4	1/8	2	RSB0355	40.30	RSB0355-C3	45.00
.0360	#64	.281	.500	.0041	4	1/8	2	RSB0360	41.50	RSB0360-C3	45.00
.0365		.281	.500	.0042	4	1/8	2	RSB0365	40.30	RSB0365-C3	45.00
.0370	#63	.281	.500	.0043	4	1/8	2	RSB0370	40.30	RSB0370-C3	45.00
.0375		.281	.500	.0043	4	1/8	2	RSB0375	40.30	RSB0375-C3	45.00
.0380	#62	.281	.500	.0044	4	1/8	2	RSB0380	40.30	RSB0380-C3	45.00
.0385		.281	.500	.0044	4	1/8	2	RSB0385	40.30	RSB0385-C3	45.00
.0390	#61	.281	.500	.0045	4	1/8	2	RSB0390	40.30	RSB0390-C3	45.00
.0395		.281	.500	.0045	4	1/8	2	RSB0395	40.30	RSB0395-C3	45.00
.0400	#60	.281	.500	.0046	4	1/8	2	RSB0400	40.30	RSB0400-C3	45.00
.0405		.281	.500	.0047	4	1/8	2	RSB0405	40.30	RSB0405-C3	45.00
.0410	#59	.281	.500	.0047	4	1/8	2	RSB0410	40.30	RSB0410-C3	45.00
.0415		.281	.500	.0048	4	1/8	2	RSB0415	40.30	RSB0415-C3	45.00
.0420	#58	.281	.500	.0048	4	1/8	2	RSB0420	40.30	RSB0420-C3	45.00
.0425		.312	.562	.0049	4	1/8	2	RSB0425	41.50	RSB0425-C3	45.00
.0430	#57	.312	.562	.0049	4	1/8	2	RSB0430	40.30	RSB0430-C3	45.00
.0435		.312	.562	.0050	4	1/8	2	RSB0435	40.30	RSB0435-C3	45.00
.0440		.312	.562	.0044	4	1/8	2	RSB0440	41.50	RSB0440-C3	45.00
.0445		.312	.562	.0045	4	1/8	2	RSB0445	41.50	RSB0445-C3	45.00
.0450		.312	.562	.0045	4	1/8	2	RSB0450	40.30	RSB0450-C3	45.00
.0455		.312	.562	.0046	4	1/8	2	RSB0455	40.30	RSB0455-C3	45.00
.0460		.312	.562	.0046	4	1/8	2	RSB0460	40.30	RSB0460-C3	45.00
.0465	#56	.312	.562	.0047	4	1/8	2	RSB0465	40.30	RSB0465-C3	45.00
.0469 (3/64)		.312	.562	.0047	4	1/8	2	RSB0469	34.20	RSB0469-C3	38.50
.0470		.312	.562	.0047	4	1/8	2	RSB0470	34.20	RSB0470-C3	38.50
.0475		.312	.562	.0048	4	1/8	2	RSB0475	34.20	RSB0475-C3	38.50

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AIIIN coating is +.0002"/-.0000".

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REAMERS

# MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	OVERALL REACH L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	CHAMFER LENGTH L <sub>4</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
.0480		.375	.625	.0048	4	1/8	2	RSB0480	34.20	RSB0480-C3	38.50
.0485		.375	.625	.0049	4	1/8	2	RSB0485	34.20	RSB0485-C3	38.50
.0490		.375	.625	.0049	4	1/8	2	RSB0490	34.20	RSB0490-C3	38.50
.0495		.375	.625	.0050	4	1/8	2	RSB0495	34.20	RSB0495-C3	38.50
.0500		.375	.625	.0050	4	1/8	2	RSB0500	34.20	RSB0500-C3	38.50
.0505		.375	.625	.0051	4	1/8	2	RSB0505	34.20	RSB0505-C3	38.50
.0510		.375	.625	.0051	4	1/8	2	RSB0510	34.20	RSB0510-C3	38.50
.0515		.375	.625	.0052	4	1/8	2	RSB0515	33.80	RSB0515-C3	38.80
.0520	#55	.375	.625	.0052	4	1/8	2	RSB0520	34.20	RSB0520-C3	38.80
.0525		.375	.625	.0053	4	1/8	2	RSB0525	34.80	RSB0525-C3	38.50
.0530		.437	.687	.0053	4	1/8	2	RSB0530	34.20	RSB0530-C3	38.50
.0535		.437	.687	.0054	4	1/8	2	RSB0535	34.20	RSB0535-C3	38.50
.0540		.437	.687	.0054	4	1/8	2	RSB0540	33.80	RSB0540-C3	38.50
.0545		.437	.687	.0055	4	1/8	2	RSB0545	34.80	RSB0545-C3	38.50
.0550	#54	.437	.687	.0055	4	1/8	2	RSB0550	34.20	RSB0550-C3	38.50
.0555		.437	.750	.0056	4	1/8	2	RSB0555	33.80	RSB0555-C3	38.80
.0560		.437	.750	.0056	4	1/8	2	RSB0560	34.20	RSB0560-C3	38.50
.0565		.437	.750	.0057	4	1/8	2	RSB0565	34.20	RSB0565-C3	38.50
.0570		.437	.750	.0057	4	1/8	2	RSB0570	34.20	RSB0570-C3	38.50
.0575		.437	.750	.0058	4	1/8	2	RSB0575	34.20	RSB0575-C3	38.80
.0580		.437	.750	.0058	4	1/8	2	RSB0580	34.20	RSB0580-C3	38.50
.0585		.437	.750	.0059	4	1/8	2	RSB0585	34.20	RSB0585-C3	38.50
.0590		.437	.750	.0059	4	1/8	2	RSB0590	33.80	RSB0590-C3	38.50
.0595	#53	.437	.750	.0060	4	1/8	2	RSB0595	34.20	RSB0595-C3	38.50
.0600		.437	.812	.0060	4	1/8	2	RSB0600	33.80	RSB0600-C3	38.50
.0605		.437	.812	.0061	4	1/8	2	RSB0605	33.80	RSB0605-C3	38.50
.0610 (1.55 mm)		.437	.812	.0061	4	1/8	2	RSB0610	33.80	RSB0610-C3	38.50
.0615		.437	.812	.0062	4	1/8	2	RSB0615	33.80	RSB0615-C3	38.50
.0620		.437	.812	.0062	4	1/8	2	RSB0620	33.80	RSB0620-C3	38.50
.0625 (1/16)		.437	.812	.0063	4	1/8	2	RSB0625	33.80	RSB0625-C3	38.50
.0630 (1.60 mm)		.437	.812	.0063	4	1/8	2	RSB0630	33.80	RSB0630-C3	38.50
.0635	#52	.437	.812	.0064	4	1/8	2	RSB0635	33.80	RSB0635-C3	38.50
.0640		.437	.812	.0064	4	1/8	2	RSB0640	33.80	RSB0640-C3	38.50
.0645		.437	.812	.0065	4	1/8	2	RSB0645	33.80	RSB0645-C3	39.00
.0650 (1.65 mm)		.437	.812	.0065	4	1/8	2	RSB0650	33.80	RSB0650-C3	38.50
.0660		.500	.875	.0066	4	1/8	2	RSB0660	33.80	RSB0660-C3	38.50
.0670	#51	.500	.875	.0067	4	1/8	2	RSB0670	33.80	RSB0670-C3	38.50
.0680		.500	.875	.0068	4	1/8	2	RSB0680	33.80	RSB0680-C3	38.50
.0690		.500	.875	.0062	4	1/8	2	RSB0690	34.80	RSB0690-C3	38.50
.0700	#50	.562	.937	.0063	4	1/8	2	RSB0700	33.80	RSB0700-C3	38.50
.0710		.562	.937	.0064	4	1/8	2	RSB0710	33.80	RSB0710-C3	38.50
.0720		.562	.937	.0065	4	1/8	2	RSB0720	33.80	RSB0720-C3	38.50
.0730	#49	.562	.937	.0066	4	1/8	2	RSB0730	33.80	RSB0730-C3	38.50
.0740		.562	.937	.0067	4	1/8	2	RSB0740	34.80	RSB0740-C3	38.50
.0750		.562	1.000	.0068	4	1/8	2	RSB0750	34.80	RSB0750-C3	38.50
.0760	#48	.562	1.000	.0068	4	1/8	2	RSB0760	34.80	RSB0760-C3	38.50
.0765		.562	1.000	.0069	4	1/8	2	RSB0765	33.80	RSB0765-C3	38.50

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AITIN coating is +.0002"/-.0000".

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REAMERS

NEW



# MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+ .020"</sup> / <sub>- .000"</sub>	L <sub>3</sub> <sup>+ .020"</sup> / <sub>- .000"</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.0770		.562	1.000	.0069	4	1/8	2	RSB0770	33.80	RSB0770-C3	38.50
.0775		.562	1.000	.0070	4	1/8	2	RSB0775	33.80	RSB0775-C3	38.50
.0780		.562	1.000	.0070	4	1/8	2	RSB0780	33.80	RSB0780-C3	38.50
.0781 (5/64)		.562	1.000	.0070	4	1/8	2	RSB0781	33.80	RSB0781-C3	38.50
.0785	#47	.562	1.000	.0071	4	1/8	2	RSB0785	33.80	RSB0785-C3	38.50
.0787 (2.00 mm)		.562	1.000	.0071	4	1/8	2	RSB0787	33.80	RSB0787-C3	38.50
.0790		.562	1.000	.0071	4	1/8	2	RSB0790	33.80	RSB0790-C3	38.50
.0795		.562	1.000	.0072	4	1/8	2	RSB0795	33.80	RSB0795-C3	38.50
.0800		.562	1.000	.0072	4	1/8	2	RSB0800	33.80	RSB0800-C3	38.50
<b>NEW</b> .0805		.562	1.000	.0072	4	1/8	2	<b>RSB0805</b>	33.80	<b>RSB0805-C3</b>	39.00
.0810	#46	.562	1.000	.0073	4	1/8	2	RSB0810	33.80	RSB0810-C3	38.50
<b>NEW</b> .0815		.562	1.000	.0073	4	1/8	2	<b>RSB0815</b>	33.80	<b>RSB0815-C3</b>	39.00
.0820	#45	.562	1.000	.0074	4	1/8	2	RSB0820	33.80	RSB0820-C3	38.50
.0830		.562	1.000	.0075	4	1/8	2	RSB0830	33.80	RSB0830-C3	38.50
.0840		.625	1.125	.0076	4	1/8	2-1/2	RSB0840	33.80	RSB0840-C3	38.50
.0850		.625	1.125	.0077	4	1/8	2-1/2	RSB0850	34.80	RSB0850-C3	38.50
.0860	#44	.625	1.125	.0077	4	1/8	2-1/2	RSB0860	34.80	RSB0860-C3	38.50
.0870		.625	1.125	.0078	4	1/8	2-1/2	RSB0870	34.80	RSB0870-C3	38.50
.0880		.625	1.125	.0079	4	1/8	2-1/2	RSB0880	34.80	RSB0880-C3	38.50
.0890	#43	.625	1.125	.0080	4	1/8	2-1/2	RSB0890	34.80	RSB0890-C3	38.50
.0900		.625	1.125	.0081	4	1/8	2-1/2	RSB0900	34.80	RSB0900-C3	38.50
.0910		.625	1.125	.0082	4	1/8	2-1/2	RSB0910	34.80	RSB0910-C3	38.50
.0920		.625	1.125	.0083	4	1/8	2-1/2	RSB0920	33.80	RSB0920-C3	38.50
.0925 (2.35 mm)		.687	1.250	.0083	4	1/8	2-1/2	RSB0925	33.80	RSB0925-C3	38.50
.0930		.687	1.250	.0084	4	1/8	2-1/2	RSB0930	33.80	RSB0930-C3	38.50
.0935	#42	.687	1.250	.0084	4	1/8	2-1/2	RSB0935	33.80	RSB0935-C3	38.50
.0937 (3/32)		.687	1.250	.0084	4	1/8	2-1/2	RSB0937	33.80	RSB0937-C3	38.50
.0940		.687	1.250	.0085	4	1/8	2-1/2	RSB0940	33.80	RSB0940-C3	38.50
.0945 (2.40 mm)		.687	1.250	.0085	4	1/8	2-1/2	RSB0945	33.80	RSB0945-C3	38.50
.0950		.687	1.250	.0086	4	1/8	2-1/2	RSB0950	33.80	RSB0950-C3	38.50
.0960	#41	.687	1.250	.0086	4	1/8	2-1/2	RSB0960	33.80	RSB0960-C3	38.50
.0970		.687	1.250	.0087	4	1/8	2-1/2	RSB0970	33.80	RSB0970-C3	38.50
.0980	#40	.687	1.250	.0088	4	1/8	2-1/2	RSB0980	33.80	RSB0980-C3	38.50
.0990		.687	1.250	.0089	4	1/8	2-1/2	RSB0990	34.80	RSB0990-C3	38.50
.0995	#39	.687	1.250	.0090	4	1/8	2-1/2	RSB0995	33.80	RSB0995-C3	38.50
.1000		.750	1.375	.0090	4	1/8	2-1/2	RSB1000	33.80	RSB1000-C3	38.50
.1010		.750	1.375	.0091	4	1/8	2-1/2	RSB1010	33.80	RSB1010-C3	38.50
.1015	#38	.750	1.375	.0091	4	1/8	2-1/2	RSB1015	34.80	RSB1015-C3	38.50
.1020		.750	1.375	.0092	4	1/8	2-1/2	RSB1020	33.80	RSB1020-C3	38.50
.1030		.750	1.375	.0093	4	1/8	2-1/2	RSB1030	33.80	RSB1030-C3	38.50
.1040	#37	.750	1.375	.0094	4	1/8	2-1/2	RSB1040	33.80	RSB1040-C3	38.50
.1050		.750	1.375	.0095	4	1/8	2-1/2	RSB1050	34.80	RSB1050-C3	38.50
.1060		.750	1.375	.0095	4	1/8	2-1/2	RSB1060	33.80	RSB1060-C3	38.50
.1065	#36	.750	1.375	.0096	4	1/8	2-1/2	RSB1065	34.80	RSB1065-C3	38.50
.1070		.750	1.375	.0096	4	1/8	2-1/2	RSB1070	34.80	RSB1070-C3	38.50
.1080		.750	1.375	.0097	4	1/8	2-1/2	RSB1080	34.80	RSB1080-C3	38.50
.1083 (2.75 mm)		.750	1.375	.0097	4	1/8	2-1/2	RSB1083	34.80	RSB1083-C3	39.60

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AITIN coating is +.0002"/-.0000".

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REAMERS

# MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.1085		.750	1.375	.0098	4	1/8	2-1/2	RSB1085	34.80	RSB1085-C3	39.60
.1090		.750	1.375	.0098	4	1/8	2-1/2	RSB1090	34.80	RSB1090-C3	38.50
.1094 (7/64)		.750	1.375	.0098	4	1/8	2-1/2	RSB1094	34.80	RSB1094-C3	39.60
.1100	#35	.750	1.375	.0099	4	1/8	2-1/2	RSB1100	34.80	RSB1100-C3	38.50
.1105		.750	1.375	.0099	4	1/8	2-1/2	RSB1105	34.80	RSB1105-C3	38.50
.1110	#34	.750	1.375	.0100	4	1/8	2-1/2	RSB1110	33.80	RSB1110-C3	38.50
.1120		.750	1.375	.0101	4	1/8	2-1/2	RSB1120	34.80	RSB1120-C3	38.50
.1130	#33	.750	1.500	.0102	4	1/8	2-1/2	RSB1130	34.80	RSB1130-C3	38.50
.1140		.750	1.500	.0103	4	1/8	2-1/2	RSB1140	33.80	RSB1140-C3	38.50
.1150		.750	1.500	.0104	4	1/8	2-1/2	RSB1150	34.80	RSB1150-C3	38.50
.1160	#32	.750	1.500	.0104	4	1/8	2-1/2	RSB1160	34.80	RSB1160-C3	38.50
.1170		.750	1.500	.0105	4	1/8	2-1/2	RSB1170	33.80	RSB1170-C3	38.50
.1180		.750	1.500	.0106	4	1/8	2-1/2	RSB1180	33.80	RSB1180-C3	38.50
.1190		.750	1.500	.0107	4	1/8	2-1/2	RSB1190	33.80	RSB1190-C3	38.50
.1200	#31	.750	1.500	.0108	4	1/8	2-1/2	RSB1200	33.80	RSB1200-C3	38.50
.1210		.750	1.500	.0109	4	1/8	2-1/2	RSB1210	33.80	RSB1210-C3	38.50
.1220 (3.10 mm)		.750	1.500	.0110	4	1/8	2-1/2	RSB1220	34.80	RSB1220-C3	38.50

REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.1230		.750	1.500	.0111	4	3/16	3	RSB1230	40.10	RSB1230-C3	44.80
.1235		.750	1.500	.0111	4	3/16	3	RSB1235	40.10	RSB1235-C3	44.80
.1240		.750	1.500	.0112	4	3/16	3	RSB1240	39.70	RSB1240-C3	44.80
.1245		.750	1.500	.0112	4	3/16	3	RSB1245	39.70	RSB1245-C3	44.80
.1250 (1/8)		.750	1.500	.0113	4	3/16	3	RSB1250	39.70	RSB1250-C3	44.80
.1255		.750	1.500	.0113	4	3/16	3	RSB1255	39.70	RSB1255-C3	44.80
.1260 (3.20 mm)		.750	1.500	.0113	4	3/16	3	RSB1260	39.70	RSB1260-C3	44.80
.1265		.750	1.500	.0114	4	3/16	3	RSB1265	39.70	RSB1265-C3	44.80
.1270		.750	1.500	.0114	4	3/16	3	RSB1270	40.10	RSB1270-C3	45.70
.1285	#30	.750	1.500	.0116	4	3/16	3	RSB1285	40.10	RSB1285-C3	44.80
.1360	#29	.750	1.625	.0122	4	3/16	3	RSB1360	40.10	RSB1360-C3	44.80
.1390		.750	1.625	.0125	4	3/16	3	RSB1390	40.10	RSB1390-C3	44.80
.1395		.750	1.625	.0126	4	3/16	3	RSB1395	40.10	RSB1395-C3	45.20
.1400		.750	1.625	.0126	4	3/16	3	RSB1400	40.10	RSB1400-C3	44.80
.1405	#28	.750	1.625	.0126	4	3/16	3	RSB1405	40.10	RSB1405-C3	45.20
.1406 (9/64)		.750	1.625	.0127	4	3/16	3	RSB1406	40.10	RSB1406-C3	44.80
.1410		.750	1.625	.0127	4	3/16	3	RSB1410	40.10	RSB1410-C3	45.20
.1415		.750	1.625	.0127	4	3/16	3	RSB1415	40.10	RSB1415-C3	45.20
.1420		.750	1.625	.0128	4	3/16	3	RSB1420	40.10	RSB1420-C3	45.20
.1440	#27	.750	1.625	.0130	4	3/16	3	RSB1440	40.10	RSB1440-C3	44.80
.1470	#26	.875	1.750	.0132	4	3/16	3	RSB1470	40.10	RSB1470-C3	45.20
.1495	#25	.875	1.750	.0135	4	3/16	3	RSB1495	40.10	RSB1495-C3	44.80
.1520	#24	.875	1.750	.0137	4	3/16	3	RSB1520	40.10	RSB1520-C3	45.20
.1540	#23	.875	1.750	.0139	4	3/16	3	RSB1540	40.10	RSB1540-C3	45.20
.1545		.875	1.750	.0139	4	3/16	3	RSB1545	40.10	RSB1545-C3	44.80
.1550		.875	1.750	.0140	4	3/16	3	RSB1550	40.10	RSB1550-C3	44.80
.1555		.875	1.750	.0140	4	3/16	3	RSB1555	40.10	RSB1555-C3	44.80

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AIIIN coating is +.0002"/-.0000".

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REAMERS

NEW

## MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+0.030"</sup> -0.000"	L <sub>3</sub> <sup>+0.030"</sup> -0.000"	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.1560		.875	1.750	.0140	4	3/16	3	RSB1560	39.70	RSB1560-C3	44.80
.1562 (5/32)		.875	1.750	.0141	4	3/16	3	RSB1562	40.10	RSB1562-C3	44.80
.1565		.875	1.750	.0141	4	3/16	3	RSB1565	40.10	RSB1565-C3	44.80
.1570	#22	.875	1.750	.0141	4	3/16	3	RSB1570	39.70	RSB1570-C3	44.80
.1575 (4.00 mm)		.875	1.750	.0142	4	3/16	3	RSB1575	39.70	RSB1575-C3	44.80
.1580		.875	1.875	.0142	4	3/16	3	RSB1580	39.70	RSB1580-C3	44.80
.1585		.875	1.875	.0143	4	3/16	3	RSB1585	40.10	RSB1585-C3	44.80
.1590	#21	.875	1.875	.0143	4	3/16	3	RSB1590	40.10	RSB1590-C3	44.80
.1610	#20	.875	1.875	.0145	4	3/16	3	RSB1610	40.10	RSB1610-C3	44.80
.1660	#19	.875	1.875	.0149	4	3/16	3	RSB1660	40.10	RSB1660-C3	45.20
.1695	#18	1.000	2.000	.0153	4	3/16	4	RSB1695	44.50	RSB1695-C3	50.80
.1705		1.000	2.000	.0153	4	3/16	4	RSB1705	44.50	RSB1705-C3	50.80
.1710		1.000	2.000	.0154	4	3/16	4	RSB1710	44.50	RSB1710-C3	50.80
.1715		1.000	2.000	.0154	4	3/16	4	RSB1715	44.50	RSB1715-C3	52.30
.1719 (11/64)		1.000	2.000	.0155	4	3/16	4	RSB1719	44.50	RSB1719-C3	50.80
.1725		1.000	2.000	.0155	4	3/16	4	RSB1725	44.50	RSB1725-C3	52.30
.1730	#17	1.000	2.000	.0156	4	3/16	4	RSB1730	44.50	RSB1730-C3	50.80
.1735		1.000	2.000	.0156	4	3/16	4	RSB1735	44.50	RSB1735-C3	50.80
.1770	#16	1.000	2.000	.0159	4	3/16	4	RSB1770	44.50	RSB1770-C3	50.80
.1800	#15	1.000	2.125	.0162	4	3/16	4	RSB1800	44.50	RSB1800-C3	50.80
.1820	#14	1.000	2.125	.0164	4	3/16	4	RSB1820	44.50	RSB1820-C3	50.80
.1850 (4.70 mm)	#13	1.000	2.125	.0167	4	1/4	4	RSB1850	53.70	RSB1850-C3	62.20
.1860		1.000	2.125	.0167	4	1/4	4	RSB1860	53.70	RSB1860-C3	60.40
.1865		1.000	2.125	.0168	4	1/4	4	RSB1865	53.70	RSB1865-C3	60.40
.1870		1.000	2.125	.0168	4	1/4	4	RSB1870	53.70	RSB1870-C3	60.40
.1875 (3/16)		1.000	2.125	.0169	4	1/4	4	RSB1875	53.70	RSB1875-C3	60.40
.1880		1.000	2.125	.0169	4	1/4	4	RSB1880	53.70	RSB1880-C3	60.40
.1885		1.000	2.125	.0170	4	1/4	4	RSB1885	53.20	RSB1885-C3	60.40
.1890	#12	1.000	2.125	.0170	4	1/4	4	RSB1890	53.70	RSB1890-C3	60.40
.1910	#11	1.000	2.125	.0172	4	1/4	4	RSB1910	53.70	RSB1910-C3	61.30
.1935	#10	1.000	2.125	.0174	4	1/4	4	RSB1935	53.70	RSB1935-C3	61.30
.1960	#9	1.000	2.125	.0176	4	1/4	4	RSB1960	53.70	RSB1960-C3	61.30
.1969 (5.00 mm)		1.000	2.125	.0177	4	1/4	4	RSB1969	55.80	RSB1969-C3	63.90
.1990	#8	1.000	2.125	.0179	4	1/4	4	RSB1990	55.80	RSB1990-C3	63.90
.2010	#7	1.000	2.125	.0181	4	1/4	4	RSB2010	55.80	RSB2010-C3	63.90
.2015		1.000	2.125	.0181	4	1/4	4	RSB2015	57.40	RSB2015-C3	63.90
.2020		1.000	2.125	.0182	4	1/4	4	RSB2020	57.40	RSB2020-C3	65.80
.2025		1.000	2.125	.0182	4	1/4	4	RSB2025	57.40	RSB2025-C3	65.80
.2031 (13/64)		1.000	2.250	.0183	4	1/4	4	RSB2031	58.30	RSB2031-C3	66.50
.2035		1.000	2.250	.0183	4	1/4	4	RSB2035	58.30	RSB2035-C3	66.50
.2040	#6	1.000	2.250	.0184	4	1/4	4	RSB2040	58.30	RSB2040-C3	66.50
.2045		1.000	2.250	.0184	4	1/4	4	RSB2045	58.30	RSB2045-C3	66.50
.2055	#5	1.000	2.250	.0185	4	1/4	4	RSB2055	58.30	RSB2055-C3	64.60
.2090	#4	1.000	2.250	.0188	4	1/4	4	RSB2090	58.30	RSB2090-C3	64.60
.2130	#3	1.000	2.250	.0192	4	1/4	4	RSB2130	58.30	RSB2130-C3	64.60
.2170		1.000	2.375	.0195	4	1/4	4	RSB2170	58.30	RSB2170-C3	66.50

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AITIN coating is +.0002"/-.0000".

continued on next page

# MINIATURE REAMERS

(cont.)

continued from previous page

REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.2175		1.000	2.375	.0196	4	1/4	4	RSB2175	58.30	RSB2175-C3	66.50
.2180		1.000	2.375	.0196	4	1/4	4	RSB2180	58.30	RSB2180-C3	64.60
.2185		1.000	2.375	.0197	4	1/4	4	RSB2185	58.30	RSB2185-C3	64.60
.2187 (7/32)		1.000	2.375	.0197	4	1/4	4	RSB2187	58.30	RSB2187-C3	66.50
.2190		1.000	2.375	.0197	4	1/4	4	RSB2190	58.30	RSB2190-C3	64.60
.2195		1.000	2.375	.0198	4	1/4	4	RSB2195	58.30	RSB2195-C3	64.60
.2200		1.000	2.375	.0198	4	1/4	4	RSB2200	58.30	RSB2200-C3	64.60
.2205 (5.60 mm)		1.000	2.375	.0198	4	1/4	4	RSB2205	58.30	RSB2205-C3	64.60
.2210	#2	1.000	2.375	.0199	4	1/4	4	RSB2210	58.30	RSB2210-C3	66.50
.2280	#1	1.125	2.500	.0182	6	1/4	4	RSB2280	61.40	RSB2280-C3	71.50
.2330		1.125	2.500	.0186	6	1/4	4	RSB2330	63.20	RSB2330-C3	69.50
.2335		1.125	2.500	.0187	6	1/4	4	RSB2335	63.20	RSB2335-C3	71.50
.2340	A	1.125	2.500	.0187	6	1/4	4	RSB2340	63.20	RSB2340-C3	71.50
.2344 (15/64)		1.125	2.500	.0188	6	1/4	4	RSB2344	63.20	RSB2344-C3	71.50
.2350		1.125	2.500	.0188	6	1/4	4	RSB2350	61.40	RSB2350-C3	69.50
.2355		1.125	2.500	.0188	6	1/4	4	RSB2355	63.20	RSB2355-C3	69.50
.2360		1.125	2.500	.0189	6	1/4	4	RSB2360	61.40	RSB2360-C3	69.50
.2362 (6.00 mm)		1.125	2.500	.0189	6	1/4	4	RSB2362	63.20	RSB2362-C3	69.50
.2380	B	1.125	2.500	.0190	6	1/4	4	RSB2380	63.20	RSB2380-C3	69.50
.2420	C	1.125	2.500	.0194	6	1/4	4	RSB2420	63.20	RSB2420-C3	69.50
.2460	D	1.125	2.500	.0197	6	1/4	4	RSB2460	63.20	RSB2460-C3	71.50
.2485		1.125	2.750	.0199	6	5/16	4	RSB2485	65.10	RSB2485-C3	75.00
.2490		1.125	2.750	.0199	6	5/16	4	RSB2490	65.10	RSB2490-C3	75.00
.2495		1.125	2.750	.0200	6	5/16	4	RSB2495	64.40	RSB2495-C3	75.00
.2500 (1/4)	E	1.125	2.750	.0200	6	5/16	4	RSB2500	64.40	RSB2500-C3	75.00
.2505		1.125	2.750	.0200	6	5/16	4	RSB2505	64.40	RSB2505-C3	75.00
.2510		1.125	2.750	.0201	6	5/16	4	RSB2510	64.40	RSB2510-C3	75.00
.2515		1.125	2.750	.0201	6	5/16	4	RSB2515	64.40	RSB2515-C3	75.00
.2570	F	1.125	2.750	.0206	6	5/16	4	RSB2570	65.10	RSB2570-C3	75.00
.2812		1.125	2.875	.0225	6	5/16	6	RSB2812	100.40	RSB2812-C3	115.50
.3125 (5/16)		1.125	3.000	.0250	6	3/8	6	RSB3125	117.80	RSB3125-C3	133.40
.3150		1.125	3.000	.0252	6	3/8	6	RSB3150	117.80	RSB3150-C3	133.40
.3745		1.250	3.500	.0300	6	1/2	6	RSB3745	151.30	RSB3745-C3	166.40
.3750 (3/8)		1.250	3.500	.0300	6	1/2	6	RSB3750	151.30	RSB3750-C3	166.40
.3755		1.250	3.500	.0300	6	1/2	6	RSB3755	151.30	RSB3755-C3	166.40
.3760		1.250	3.500	.0301	6	1/2	6	RSB3760	151.30	RSB3760-C3	166.40

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AIIIN coating is +.0002"/-.0000".

PLEASE SEE SPEEDS & FEEDS ON PAGE 478

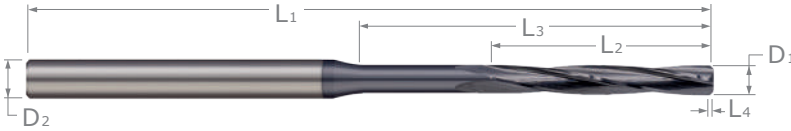


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# MINIATURE REAMERS

## Right Hand Spiral



	D1 Tolerances
Uncoated	+ .0000" - .0002"
AlTiN Coated	+ .0002" - .0000"

- Helical flutes increase shearing action on chamfer for superior finish
- Right hand spiral flutes for increased chip evacuation in blind hole applications
- Available uncoated or with AlTiN coating for improved lubricity and heat resistance
- Oversized, common shanks to maintain strength, stiffness, and accuracy
- 45° chamfer angle • h6 shank tolerance for high precision tool holders
- Solid carbide • CNC ground in the USA

REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AlTiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D1*		L2 <sup>+ .020"</sup> <sub>- .000"</sub>	L3 <sup>+ .020"</sup> <sub>- .000"</sub>	L4		D2 (h6)	L1				
.0100	#87	.078	.125	.0017	4	1/8	1-1/2	RRH0100	57.60	RRH0100-C3	62.80
.0150		.109	.187	.0025	4	1/8	1-1/2	RRH0150	58.70	RRH0150-C3	63.90
.0200	#76	.140	.250	.0023	4	1/8	1-1/2	RRH0200	43.30	RRH0200-C3	48.50
.0250	#72	.187	.312	.0029	4	1/8	1-1/2	RRH0250	44.20	RRH0250-C3	49.40
.0300		.218	.375	.0035	4	1/8	2	RRH0300	44.20	RRH0300-C3	49.40
.0305		.218	.375	.0035	4	1/8	2	RRH0305	43.30	RRH0305-C3	48.50
.0310	#68	.218	.375	.0036	4	1/8	2	RRH0310	44.20	RRH0310-C3	49.40
.0315 (.80 mm)		.218	.375	.0036	4	1/8	2	RRH0315	43.30	RRH0315-C3	48.50
.0350	#65	.250	.437	.0040	4	1/8	2	RRH0350	44.20	RRH0350-C3	49.40
.0400	#60	.281	.500	.0046	4	1/8	2	RRH0400	43.30	RRH0400-C3	48.50
.0500		.375	.625	.0050	4	1/8	2	RRH0500	36.40	RRH0500-C3	41.60
.0600		.437	.812	.0060	4	1/8	2	RRH0600	36.40	RRH0600-C3	41.60
.0620		.437	.812	.0062	4	1/8	2	RRH0620	36.40	RRH0620-C3	41.60
.0625 (1/16)		.437	.812	.0063	4	1/8	2	RRH0625	36.40	RRH0625-C3	41.60
.0630 (1.60 mm)		.437	.812	.0063	4	1/8	2	RRH0630	36.40	RRH0630-C3	41.60
.0700	#50	.562	.937	.0063	4	1/8	2	RRH0700	36.40	RRH0700-C3	41.60
.0781 (5/64)		.562	1.000	.0070	4	1/8	2	RRH0781	36.40	RRH0781-C3	41.60
.0800		.562	1.000	.0072	4	1/8	2	RRH0800	36.40	RRH0800-C3	41.60
.0900		.625	1.125	.0081	4	1/8	2-1/2	RRH0900	36.40	RRH0900-C3	41.60
.0935	#42	.687	1.250	.0084	4	1/8	2-1/2	RRH0935	36.40	RRH0935-C3	41.60
.0937 (3/32)		.687	1.250	.0084	4	1/8	2-1/2	RRH0937	36.40	RRH0937-C3	41.60
.0940		.687	1.250	.0085	4	1/8	2-1/2	RRH0940	36.40	RRH0940-C3	41.60
.0950		.687	1.250	.0086	4	1/8	2-1/2	RRH0950	36.40	RRH0950-C3	41.60
.1000		.750	1.375	.0090	4	1/8	2-1/2	RRH1000	36.40	RRH1000-C3	41.60

REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	AlTiN COATED
D1*		L2 <sup>+ .030"</sup> <sub>- .000"</sub>	L3 <sup>+ .030"</sup> <sub>- .000"</sub>	L4		D2 (h6)	L1	TOOL #	PRICE
.1245		.750	1.500	.0112	4	3/16	3	RRH1245	42.70
.1250 (1/8)		.750	1.500	.0113	4	3/16	3	RRH1250	42.70
.1255		.750	1.500	.0113	4	3/16	3	RRH1255	42.70
.1285	#30	.750	1.500	.0116	4	3/16	3	RRH1285	42.70
.1560		.875	1.750	.0140	4	3/16	3	RRH1560	42.70
.1575 (4.00 mm)		.875	1.750	.0142	4	3/16	3	RRH1575	42.70
.1870		1.000	2.125	.0168	4	1/4	4	RRH1870	57.30
.1875 (3/16)		1.000	2.125	.0169	4	1/4	4	RRH1875	57.30
.1880		1.000	2.125	.0169	4	1/4	4	RRH1880	57.30

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AlTiN coating is +.0002"/-.0000".

PLEASE SEE SPEEDS & FEEDS ON PAGE 478

# MINIATURE REAMERS

(cont.)

## SPEEDS & FEEDS (Miniature Reamers)

**Important Note:** Values in table are based on a material hardness of 29-37 Rc for Ferrous Materials and up to 28 Rc for Non-Ferrous Materials. For higher hardness materials, table values of IPR must be reduced. For ferrous materials at 38-45 Rc, reduce IPR to 80%. For complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

In order to maintain appropriate stock removal amounts based on the reamer size, a hole should be pre-drilled at a diameter that is 90-94% of the finished reamed hole diameter. For example, for a finished reamed hole diameter of .0625", the pre-drilled hole diameter should be in the range of .056"-.058". The pre-drilled hole should not be smaller than 85% of the finished reamed hole diameter.

Material	SFM	Chip Load IPR (Inches Per Revolution) By Reamer Diameter													
		.015	.031	.047	.062	.078	.093	.125	.187	.250	.375				
<b>Aluminum Alloys</b> Casting (2xx, 5xx, 7xx, 8xx)	450														
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	600	.00041	.00084	.00127	.00167	.00211	.00251	.00338	.00505	.00675	.01013				
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	450														
Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	420														
Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	390														
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	350														
Wrought - 5%-8% Si (4xxx)	600	.00036	.00075	.00114	.00151	.00190	.00226	.00304	.00454	.00608	.00911				
Wrought - 8%-12% Si (4xxx)	480														
<b>Magnesium Alloys</b>	900														
<b>Zinc Alloys</b>	480	.00041	.00084	.00127	.00167	.00211	.00251	.00338	.00505	.00675	.01013				
<b>Copper Alloys</b> High Coppers - 90%+ (C1xxx)	170														
Brass (Copper Zinc alloys, C2xxx, C3xxx, C4xxx, C66400-C69800)	375														
Phosphor Bronzes (Copper Tin alloys, C5xxx)	170														
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	375	.00032	.00067	.00102	.00134	.00168	.00201	.00270	.00404	.00540	.00810				
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	375														
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxx)	170														
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	400														
<b>Carbon Steels</b> Free Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	240	.00035	.00073	.00111	.00146	.00184	.00220	.00295	.00442	.00591	.00886				
1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx	150	.00032	.00067	.00102	.00134	.00168	.00201	.00270	.00404	.00540	.00810				
<b>Stainless Steels</b> 203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	180	.00035	.00073	.00111	.00146	.00184	.00220	.00295	.00442	.00591	.00886				
201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 420, 429, 430, 434, 436, 442, 446, 501, 502	150	.00032	.00067	.00102	.00134	.00168	.00201	.00270	.00404	.00540	.00810				
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	125	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	.00506				
<b>Tool Steels</b> A, L, O, P, W series	125	.00032	.00067	.00102	.00134	.00168	.00201	.00270	.00404	.00540	.00810				
D, H, M, T, S series	90	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	.00506				
<b>Titanium Alloys</b>	100	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	.00506				
<b>High Temp Alloys</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy	70	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	.00506				

REAMERS

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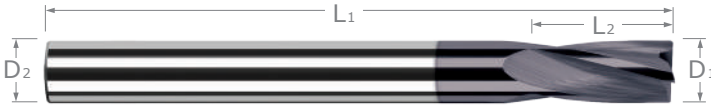


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# COUNTERBORES

Flat Bottom



For Spot Facing or Counterboring on Irregular Surfaces

- **Flat bottom (no dish)** design allows spot facing or counterboring on irregular surfaces
- Ideal for castings, rounded parts, concaved, or drafted surfaces
- Center cutting
- Can be used for flat bottom reaming or straightening misaligned holes
- 15° helix
- 4 flutes
- Solid carbide
- Ground with full cylindrical margin (not side cutting)
- AlTiN coating for increased performance in ferrous materials
- AlTiN Nano coating for superior performance in ferrous and difficult to machine materials
- TiB2 coating prevents chip packing in non-abrasive aluminum alloys
- CNC ground in the USA

NEW

NEW

NEW

NEW

NEW

NEW

NEW

	CUTTER DIAMETER	FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AlTiN COATED		AlTiN NANO COATED		TiB <sub>2</sub> COATED	
					4 FL	PRICE	4 FL	PRICE	4 FL	PRICE	3 FL	PRICE
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.0005"</sub> *	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>								
	.0200	.060	1/8	1-1/2	23320	32.40	23320-C3	37.60				
	.0300	1/8	1/8	1-1/2	23330	31.80	23330-C3	37.00				
	.0312 (1/32)	1/8	1/8	1-1/2	23331	31.50	23331-C3	36.70				
	.0394 (1 mm)	5/32	1/8	1-1/2	2331M	31.50	2331M-C3	36.70			2331M-C8	39.10
	.0400	5/32	1/8	1-1/2	23340	31.80	23340-C3	37.00				
	.0469 (3/64)	3/16	1/8	1-1/2	23347	31.50	23347-C3	36.70				
	.0500	3/16	1/8	1-1/2	23350	31.80	23350-C3	37.00				
	.0550	1/4	1/8	1-1/2	23355	31.50	23355-C3	36.70				
	.0600	1/4	1/8	1-1/2	23360	31.50	23360-C3	36.70				
	.0625 (1/16)	1/4	1/8	1-1/2	23362	31.50	23362-C3	36.70	23362-C6	39.10	23362-C8	39.10
	.0700	9/32	1/8	1-1/2	23370	31.50	23370-C3	36.70				
	.0781 (5/64)	5/16	1/8	1-1/2	23378	31.50	23378-C3	36.70				
	.0787 (2 mm)	5/16	1/8	1-1/2	2332M	31.50	2332M-C3	36.70				
	.0800	5/16	1/8	1-1/2	23380	31.50	23380-C3	36.70				
	.0900	3/8	1/8	1-1/2	23390	31.50	23390-C3	38.80				
	.0937 (3/32)	3/8	1/8	1-1/2	23393	31.50	23393-C3	36.70	23393-C6	39.10		
	.1094 (7/64)	3/8	1/8	1-1/2	23407	31.50	23407-C3	36.70				
	.1181 (3 mm)	3/8	1/8	1-1/2	2343M	31.50	2343M-C3	36.70	2343M-C6	39.10	2343M-C8	39.10
	.1250 (1/8)	1/2	1/8	1-1/2	23408	31.50	23408-C3	36.70	23408-C6	39.10	23408-C8	39.10
	.1406 (9/64)	9/16	3/16	2	23409	30.10	23409-C3	35.70	23409-C6	38.30		
	.1562 (5/32)	5/8	3/16	2	23410	30.10	23410-C3	35.70				
	.1575 (4 mm)	5/8	3/16	2	2344M	30.10	2344M-C3	35.70				
	.1719 (11/64)	5/8	3/16	2	23411	30.10	23411-C3	35.70	23411-C6	38.30		
	.1875 (3/16)	3/4	3/16	2	23412	30.10	23412-C3	35.70	23412-C6	38.30	23412-C8	37.70
	.1968 (5 mm)	3/4	1/4	2-1/2	2345M	41.20	2345M-C3	48.80	2345M-C6	52.40	2345M-C8	49.40
	.2031 (13/64)	3/4	1/4	2-1/2	23413	41.20	23413-C3	48.80				
	.2187 (7/32)	3/4	1/4	2-1/2	23414	41.20	23414-C3	48.80				
	.2344 (15/64)	7/8	1/4	2-1/2	23415	41.20	23415-C3	48.80				
	.2362 (6 mm)	7/8	1/4	2-1/2	2346M	41.20	2346M-C3	48.80	2346M-C6	52.40		
	.2500 (1/4)	7/8	1/4	2-1/2	23416	41.20	23416-C3	48.80	23416-C6	52.40	23416-C8	49.40
	.2656 (17/64)	7/8	5/16	2-1/2	23417	50.80	23417-C3	59.70				
	.2812 (9/32)	7/8	5/16	2-1/2	23418	50.80	23418-C3	59.70				
	.2969 (19/64)	7/8	5/16	2-1/2	23419	50.80	23419-C3	59.70				

\* Tolerance listed above refers to uncoated counterbores. Tolerance for AlTiN and AlTiN Nano coating is  $\pm .0002"/- .0005"$ .

continued on next page

COUNTERBORES

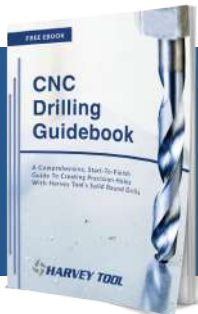
## COUNTERBORES

## Flat Bottom (cont.)

continued from previous page

CUTTER DIAMETER	FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITiN COATED		AITiN NANO COATED		TiB <sub>2</sub> COATED	
				4 FL	PRICE	4 FL	PRICE	4 FL	PRICE	3 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.0005"</sub> *	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.0000"</sub>	D <sub>2</sub>	L <sub>1</sub>								
.3125 (5/16)	1	5/16	2-1/2	23420	50.80	23420-C3	59.70	23420-C6	63.40	23420-C8	68.20
.3150 (8 mm)	1	3/8	2-1/2	2348M	60.70	2348M-C3	70.80				
.3281 (21/64)	1	3/8	2-1/2	23421	60.70	23421-C3	70.80				
.3437 (11/32)	1	3/8	2-1/2	23422	60.70	23422-C3	70.80				
.3594 (23/64)	1	3/8	2-1/2	23423	60.70	23423-C3	70.80				
.3750 (3/8)	1	3/8	2-1/2	23424	60.70	23424-C3	70.80	23424-C6	73.30	23424-C8	81.80
.3937 (10 mm)	1	7/16	2-3/4	2340M	74.90	2340M-C3	87.50				
.4062 (13/32)	1	7/16	2-3/4	23426	74.90	23426-C3	87.50				
.4375 (7/16)	1	7/16	2-3/4	23428	74.90	23428-C3	87.50				
.4687 (15/32)	1	1/2	3	23430	101.40	23430-C3	116.50				
.4724 (12 mm)	1	1/2	3	23476	98.50	23476-C3	113.60				
.5000 (1/2)	1	1/2	3	23432	98.50	23432-C3	113.60	23432-C6	114.80	23432-C8	123.30
.5625 (9/16)	1-1/2	5/8	3-1/2	23436	139.90	23436-C3	155.00				
.6250 (5/8)	1-1/2	5/8	3-1/2	23440	156.70	23440-C3	171.80				
.6875 (11/16)	1-1/2	3/4	4	23444	233.70	23444-C3	250.00				
.7500 (3/4)	1-1/2	3/4	4	23448	227.10	23448-C3	243.40				

\* Tolerance listed above refers to uncoated counterbores. Tolerance for AITiN and AITiN Nano coating is  $+0.0002"/-0.0005"$ .



Learn the Secrets to Higher Quality  
Drilling Operations

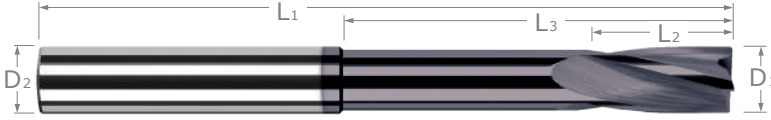


Download our CNC Drilling Guidebook on [harveytool.com](http://harveytool.com)



# COUNTERBORES

## Flat Bottom – Long Reach



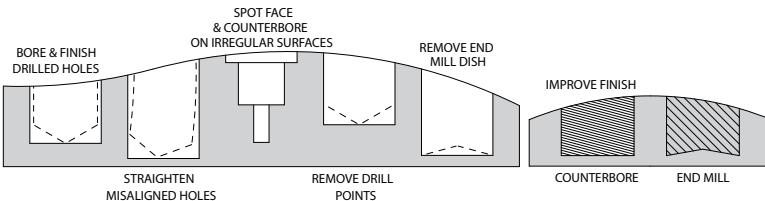
◀ **Undersized Neck to Avoid Heeling**

- **Flat bottom (no dish)** design allows spot facing or counterboring on irregular surfaces
- Ideal for castings, rounded parts, concaved, or drafted surfaces
- Can be used for flat bottom reaming or straightening misaligned holes • Center cutting
- Ground with full cylindrical margin (not side cutting) • 15° helix • 4 flutes • Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	FLUTE LENGTH	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN COATED	
					4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.0000"</sup> / <sub>-.0005"</sub> *	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>				
.0312 (1/32)	1/8	1/4	1/8	2-1/2	25431	38.30	25431-C3	43.50
.0394 (1 mm)	5/32	5/16	1/8	2-1/2	2541M	37.60	2541M-C3	42.80
.0469 (3/64)	3/16	3/8	1/8	2-1/2	25447	37.60	25447-C3	42.80
.0625 (1/16)	1/4	1/2	1/8	2-1/2	25462	37.60	25462-C3	42.80
.0781 (5/64)	5/16	5/8	1/8	2-1/2	25478	37.60	25478-C3	42.80
.0787 (2 mm)	5/16	5/8	1/8	2-1/2	2542M	37.60	2542M-C3	42.80
.0937 (3/32)	3/8	3/4	1/8	2-1/2	25493	37.60	25493-C3	42.80
.1094 (7/64)	3/8	7/8	1/8	2-1/2	25507	37.60	25507-C3	42.80
.1181 (3 mm)	3/8	1	1/8	2-1/2	2553M	37.60	2553M-C3	42.80
.1250 (1/8)	1/2	1	1/8	2-1/2	25508	37.60	25508-C3	42.80
.1406 (9/64)	9/16	1-1/8	3/16	3	25509	45.80	25509-C3	51.40
.1562 (5/32)	5/8	1-1/4	3/16	3	25510	45.80	25510-C3	51.40
.1575 (4 mm)	5/8	1-1/4	3/16	3	2554M	45.80	2554M-C3	51.40
.1719 (11/64)	5/8	1-3/8	3/16	3	25511	45.80	25511-C3	51.40
.1875 (3/16)	3/4	1-1/2	3/16	3	25512	45.80	25512-C3	51.40
.1968 (5 mm)	3/4	1-9/16	1/4	4	2555M	63.50	2555M-C3	72.40
.2031 (13/64)	3/4	1-5/8	1/4	4	25513	60.80	25513-C3	69.70
.2187 (7/32)	3/4	1-3/4	1/4	4	25514	60.80	25514-C3	69.70
.2344 (15/64)	7/8	1-7/8	1/4	4	25515	60.80	25515-C3	69.70
.2362 (6 mm)	7/8	1-7/8	1/4	4	2556M	63.50	2556M-C3	72.40
.2500 (1/4)	7/8	2	1/4	4	25516	60.80	25516-C3	69.70
.2656 (17/64)	7/8	2-1/8	5/16	4	25517	77.10	25517-C3	87.80
.2812 (9/32)	7/8	2-1/4	5/16	4	25518	77.10	25518-C3	87.80
.2969 (19/64)	7/8	2-3/8	5/16	4	25519	77.10	25519-C3	87.80
.3125 (5/16)	1	2-1/2	5/16	4	25520	77.10	25520-C3	87.80
.3150 (8 mm)	1	2-1/2	3/8	4	2558M	99.50	2558M-C3	113.30
.3437 (11/32)	1	2-3/4	3/8	4	25522	93.00	25522-C3	106.80
.3750 (3/8)	1	3	3/8	4	25524	93.00	25524-C3	106.80
.3937 (10 mm)	1	3	7/16	4	2550M	115.70	2550M-C3	130.80
.4375 (7/16)	1	3	7/16	4	25528	108.00	25528-C3	123.10
.5000 (1/2)	1	3	1/2	4	25532	132.40	25532-C3	147.50

\* Tolerance listed above refers to uncoated counterbores. Tolerance for A1TIN coating is +.0002"/-.0005".

### APPLICATIONS:



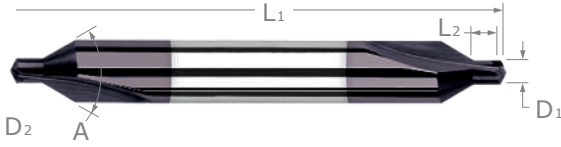
**SPOT EFFECTIVELY.** The flat bottom removes end mill dish or drill points while effectively spotting on irregular surfaces.

**HOLD POSITION.** The full cylindrical margin and back taper are not side cutting and won't grab or deflect.

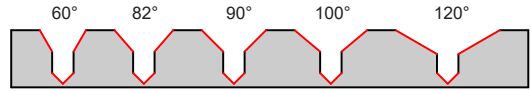
**CONTROL FINISH.** The low rake avoids part engagement and helps to control finish.

COUNTERBORES

# COMBINED DRILL & COUNTERSINKS



- 60°, 82°, 90°, 100°, and 120° included angles - plain type
- 2 flutes
- 118° included tip angle
- Double-ended
- Solid carbide
- CNC ground in the USA

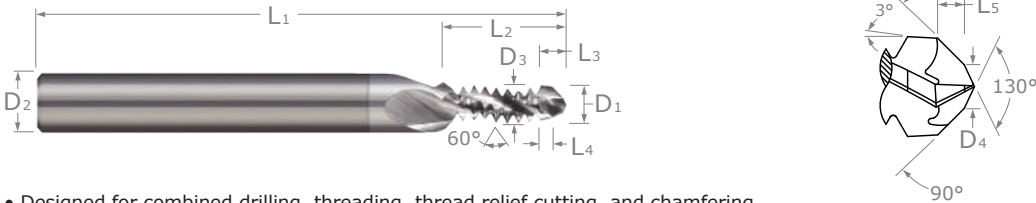


Stocked in *Five* Angles!

COMBINED DRILL & COUNTERSINKS

INCLUDED ANGLE	SIZE	DRILL DIAMETER	DRILL LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
						2 FL	PRICE	2 FL	PRICE
A <sup>+1°</sup> -1°		D <sub>1</sub> <sup>+0.015"</sup> +0.005"	L <sub>2</sub> <sup>+0.05"</sup> -0.000"	D <sub>2</sub>	L <sub>1</sub>				
60°	0000	1/64	1/64	1/8	1-1/2	11002	33.60	11002-C3	40.00
	000	.020	.020	1/8	1-1/2	11005	25.50	11005-C3	31.90
	00	.025	.025	1/8	1-1/2	11010	19.90	11010-C3	26.30
	0	1/32	1/32	1/8	1-1/2	11020	19.90	11020-C3	26.30
	1	3/64	3/64	1/8	1-1/2	11030	16.70	11030-C3	23.10
	2	5/64	5/64	3/16	2	11040	25.50	11040-C3	33.10
	3	7/64	7/64	1/4	2	11050	29.00	11050-C3	39.40
	4	1/8	1/8	5/16	2-1/2	11060	39.70	11060-C3	52.30
	5	3/16	3/16	7/16	2-3/4	11070	59.30	11070-C3	78.10
82°	6	7/32	7/32	1/2	3	11080	84.50	11080-C3	105.20
82°	00	.025	.025	1/8	1-1/2	25610	21.30	25610-C3	27.70
	0	1/32	1/32	1/8	1-1/2	25620	21.10	25620-C3	27.50
	1	3/64	3/64	1/8	1-1/2	25630	17.70	25630-C3	24.10
	2	5/64	5/64	3/16	2	25640	27.20	25640-C3	34.80
	3	7/64	7/64	1/4	2	25650	30.90	25650-C3	41.30
	4	1/8	1/8	5/16	2-1/2	25660	41.90	25660-C3	54.50
	5	3/16	3/16	7/16	2-3/4	25670	63.00	25670-C3	81.80
90°	0000	1/64	1/64	1/8	1-1/2	17902	34.70	17902-C3	41.10
	000	.020	.020	1/8	1-1/2	17905	26.30	17905-C3	32.70
	00	.025	.025	1/8	1-1/2	17910	20.60	17910-C3	27.00
	0	1/32	1/32	1/8	1-1/2	17920	20.60	17920-C3	27.00
	1	3/64	3/64	1/8	1-1/2	17930	17.30	17930-C3	23.70
	2	5/64	5/64	3/16	2	17940	26.30	17940-C3	33.90
	3	7/64	7/64	1/4	2	17950	29.90	17950-C3	40.30
	4	1/8	1/8	5/16	2-1/2	17960	40.70	17960-C3	53.30
	5	3/16	3/16	7/16	2-3/4	17970	61.10	17970-C3	79.90
100°	6	7/32	7/32	1/2	3	17980	86.40	17980-C3	107.10
100°	0	1/32	1/32	1/8	1-1/2	849520	23.60	849520-C3	30.00
	1	3/64	3/64	1/8	1-1/2	849530	20.00	849530-C3	26.40
	2	5/64	5/64	3/16	2	849540	30.10	849540-C3	36.30
	3	7/64	7/64	1/4	2	849550	34.20	849550-C3	44.60
	4	1/8	1/8	5/16	2-1/2	849560	46.50	849560-C3	56.00
120°	2	5/64	5/64	3/16	2	822540	30.10	822540-C3	35.20
	3	7/64	7/64	1/4	2	822550	34.20	822550-C3	39.70
	4	1/8	1/8	5/16	2-1/2	822560	46.50	822560-C3	51.90

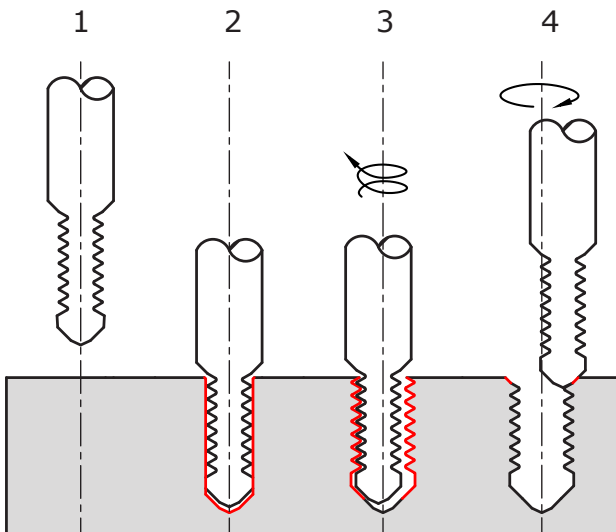
## COMBINATION DRILL / THREAD MILLS



- Designed for combined drilling, threading, thread relief cutting, and chamfering
- One cutter for 4 different operations saves time on tool changes and leaves more room in the tool carousel
- Length of cut includes transition angle, allowing for optional 45° chamfer pass
- Optimized for cutting non-ferrous materials such as aluminum, unfilled plastics, copper, brass, and bronze alloys
- Recommended for cutting, threading and chamfering through holes
- 3 flutes to center • Cuts internal 60° UN threads • 90° included back chamfer
- Solid carbide • CNC ground in the USA

THREAD SIZE	DRILL DIAMETER	LENGTH OF CUT	THREAD DIAMETER	SECONDARY POINT DIAMETER	LENGTH OF TIP	LENGTH OF THREAD RELIEF	CHAMFER LENGTH	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED	
	D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>3</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	D <sub>4</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE
4-40	.0876	.2513	.085	.0356	.0580	.0250	.0247	1/8	2	820616	120.60	820616-C8	128.20
6-32	.1076	.3323	.100	.0475	.0707	.0312	.0284	3/16	2	820622	124.40	820622-C8	132.00
8-32	.1336	.3652	.115	.0735	.0767	.0312	.0284	3/16	2	820628	133.20	820628-C8	140.80
10-24	.1494	.4966	.120	.0760	.0939	.0416	.0345	1/4	2	820634	139.80	820634-C8	148.00
10-32	.1596	.4681	.120	.0995	.0828	.0312	.0284	1/4	2	820636	139.80	820636-C8	148.00
1/4-20	.2013	.7154	.180	.1172	.1168	.0500	.0394	3/8	2-1/2	820644	166.50	820644-C8	179.80
1/4-28	.2152	.7078	.180	.1494	.1016	.0357	.0310	3/8	2-1/2	820646	166.50	820646-C8	187.60
5/16-18	.2584	.8750	.240	.1671	.1372	.0555	.0427	3/8	2-1/2	820654	182.00	820654-C8	195.00
5/16-24	.2719	.8248	.240	.1985	.1224	.0416	.0345	3/8	2-1/2	820656	204.60	820656-C8	225.70
3/8-16	.3141	1.019	.285	.2140	.1592	.0625	.0468	1/2	3	820664	243.20	820664-C8	258.20
7/16-20	.3888	1.154	.335	.3047	.1605	.0500	.0394	1/2	3-1/2	820676	262.90	820676-C8	287.70
1/2-13	.4251	1.279	.350	.3064	.2036	.0769	.0553	5/8	3-1/2	820684	271.30	820684-C8	307.40

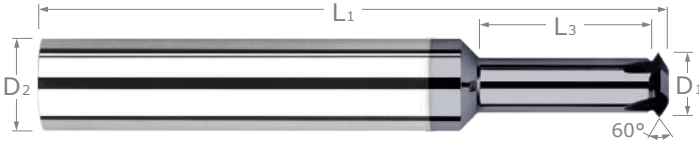
### Combination Drill/Thread Mills Order of Operations



1. Approach the workpiece by centering the tool along the axis of the anticipated hole.
2. Drill a hole to the desired depth. For simultaneous chamfering, use the full length of cut to engage on the transition of the tool.
3. To begin thread, lift drill up by 1/2x - 1x pitch, then helically interpolate up 1 pitch. Return tool to center axis of the hole for retraction.
4. Re-engage the tool on top of the hole to create, increase, or finish the chamfer if desired.

# THREAD MILLING CUTTERS

## Single Form – UN Threads



Stocked in Multiple Reach Lengths!



- Single thread form – can mill multiple pitches
- Cuts internal and external 60° UN threads
- Mills right hand and left hand threads
- Tip of included angle ground to a point
- Solid carbide
- CNC ground in the USA

For thread fit chart, scan the QR code or visit [harveytool.com/resources](http://harveytool.com/resources)



THREAD SIZE	CUTTER DIA. D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	NECK DIA.	MAX DEPTH OF THREAD L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
00	.032	.016	<b>1/16</b>	2	1/8	1-1/2	71001	79.60	71001-C3	84.80		
00	.032	.016	<b>3/32</b>	2	1/8	1-1/2	41401	84.30	41401-C3	89.50		
00	.032	.016	<b>1/8</b>	2	1/8	1-1/2	54201	85.10	54201-C3	90.30		
0	.044	.024	<b>3/32</b>	2	1/8	1-1/2	71002	76.80	71002-C3	82.00	71002-C4	89.90
0	.044	.024	<b>1/8</b>	2	1/8	1-1/2	41402	81.60	41402-C3	86.80	41402-C4	94.70
0	.044	.024	<b>3/16</b>	2	1/8	1-1/2	54202	87.70	54202-C3	92.90	54202-C4	100.80
0	.044	.024	<b>1/4</b>	2	1/8	1-1/2	993902	91.80	993902-C3	97.00		
0	.044	.024	<b>5/16</b>	2	1/8	1-1/2	901202	95.60	901202-C3	100.80		
1	.054	.032	<b>3/32</b>	2	1/8	1-1/2	932904	77.40	932904-C3	82.60		
1	.054	.032	<b>1/8</b>	2	1/8	1-1/2	71004	76.80	71004-C3	82.00	71004-C4	89.90
1	.054	.032	<b>3/16</b>	2	1/8	1-1/2	41404	81.60	41404-C3	86.80	41404-C4	94.70
1	.054	.032	<b>1/4</b>	2	1/8	1-1/2	54204	87.70	54204-C3	92.90	54204-C4	100.80
1	.054	.032	<b>5/16</b>	2	1/8	1-1/2	993904	91.80	993904-C3	97.00		
1	.054	.032	<b>3/8</b>	2	1/8	1-1/2	901204	95.60	901204-C3	100.80		
2	.064	.038	<b>1/8</b>	2	1/8	1-1/2	772906	77.40	772906-C3	82.60		
2	.064	.038	<b>5/32</b>	2	1/8	1-1/2	71006	76.80	71006-C3	82.00	71006-C4	89.90
2	.064	.038	<b>3/16</b>	2	1/8	1-1/2	822706	79.20	822706-C3	84.40		
2	.064	.038	<b>7/32</b>	2	1/8	1-1/2	41406	81.60	41406-C3	86.80	41406-C4	94.70
2	.064	.038	<b>1/4</b>	2	1/8	1-1/2	821406	84.60	821406-C3	89.80		
2	.064	.038	<b>5/16</b>	2	1/8	1-1/2	54206	87.70	54206-C3	92.90	54206-C4	100.80
2	.064	.038	<b>7/16</b>	2	1/8	1-1/2	993906	91.80	993906-C3	97.00		
2	.064	.038	<b>9/16</b>	2	1/8	1-1/2	901206	95.60	901206-C3	100.80		
3	.072	.040	<b>5/32</b>	2	1/8	1-1/2	71008	76.80	71008-C3	82.00	71008-C4	89.90
3	.072	.040	<b>1/4</b>	2	1/8	1-1/2	41408	81.60	41408-C3	86.80	41408-C4	94.70
3	.072	.040	<b>5/16</b>	2	1/8	1-1/2	<b>821408</b>	84.70	<b>821408-C3</b>	89.90		NEW
3	.072	.040	<b>3/8</b>	2	1/8	1-1/2	54208	87.70	54208-C3	92.90	54208-C4	100.80
3	.072	.040	<b>1/2</b>	2	1/8	1-1/2	993908	91.80	993908-C3	97.00		
4	.080	.040	<b>1/8</b>	2	3/16	2	71010	77.00	71010-C3	82.60	71010-C4	95.10
4	.080	.040	<b>3/16</b>	2	3/16	2	820310	79.40	820310-C3	85.00		
4	.080	.040	<b>1/4</b>	2	3/16	2	41410	81.80	41410-C3	87.40	41410-C4	99.90
4	.080	.040	<b>5/16</b>	2	3/16	2	821410	84.90	821410-C3	90.50		
4	.080	.040	<b>3/8</b>	2	3/16	2	54210	88.10	54210-C3	93.70	54210-C4	106.20
4	.080	.040	<b>7/16</b>	2	3/16	2	771810	90.30	771810-C3	95.90		
4	.080	.040	<b>1/2</b>	2	3/16	2	993910	92.50	993910-C3	98.10		
4	.080	.040	<b>5/8</b>	2	3/16	2	901210	97.10	901210-C3	102.70		
5	.093	.050	<b>1/8</b>	4	3/16	2	932915	77.40	932915-C3	83.00		
5	.093	.050	<b>3/16</b>	4	3/16	2	71015	76.80	71015-C3	82.40		
5	.093	.050	<b>1/4</b>	4	3/16	2	822715	79.20	822715-C3	84.80		
5	.093	.050	<b>3/8</b>	4	3/16	2	41415	81.60	41415-C3	87.20	41415-C4	99.70
5	.093	.050	<b>1/2</b>	4	3/16	2	54215	87.70	54215-C3	93.30		
5	.093	.050	<b>5/8</b>	4	3/16	2	993915	92.50	993915-C3	98.10		

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THREAD MILLING CUTTERS

# THREAD MILLING CUTTERS

Single Form – UN Threads (cont.)

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THREAD SIZE	CUTTER DIA. D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	NECK DIA.	MAX DEPTH OF THREAD L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
6	.098	.050	<b>5/32</b>	4	3/16	2	932920	77.00	932920-C3	82.60		
6	.098	.050	<b>1/4</b>	4	3/16	2	71020	77.00	71020-C3	82.60	71020-C4	95.10
6	.098	.050	<b>5/16</b>	4	3/16	2	822720	79.20	822720-C3	84.80		
6	.098	.050	<b>3/8</b>	4	3/16	2	41420	81.80	41420-C3	87.40	41420-C4	99.90
6	.098	.050	<b>7/16</b>	4	3/16	2	821420	84.90	821420-C3	90.50		
6	.098	.050	<b>1/2</b>	4	3/16	2	54220	88.10	54220-C3	93.70	54220-C4	106.20
6	.098	.050	<b>5/8</b>	4	3/16	2	993920	92.50	993920-C3	98.10		
6	.098	.050	<b>3/4</b>	4	3/16	2	901220	97.10	901220-C3	102.70		
8	.120	.070	<b>7/32</b>	4	1/4	2-1/2	932930	78.10	932930-C3	85.70		
8	.120	.070	<b>5/16</b>	4	1/4	2-1/2	71030	79.00	71030-C3	86.60	71030-C4	99.60
8	.120	.070	<b>3/8</b>	4	1/4	2-1/2	820330	81.60	820330-C3	89.20		
8	.120	.070	<b>1/2</b>	4	1/4	2-1/2	41430	84.30	41430-C3	91.90	41430-C4	104.90
8	.120	.070	<b>9/16</b>	4	1/4	2-1/2	821430	87.10	821430-C3	92.20		
8	.120	.070	<b>5/8</b>	4	1/4	2-1/2	54230	90.10	54230-C3	97.70	54230-C4	110.70
8	.120	.070	<b>3/4</b>	4	1/4	2-1/2	993930	97.10	993930-C3	104.70		
8	.120	.070	<b>7/8</b>	4	1/4	2-1/2	901230	102.90	901230-C3	110.50		
10	.135	.070	<b>7/32</b>	4	1/4	2-1/2	932940	78.10	932940-C3	85.70		
10	.135	.070	<b>5/16</b>	4	1/4	2-1/2	71040	79.00	71040-C3	86.60	71040-C4	99.60
10	.135	.070	<b>3/8</b>	4	1/4	2-1/2	820340	81.60	820340-C3	89.20		
10	.135	.070	<b>1/2</b>	4	1/4	2-1/2	41440	84.30	41440-C3	91.90	41440-C4	104.90
10	.135	.070	<b>5/8</b>	4	1/4	2-1/2	54240	90.10	54240-C3	97.70	54240-C4	110.70
10	.135	.070	<b>3/4</b>	4	1/4	2-1/2	771840	93.60	771840-C3	101.20		
10	.135	.070	<b>7/8</b>	4	1/4	2-1/2	993940	97.10	993940-C3	104.70		
10	.135	.070	<b>1-1/8</b>	4	1/4	2-1/2	901240	102.90	901240-C3	110.50		
12	.160	.095	<b>1/4</b>	4	1/4	2-1/2	932945	79.70	932945-C3	87.30		
12	.160	.095	<b>3/8</b>	4	1/4	2-1/2	71045	79.00	71045-C3	86.60		
12	.160	.095	<b>1/2</b>	4	1/4	2-1/2	822745	81.60	822745-C3	89.20		
12	.160	.095	<b>5/8</b>	4	1/4	2-1/2	41445	84.30	41445-C3	91.90		
12	.160	.095	<b>7/8</b>	4	1/4	2-1/2	54245	90.10	54245-C3	97.70		
12	.160	.095	<b>1-1/8</b>	4	1/4	2-1/2	993945	95.20	993945-C3	102.80		
1/4	.180	.115	<b>5/16</b>	4	1/4	2-1/2	932950	78.10	932950-C3	85.70		
1/4	.180	.115	<b>3/8</b>	4	1/4	2-1/2	772950	78.60	772950-C3	86.20		
1/4	.180	.115	<b>1/2</b>	4	1/4	2-1/2	71050	79.00	71050-C3	86.60	71050-C4	99.60
1/4	.180	.115	<b>5/8</b>	4	1/4	2-1/2	822750	81.60	822750-C3	89.20		
1/4	.180	.115	<b>3/4</b>	4	1/4	2-1/2	41450	84.30	41450-C3	91.90	41450-C4	104.90
1/4	.180	.115	<b>7/8</b>	4	1/4	2-1/2	821450	87.10	821450-C3	94.70		
1/4	.180	.115	<b>1</b>	4	1/4	2-1/2	54250	90.10	54250-C3	97.70	54250-C4	110.70
1/4	.180	.115	<b>1-1/8</b>	4	1/4	2-1/2	771850	93.40	771850-C3	101.00		
1/4	.180	.115	<b>1-1/4</b>	4	1/4	2-1/2	993950	97.10	993950-C3	104.70		
1/4	.180	.115	<b>1-1/2</b>	4	1/4	3	901250	102.90	901250-C3	110.50		
5/16	.240	.160	<b>3/8</b>	4	1/4	2-1/2	932955	79.70	932955-C3	87.30		
5/16	.240	.160	<b>1/2</b>	4	1/4	2-1/2	71055	79.00	71055-C3	86.60	71055-C4	99.60
5/16	.240	.160	<b>5/8</b>	4	1/4	2-1/2	822755	81.60	822755-C3	89.20		
5/16	.240	.160	<b>3/4</b>	4	1/4	2-1/2	41455	84.30	41455-C3	91.90	41455-C4	104.90
5/16	.240	.160	<b>7/8</b>	4	1/4	2-1/2	821455	88.70	821455-C3	96.30		
5/16	.240	.160	<b>1</b>	4	1/4	2-1/2	54255	93.00	54255-C3	100.60	54255-C4	113.60
5/16	.240	.160	<b>1-1/4</b>	4	1/4	2-1/2	993955	97.10	993955-C3	104.70		
5/16	.240	.160	<b>1-1/2</b>	4	1/4	3	901255	102.90	901255-C3	110.50		

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THREAD MILLING CUTTERS


# THREAD MILLING CUTTERS

## Single Form – UN Threads (cont.)

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THREAD SIZE	CUTTER DIA.	NECK DIA.	MAX DEPTH OF THREAD	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
3/8	.300	.218	<b>3/4</b>	4	3/8	2-1/2	71060	102.90	71060-C3	113.00	71060-C4	127.70
3/8	.300	.218	<b>7/8</b>	4	3/8	2-1/2	822760	105.40	822760-C3	115.50		
3/8	.300	.218	<b>1</b>	4	3/8	2-1/2	41460	108.00	41460-C3	118.10	41460-C4	132.80
3/8	.300	.218	<b>1-1/8</b>	4	3/8	2-1/2	821460	113.10	821460-C3	123.20		
3/8	.300	.218	<b>1-1/4</b>	4	3/8	2-1/2	54260	113.80	54260-C3	123.90	54260-C4	138.60
3/8	.300	.218	<b>1-3/8</b>	4	3/8	3	771860	115.80	771860-C3	125.90		NEW
3/8	.300	.218	<b>1-1/2</b>	4	3/8	3	993960	118.10	993960-C3	128.20		
3/8	.300	.218	<b>1-3/4</b>	4	3/8	3	901260	122.40	901260-C3	132.50		
7/16	.340	.230	<b>3/4</b>	4	3/8	2-1/2	71065	115.90	71065-C3	126.00		
7/16	.340	.230	<b>1</b>	4	3/8	2-1/2	41465	120.80	41465-C3	130.90		
7/16	.340	.230	<b>1-1/4</b>	4	3/8	3	54265	129.10	54265-C3	139.20		
1/2	.388	.250	<b>3/4</b>	4	1/2	3	71070	115.90	71070-C3	131.00		
1/2	.388	.250	<b>1</b>	4	1/2	3	822770	118.60	822770-C3	133.70		
1/2	.388	.250	<b>1-1/4</b>	4	1/2	3	41470	121.30	41470-C3	136.40	41470-C4	151.20
1/2	.388	.250	<b>1-1/2</b>	4	1/2	3	821470	125.30	821470-C3	140.40		
1/2	.388	.250	<b>1-3/4</b>	4	1/2	4	54270	129.30	54270-C3	144.40		
1/2	.388	.250	<b>2-1/4</b>	4	1/2	4	993970	134.80	993970-C3	149.90		
1/2	.388	.250	<b>2-3/4</b>	4	1/2	6	901270	140.10	901270-C3	155.20		
9/16	.400	.270	<b>7/8</b>	6	1/2	3	71073	121.10	71073-C3	136.20		
9/16	.400	.270	<b>1-1/4</b>	6	1/2	3	41473	121.10	41473-C3	136.20		
5/8	.450	.300	<b>1</b>	6	1/2	3	71075	121.10	71075-C3	136.20		
5/8	.450	.300	<b>1-3/8</b>	6	1/2	3	41475	126.80	41475-C3	141.90		
5/8	.450	.300	<b>1-3/4</b>	6	1/2	4	54275	135.70	54275-C3	150.80		
3/4	.495	.325	<b>1</b>	6	1/2	3	71080	121.10	71080-C3	136.20		
3/4	.495	.325	<b>1-1/4</b>	6	1/2	3	822780	126.30	822780-C3	141.40		
3/4	.495	.325	<b>1-3/8</b>	6	1/2	3	41480	126.80	41480-C3	141.90		
3/4	.495	.325	<b>1-3/4</b>	6	1/2	4	54280	133.50	54280-C3	148.60		
3/4	.495	.325	<b>2-1/4</b>	6	1/2	4	993980	139.30	993980-C3	154.40		
3/4	.495	.325	<b>2-3/4</b>	6	1/2	6	901280	145.00	901280-C3	160.10		
7/8	.590	.400	<b>1-1/4</b>	6	5/8	3-1/2	71085	164.70	71085-C3	179.80		
7/8	.590	.400	<b>1-1/2</b>	6	5/8	3-1/2	41485	173.80	41485-C3	188.90		
1	.620	.420	<b>1-5/16</b>	6	5/8	3-1/2	71090	164.70	71090-C3	179.80		
1	.620	.420	<b>1-3/4</b>	6	5/8	3-1/2	41490	173.80	41490-C3	188.90		
1	.625	.420	<b>2-1/4</b>	6	5/8	4	54290	186.40	54290-C3	202.70		

THREAD MILLING CUTTERS



Single Form Thread Mills (Series 41460, 41470, 41480, 41490, 54260, 54270, 54280, 54290, 71060, 71070, 71080, 71090) are well suited for producing tapered and chamfered threads. Single form cutters are more accurate than standard cutters as they are not loaded like a hole drill. Therefore, cutters that are loaded of standardizing tools.

Check availability: 1. Check our cutter catalog or visit our website. 2. Check our cutter stock levels or visit our website.

Thread Size	Cutter Dia.	Neck Dia.	Max Depth of Thread	Flutes	Shank Dia.	Overall Length	Tool #	Price	AITIN Coated Tool #	AITIN Coated Price	Amorphous Diamond Tool #	Amorphous Diamond Price
5-40	.400	.280	.100	4	5/8	3-1/2	71040	102.90	71040-C3	113.00	71040-C4	127.70
5-44	.440	.320	.100	4	5/8	3-1/2	822440	105.40	822440-C3	115.50		
5-32	.320	.200	.100	4	5/8	3-1/2	41432	108.00	41432-C3	118.10	41432-C4	132.80
6-40	.400	.280	.100	4	5/8	3-1/2	821400	113.10	821400-C3	123.20		
8-32	.320	.200	.100	4	5/8	3-1/2	54232	113.80	54232-C3	123.90	54232-C4	138.60
M3.0 x 0.50	.300	.218	.100	4	3/8	2-1/2	71060	102.90	71060-C3	113.00	71060-C4	127.70
M3.5 x 0.60	.350	.250	.100	4	3/8	2-1/2	822350	105.40	822350-C3	115.50		
M4.0 x 0.70	.400	.280	.100	4	3/8	2-1/2	41460	108.00	41460-C3	118.10	41460-C4	132.80

## SINGLE FORM THREAD FIT CHARTS

Our single form thread milling cutters can produce a range of thread sizes, from common UN threads to metric threads.

For example, our 5 thread size single form cutters (pictured left) can produce a range of thread sizes from 5-40 to 8-32 as well as M3.0 x 0.50 to M4.0 x 0.70.

For help with choosing the right thread mill, please call our Technical Support Team at **800-645-5609**.

5-40      3, 4, 5, 6

5-44      3, 4, 5, 6

6-32      4, 5, 6


6-40      4, 5, 6

8-32      5, 6, 8

M3.0 x 0.50      3, 4, 5, 6

M3.5 x 0.60      4, 5, 6

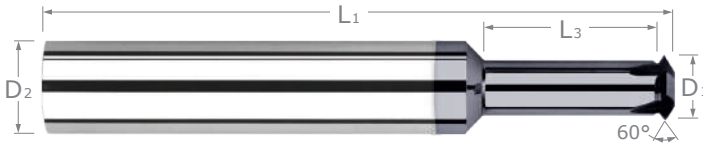
M4.0 x 0.70      5, 6, 8



For thread fit chart, scan the QR code or visit [harveytool.com/resources](http://harveytool.com/resources)

# THREAD MILLING CUTTERS

## Single Form – Metric



- Single thread form – can mill multiple pitches
- Cuts internal and external 60° metric threads
- Mills right hand and left hand threads
- Tip of included angle ground to a point
- Solid carbide • CNC ground in the USA

For thread fit chart, scan the QR code or visit [harveytool.com/resources](http://harveytool.com/resources)



NEW

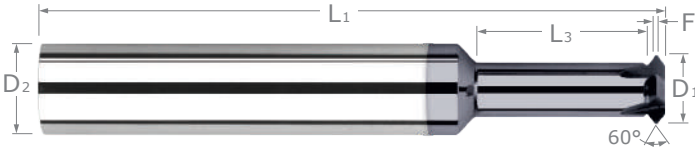
NEW

THREAD SIZE	CUTTER DIA. D <sub>1</sub> <sup>+0.00 mm</sup> / <sub>-.05 mm</sub>	NECK DIA.	MAX DEPTH OF THREAD L <sub>3</sub> <sup>+0.50 mm</sup> / <sub>-.00 mm</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
M1.6	1.16 mm	.696 mm	<b>2.10 mm</b>	2	3 mm	38 mm	890316	82.40	890316-C3	87.60
M1.6	1.16 mm	.696 mm	<b>3.50 mm</b>	2	3 mm	38 mm	882116	82.40	882116-C3	87.60
M1.6	1.16 mm	.696 mm	<b>5.60 mm</b>	2	3 mm	38 mm	826516	84.80	826516-C3	90.00
M2	1.50 mm	.900 mm	<b>2.70 mm</b>	2	3 mm	38 mm	890319	82.40	890319-C3	87.60
M2	1.50 mm	.900 mm	<b>4.50 mm</b>	2	3 mm	38 mm	882119	82.40	882119-C3	87.60
M2	1.50 mm	.900 mm	<b>6.30 mm</b>	2	3 mm	38 mm	737619	83.50	737619-C3	88.70
M2	1.50 mm	.900 mm	<b>7.00 mm</b>	2	3 mm	38 mm	826519	84.80	826519-C3	90.00
M2	1.50 mm	.900 mm	<b>9.00 mm</b>	2	3 mm	38 mm	761419	86.10	761419-C3	91.30
M2.5	1.90 mm	1.140 mm	<b>3.50 mm</b>	2	3 mm	38 mm	890322	83.20	890322-C3	88.40
M2.5	1.90 mm	1.140 mm	<b>5.80 mm</b>	2	3 mm	38 mm	882122	82.40	882122-C3	87.60
M2.5	1.90 mm	1.140 mm	<b>9.00 mm</b>	2	3 mm	38 mm	826522	84.80	826522-C3	90.00
M3	2.30 mm	1.380 mm	<b>4.00 mm</b>	4	3 mm	38 mm	890324	82.40	890324-C3	87.60
M3	2.30 mm	1.380 mm	<b>6.80 mm</b>	4	3 mm	38 mm	882124	82.40	882124-C3	87.60
M3	2.30 mm	1.380 mm	<b>9.50 mm</b>	4	3 mm	38 mm	737624	83.50	737624-C3	88.70
M3	2.30 mm	1.380 mm	<b>11.00 mm</b>	4	3 mm	38 mm	826524	84.80	826524-C3	90.00
M3	2.30 mm	1.380 mm	<b>14.00 mm</b>	4	3 mm	38 mm	761424	86.10	761424-C3	91.30
M4	3.00 mm	1.800 mm	<b>5.50 mm</b>	4	3 mm	38 mm	890326	83.50	890326-C3	88.70
M4	3.00 mm	1.800 mm	<b>9.00 mm</b>	4	3 mm	38 mm	882126	84.80	882126-C3	90.00
M4	3.00 mm	1.800 mm	<b>14.00 mm</b>	4	3 mm	38 mm	826526	87.30	826526-C3	92.50
M4	3.00 mm	1.800 mm	<b>18.00 mm</b>	4	3 mm	50 mm	761426	88.60	761426-C3	93.80
M5	4.00 mm	2.400 mm	<b>7.00 mm</b>	4	4 mm	50 mm	890328	84.80	890328-C3	90.40
M5	4.00 mm	2.400 mm	<b>12.00 mm</b>	4	4 mm	50 mm	882128	87.30	882128-C3	92.90
M5	4.00 mm	2.400 mm	<b>19.00 mm</b>	4	4 mm	50 mm	826528	90.10	826528-C3	95.70
M6	4.80 mm	2.880 mm	<b>8.50 mm</b>	4	6 mm	50 mm	890330	83.50	890330-C3	91.10
M6	4.80 mm	2.880 mm	<b>14.00 mm</b>	4	6 mm	50 mm	882130	84.80	882130-C3	92.40
M6	4.80 mm	2.880 mm	<b>23.00 mm</b>	4	6 mm	63 mm	826530	91.40	826530-C3	99.00
M8	6.00 mm	3.600 mm	<b>11.00 mm</b>	4	6 mm	50 mm	890332	84.80	890332-C3	92.40
M8	6.00 mm	3.600 mm	<b>18.00 mm</b>	4	6 mm	50 mm	882132	90.10	882132-C3	97.70
M10	8.00 mm	4.800 mm	<b>15.00 mm</b>	4	8 mm	63 mm	890334	109.90	890334-C3	118.80
M10	8.00 mm	4.800 mm	<b>24.00 mm</b>	4	8 mm	63 mm	882134	115.70	882134-C3	124.60
M16	13.70 mm	8.220 mm	<b>25.00 mm</b>	6	14 mm	75 mm	890339	129.60	890339-C3	144.70
M16	13.70 mm	8.220 mm	<b>42.00 mm</b>	6	14 mm	89 mm	882139	142.80	882139-C3	157.90

THREAD MILLING CUTTERS

# THREAD MILLING CUTTERS

## Single Form – UN Threads – For Hardened Steels



Tip of Included Angle Ground to a Flat for Increased Wear Resistance

- **Designed for threading hardened steels 46-68Rc**
- Single thread form designed to mill common pitch sizes
- Cuts internal and external 60° UN threads
- Tip of included angle ground to a flat for increased wear resistance
- Large rigid core diameter and eccentric relief for improved strength
- Mills left hand and right hand threads • h6 shank tolerance for high precision tool holders
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Select carbide grade for improved edge retention • CNC ground in the USA

THREAD SIZE	PITCH RANGE*	CUTTER DIAMETER	TIP FLAT	NECK DIAMETER	MAX DEPTH OF THREAD	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITiN NANO COATED	
									TOOL #	PRICE
		D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	F <sup>+0.0000"</sup> / <sub>-.0005"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>		
0	80	.044	.0013	.028	<b>3/32</b>	3	1/8	1-1/2	986602-C6	95.00
0	80	.044	.0013	.028	<b>1/8</b>	3	1/8	1-1/2	993102-C6	98.10
0	80	.044	.0013	.028	<b>3/16</b>	3	1/8	1-1/2	959502-C6	102.60
0	80	.044	.0013	.028	<b>1/4</b>	3	1/8	1-1/2	930302-C6	107.20
0	80	.044	.0013	.028	<b>5/16</b>	3	1/8	1-1/2	898902-C6	111.30
1	64-72	.054	.0014	.034	<b>1/8</b>	3	1/8	1-1/2	986604-C6	94.10
1	64-72	.054	.0014	.034	<b>3/16</b>	3	1/8	1-1/2	993104-C6	98.10
1	64-72	.054	.0014	.034	<b>1/4</b>	3	1/8	1-1/2	959504-C6	102.60
1	64-72	.054	.0014	.034	<b>5/16</b>	3	1/8	1-1/2	930304-C6	106.90
2	56-64	.064	.0016	.041	<b>5/32</b>	3	1/8	1-1/2	986606-C6	94.10
2	56-64	.064	.0016	.041	<b>7/32</b>	3	1/8	1-1/2	993106-C6	98.10
2	56-64	.064	.0016	.041	<b>1/4</b>	3	1/8	1-1/2	771706-C6	100.30
2	56-64	.064	.0016	.041	<b>5/16</b>	3	1/8	1-1/2	959506-C6	102.60
2	56-64	.064	.0016	.041	<b>7/16</b>	3	1/8	1-1/2	930306-C6	107.20
3	48-56	.072	.0018	.046	<b>5/32</b>	3	1/8	1-1/2	986608-C6	94.10
3	48-56	.072	.0018	.046	<b>1/4</b>	3	1/8	1-1/2	993108-C6	98.10
3	48-56	.072	.0018	.046	<b>3/8</b>	3	1/8	1-1/2	959508-C6	102.60
4	40-48	.080	.0021	.050	<b>5/32</b>	3	3/16	2	986610-C6	94.90
4	40-48	.080	.0021	.050	<b>1/4</b>	3	3/16	2	993110-C6	100.40
4	40-48	.080	.0021	.050	<b>5/16</b>	3	3/16	2	771710-C6	102.50
4	40-48	.080	.0021	.050	<b>3/8</b>	3	3/16	2	959510-C6	104.60
4	40-48	.080	.0021	.050	<b>1/2</b>	3	3/16	2	930310-C6	109.00
4	40-48	.080	.0021	.050	<b>5/8</b>	3	3/16	2	898910-C6	113.40
5	40-44	.093	.0023	.063	<b>3/16</b>	4	3/16	2	986615-C6	100.40
5	40-44	.093	.0023	.063	<b>1/2</b>	4	3/16	2	959515-C6	104.60
5	40-44	.093	.0023	.063	<b>5/8</b>	4	3/16	2	930315-C6	110.10
6	32-40	.098	.0025	.062	<b>1/4</b>	4	3/16	2	986620-C6	94.90
6	32-40	.098	.0025	.062	<b>5/16</b>	4	3/16	2	773220-C6	97.60
6	32-40	.098	.0025	.062	<b>3/8</b>	4	3/16	2	993120-C6	100.40
6	32-40	.098	.0025	.062	<b>1/2</b>	4	3/16	2	959520-C6	104.60
6	32-40	.098	.0025	.062	<b>5/8</b>	4	3/16	2	930320-C6	109.00

\*Tools are designed to produce an 83% depth of thread maximum.

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THREAD MILLING CUTTERS



# THREAD MILLING CUTTERS

## Single Form – UN Threads – For Hardened Steels (cont.)

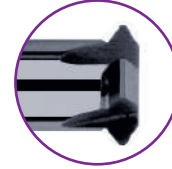
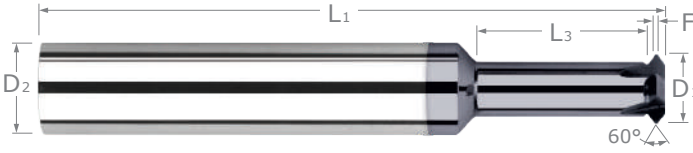
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THREAD SIZE	PITCH RANGE*	CUTTER DIAMETER	TIP FLAT	NECK DIAMETER	MAX DEPTH OF THREAD	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
									TOOL #	PRICE
		$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$F \begin{smallmatrix} +.0000'' \\ -.0005'' \end{smallmatrix}$		$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$D_2$ (h6)	$L_1$		
8	32-36	.120	.0028	.084	<b>5/16</b>	4	1/4	2-1/2	986630-C6	99.60
8	32-36	.120	.0028	.084	<b>1/2</b>	4	1/4	2-1/2	993130-C6	105.40
8	32-36	.120	.0028	.084	<b>5/8</b>	4	1/4	2-1/2	959530-C6	110.90
8	32-36	.120	.0028	.084	<b>3/4</b>	4	1/4	2-1/2	930330-C6	116.40
8	32-36	.120	.0028	.084	<b>7/8</b>	4	1/4	2-1/2	898930-C6	122.00
10	24-36	.135	.0028	.086	<b>5/16</b>	5	1/4	2-1/2	986640-C6	99.60
10	24-36	.135	.0028	.086	<b>3/8</b>	5	1/4	2-1/2	773240-C6	102.50
10	24-36	.135	.0028	.086	<b>1/2</b>	5	1/4	2-1/2	993140-C6	105.40
10	24-36	.135	.0028	.086	<b>5/8</b>	5	1/4	2-1/2	959540-C6	110.90
10	24-36	.135	.0028	.086	<b>7/8</b>	5	1/4	2-1/2	930340-C6	116.40
10	24-36	.135	.0028	.086	<b>1-1/8</b>	5	1/4	2-1/2	898940-C6	122.00
12	24-32	.160	.0030	.111	<b>3/8</b>	5	1/4	2-1/2	986645-C6	99.60
12	24-32	.160	.0030	.111	<b>5/8</b>	5	1/4	2-1/2	993145-C6	110.90
1/4	20-32	.180	.0030	.122	<b>5/16</b>	5	1/4	2-1/2	845750-C6	99.60
1/4	20-32	.180	.0030	.122	<b>1/2</b>	5	1/4	2-1/2	986650-C6	105.40
1/4	20-32	.180	.0030	.122	<b>5/8</b>	5	1/4	2-1/2	773250-C6	108.20
1/4	20-32	.180	.0030	.122	<b>3/4</b>	5	1/4	2-1/2	993150-C6	110.90
1/4	20-32	.180	.0030	.122	<b>1</b>	5	1/4	2-1/2	959550-C6	116.40
1/4	20-32	.180	.0030	.122	<b>1-1/4</b>	5	1/4	2-1/2	930350-C6	121.80
5/16	18-28	.240	.0036	.174	<b>3/8</b>	5	1/4	2-1/2	845755-C6	100.50
5/16	18-28	.240	.0036	.174	<b>1/2</b>	5	1/4	2-1/2	986655-C6	105.40
5/16	18-28	.240	.0036	.174	<b>5/8</b>	5	1/4	2-1/2	773255-C6	109.20
5/16	18-28	.240	.0036	.174	<b>3/4</b>	5	1/4	2-1/2	993155-C6	110.90
5/16	18-28	.240	.0036	.174	<b>1</b>	5	1/4	2-1/2	959555-C6	116.40
5/16	18-28	.240	.0036	.174	<b>1-1/4</b>	5	1/4	2-1/2	930355-C6	121.80
3/8	16-28	.300	.0036	.227	<b>1/2</b>	5	3/8	2-1/2	845760-C6	128.50
3/8	16-28	.300	.0036	.227	<b>3/4</b>	5	3/8	2-1/2	986660-C6	134.00
3/8	16-28	.300	.0036	.227	<b>1</b>	5	3/8	2-1/2	993160-C6	139.70
3/8	16-28	.300	.0036	.227	<b>1-1/4</b>	5	3/8	2-1/2	959560-C6	145.30
3/8	16-28	.300	.0036	.227	<b>1-1/2</b>	5	3/8	3	930360-C6	150.80
3/8	16-28	.300	.0036	.227	<b>1-3/4</b>	5	3/8	3	898960-C6	154.60
1/2	12-18	.388	.0056	.294	<b>3/4</b>	5	1/2	3	986670-C6	148.10
1/2	12-18	.388	.0056	.294	<b>1</b>	5	1/2	3	773270-C6	153.00
1/2	12-18	.388	.0056	.294	<b>1-1/4</b>	5	1/2	3	993170-C6	158.00
1/2	12-18	.388	.0056	.294	<b>1-3/4</b>	5	1/2	4	959570-C6	163.80
1/2	12-18	.388	.0056	.294	<b>2-1/4</b>	5	1/2	4	930370-C6	169.20
3/4	10-16	.495	.0063	.385	<b>1</b>	6	1/2	3	986680-C6	157.00
3/4	10-16	.495	.0063	.385	<b>1-3/8</b>	6	1/2	3	993180-C6	170.20
3/4	10-16	.495	.0063	.385	<b>1-3/4</b>	6	1/2	4	959580-C6	183.50
3/4	10-16	.495	.0063	.385	<b>2-1/4</b>	6	1/2	4	930380-C6	196.70
1	8-14	.620	.0071	.480	<b>1-5/16</b>	6	5/8	3-1/2	986690-C6	185.90
1	8-14	.620	.0071	.480	<b>1-3/4</b>	6	5/8	3-1/2	993190-C6	199.20

\*Tools are designed to produce an 83% depth of thread maximum.

# THREAD MILLING CUTTERS

## Single Form – Metric – For Hardened Steels



Tip of Included Angle Ground to a Flat for Increased Wear Resistance

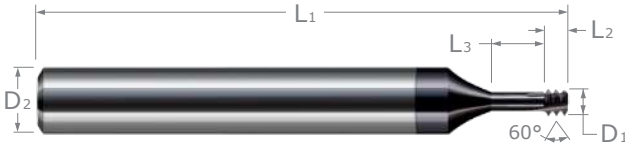
- **Designed for threading hardened steels 48-68Rc**
- Single thread form designed to mill common pitch sizes
- Cuts internal and external 60° Metric threads
- Tip of included angle ground to a flat for increased wear resistance
- Large rigid core diameter and eccentric relief for improved strength
- Mills left hand and right hand threads • h6 shank tolerance for high precision tool holders
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Select carbide grade for improved edge retention • CNC ground in the USA

THREAD SIZE	PITCH RANGE*	CUTTER DIA. D <sub>1</sub> <sup>+0.00 mm</sup> / <sub>-.05 mm</sub>	TIP FLAT F <sup>+0.000 mm</sup> / <sub>-.127 mm</sub>	NECK DIA.	MAX DEPTH OF THREAD L <sub>3</sub> <sup>+0.50 mm</sup> / <sub>-.00 mm</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	AITiN NANO COATED	
									TOOL #	PRICE
M1.6	0.35	1.16 mm	.035	.742 mm	<b>2.10 mm</b>	3	3 mm	38 mm	771616-C6	94.30
M1.6	0.35	1.16 mm	.035	.742 mm	<b>3.50 mm</b>	3	3 mm	38 mm	772716-C6	93.40
M2	0.40	1.50 mm	.040	.960 mm	<b>2.70 mm</b>	3	3 mm	38 mm	771619-C6	94.30
M2	0.40	1.50 mm	.040	.960 mm	<b>4.50 mm</b>	3	3 mm	38 mm	772719-C6	93.40
M2.5	0.45	1.90 mm	.045	1.216 mm	<b>3.50 mm</b>	3	3 mm	38 mm	771622-C6	94.30
M2.5	0.45	1.90 mm	.045	1.216 mm	<b>5.80 mm</b>	3	3 mm	38 mm	772722-C6	93.40
M3	0.50	2.30 mm	.050	1.541 mm	<b>4.00 mm</b>	4	3 mm	38 mm	771624-C6	94.30
M3	0.50	2.30 mm	.050	1.541 mm	<b>6.80 mm</b>	4	3 mm	38 mm	772724-C6	93.40
M4	0.70	3.00 mm	.070	2.010 mm	<b>5.50 mm</b>	4	3 mm	38 mm	771626-C6	94.80
M4	0.70	3.00 mm	.070	2.010 mm	<b>9.00 mm</b>	4	3 mm	38 mm	772726-C6	95.90
M5	0.80	4.00 mm	.080	2.800 mm	<b>7.00 mm</b>	5	4 mm	50 mm	771628-C6	96.80
M5	0.80	4.00 mm	.080	2.800 mm	<b>12.00 mm</b>	5	4 mm	50 mm	772728-C6	99.20
M6	1.00	4.80 mm	.100	3.360 mm	<b>8.50 mm</b>	5	6 mm	50 mm	771630-C6	97.30
M6	1.00	4.80 mm	.100	3.360 mm	<b>14.00 mm</b>	5	6 mm	50 mm	772730-C6	98.50

\*Tools are designed to produce an 83% depth of thread maximum.

# THREAD MILLING CUTTERS

## Tri-Form – UN Threads



Left-Hand Cut, Left Hand Spiral Design



Left-Hand Cut, Left-Hand Spiral Design

- **Designed for threading in hardened steels and difficult-to-machine materials**
- Left-hand cut, left-hand spiral design for climb milling from top to bottom of right-hand threads
- Three forms and helical design reduces tool pressure and deflection resulting in accurate threads
- Cuts internal 60° UN threads • Able to cut larger threads of the same pitch
- h6 shank tolerance for high precision tool holders
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Select carbide grade for maximum tool life • CNC ground in the USA

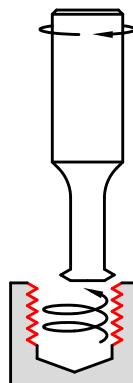
THREAD SIZE	CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	MAX DEPTH OF THREAD	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
								3 FL	PRICE
	D1 $^{+.0005"}_{-.0005"}$	L2		L3 $^{+.020"}_{-.000"}$		D2 (h6)	L1		
2-56	.065	.053	.042	<b>3/32</b>	3	1/4	2-1/2	899910-C6	186.60
2-56	.065	.053	.042	<b>5/32</b>	3	1/4	2-1/2	896410-C6	194.40
4-40	.085	.075	.053	<b>3/32</b>	3	1/4	2-1/2	899916-C6	186.60
4-40	.085	.075	.053	<b>5/32</b>	3	1/4	2-1/2	896416-C6	194.40
6-32	.100	.093	.061	<b>5/32</b>	3	1/4	2-1/2	899922-C6	186.60
6-32	.100	.093	.061	<b>1/4</b>	3	1/4	2-1/2	896422-C6	194.40
8-32	.126	.093	.087	<b>7/32</b>	3	1/4	2-1/2	899928-C6	173.40
8-32	.126	.093	.087	<b>5/16</b>	3	1/4	2-1/2	896428-C6	181.20
10-24	.138	.125	.086	<b>7/32</b>	3	1/4	2-1/2	899934-C6	173.40
10-24	.138	.125	.086	<b>5/16</b>	3	1/4	2-1/2	896434-C6	181.20
10-32	.145	.093	.106	<b>7/32</b>	3	1/4	2-1/2	899936-C6	173.40
10-32	.145	.093	.106	<b>5/16</b>	3	1/4	2-1/2	896436-C6	181.20
1/4-20	.187	.150	.124	<b>5/16</b>	3	1/4	2-1/2	899944-C6	173.40
1/4-20	.187	.150	.124	<b>1/2</b>	3	1/4	2-1/2	896444-C6	181.20
1/4-28	.197	.107	.151	<b>5/16</b>	3	1/4	2-1/2	899946-C6	173.40
1/4-28	.197	.107	.151	<b>1/2</b>	3	1/4	2-1/2	896446-C6	181.20
5/16-18	.236	.166	.166	<b>3/8</b>	3	1/4	2-1/2	899954-C6	173.40
5/16-18	.236	.166	.166	<b>1/2</b>	3	1/4	2-1/2	896454-C6	181.20
3/8-16	.264	.187	.186	<b>1/2</b>	3	5/16	2-1/2	899964-C6	182.80
3/8-16	.264	.187	.186	<b>3/4</b>	3	5/16	2-1/2	896464-C6	190.60

### Tri-Form Thread Mills

Our Tri-Form Thread Mills are unlike traditional right-handed thread mills, as they have a left-hand cut, left-hand spiral design.

- Improves thread accuracy and surface finish by climb milling from the top to the bottom of a hole.
- Tri-Form Thread Mills eliminate the need to arc-in when engaging the tool, which reduces radial pressure and deflection.

Traditional Right-Handed Thread Mill



Tri-Form Thread Mill



# THREAD MILLING CUTTERS

## Multi-Form – UN Threads



- Cuts internal and external 60° UN threads
- Mills right hand and left hand threads
- Able to cut larger threads of the same pitch
- Helical flutes
- Solid carbide
- CNC ground in the USA

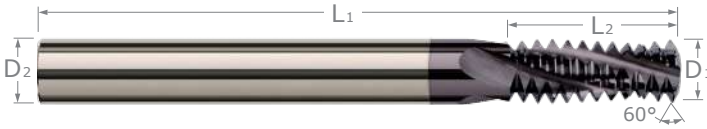
THREAD SIZE	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2$		$D_2$	$L_1$						
2-56	.065	.125	3*	1/8	2	70010	90.60	70010-C3	95.80	70010-C8	98.20
3-48	.075	.167	3*	1/8	2	70012	95.70	70012-C3	100.90		
4-40	.085	.175	3*	1/8	2	70016	95.70	70016-C3	100.90	70016-C8	103.30
5-44	.095	.228	3	1/8	2	70020	95.70	70020-C3	100.90		
6-32	.100	.218	3	1/8	2	70022	99.00	70022-C3	104.20	70022-C8	106.60
8-32	.115	.250	3	1/8	2	70028	106.20	70028-C3	111.40	70028-C8	113.80
8-36	.115	.250	3	1/8	2	70031	106.20	70031-C3	111.40		
10-24	.120	.312	3	1/8	2	70034	111.70	70034-C3	116.90	70034-C8	119.30
10-28	.120	.312	3	1/8	2	70035	114.00	70035-C3	119.20		
10-32	.120	.312	3	1/8	2	70036	111.70	70036-C3	116.90	70036-C8	119.30
1/4-20	.180	.500	3	3/16	2-1/2	70044	133.60	70044-C3	139.20	70044-C8	141.20
1/4-28	.180	.500	3	3/16	2-1/2	70046	133.60	70046-C3	139.20	70046-C8	141.20
5/16-18	.235	.625	3	1/4	2-1/2	70054	144.70	70054-C3	152.30	70054-C8	152.90
5/16-24	.235	.625	3	1/4	2-1/2	70056	163.50	70056-C3	171.10	70056-C8	171.70
3/8-16	.285	.750	4	5/16	3	70064	194.60	70064-C3	203.50	70064-C8	212.00
3/8-24	.285	.750	4	5/16	3	70066	194.60	70066-C3	203.50	70066-C8	212.00
7/16-14	.305	.750	4	5/16	3	70074	194.60	70074-C3	203.50	70074-C8	212.00
7/16-20	.335	.875	4	3/8	3-1/2	70076	210.00	70076-C3	220.10	70076-C8	231.10
1/2-13	.350	.875	4	3/8	3-1/2	70084	217.00	70084-C3	227.10		
1/2-20	.370	1.000	6	3/8	3-1/2	70086	227.80	70086-C3	237.90		
1/2-32	.370	1.000	6	3/8	3-1/2	70089	227.80	70089-C3	237.90		
9/16-12	.370	.875	4	3/8	3-1/2	70092	217.00	70092-C3	227.10		
9/16-18	.370	.875	4	3/8	3-1/2	70094	217.00	70094-C3	227.10		
5/8-11	.470	1.250	4	1/2	3-1/2	70104	268.30	70104-C3	283.40		
3/4-10	.495	1.250	4	1/2	3-1/2	70124	268.30	70124-C3	283.40		
3/4-12	.495	1.250	4	1/2	3-1/2	70126	268.30	70126-C3	283.40		
3/4-16	.490	1.250	4	1/2	3-1/2	70128	273.70	70128-C3	288.80		
7/8-9	.620	1.375	4	5/8	4	70132	411.50	70132-C3	427.80		
7/8-14	.490	1.250	4	1/2	3-1/2	70134	273.70	70134-C3	288.80		
1-8	.620	1.375	4	5/8	4	70154	411.50	70154-C3	427.80		
1-12	.745	1.500	6	3/4	4	70158	515.10	70158-C3	531.40		

\*Straight flutes

THREAD MILLING CUTTERS

## THREAD MILLING CUTTERS

### Multi-Form – UN Threads – For Hardened Steels



- Designed for threading hardened steels 46-68 Rc
- Cuts internal and external 60° UN threads
- Mill right hand and left hand threads
- Able to cut larger threads of the same pitch
- Variable helix design reduces chatter and harmonics and produces more accurate threads
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Select carbide grade for maximum tool life
- CNC ground in the USA

THREAD SIZE	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
						TOOL #	PRICE
	$D_1 \begin{smallmatrix} +.0007 \\ -.0027 \end{smallmatrix}$	$L_2$		$D_2$	$L_1$		
2-56	.065	.125	3	1/8	2	836710-C6	129.90
4-40	.085	.180	3	1/8	2	836716-C6	124.10
5-44	.095	.228	3	1/8	2	836720-C6	129.90
6-32	.100	.218	3	1/8	2	836722-C6	128.10
8-32	.115	.250	3	1/8	2	836728-C6	137.10
10-24	.120	.312	3	3/16	2	836734-C6	143.90
10-32	.120	.312	3	3/16	2	836736-C6	143.90
1/4-20	.180	.500	3	3/16	2-1/2	836744-C6	171.40
1/4-28	.180	.500	3	3/16	2-1/2	836746-C6	171.40
5/16-18	.240	.625	3	1/4	2-1/2	836754-C6	187.40
5/16-24	.240	.625	3	1/4	2-1/2	836756-C6	210.70
3/8-16	.285	.750	4	5/16	3	836764-C6	250.40
3/8-24	.285	.750	4	5/16	3	836766-C6	250.40
7/16-20	.335	.875	4	3/8	3-1/2	836776-C6	270.70
1/2-13	.350	.875	4	3/8	3-1/2	836784-C6	279.40
3/4-16	.495	1.250	4	1/2	3-1/2	836798-C6	355.10



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# THREAD MILLING CUTTERS

## Multi-Form – N.P.T. Threads



- Cuts internal and external 60° National Pipe Taper (N.P.T.) threads
- Mills right hand and left hand threads
- Helical flutes
- Solid carbide
- CNC ground in the USA

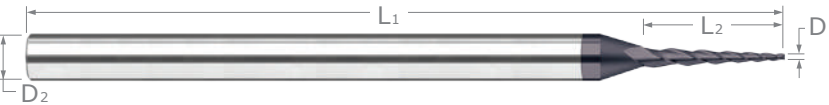


THREAD SIZE	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2$		$D_2$	$L_1$						
1/16, 1/8-27	.245*	.437	3	1/4	2-1/2	70204	149.00	70204-C3	156.60	70204-C8	157.20
1/4, 3/8-18	.305*	.625	4	5/16	3	70214	204.10	70214-C3	213.00	70214-C8	221.50
1/4, 3/8-18	.363*	.680	4	3/8	3-1/2	790414	217.10	790414-C3	227.20		
1/2, 3/4-14	.495*	.875	4	1/2	3-1/2	70226	238.10	70226-C3	253.20		
1, 2-11.5	.620*	1.125	4	5/8	4	70232	336.50	70232-C3	352.80		

\*Major cutter diameter

# THREAD MILLING CUTTERS

## N.P.T. Tapered End Mills – Square



1°47' Angle for NPT threads

- 1°47' angle for preparation of parts prior to internal or external NPT thread milling
- Length of cut and diameters designed for range of standard NPT dimensions
- 3 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA



ANGLE PER SIDE	END DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN NANO COATED	
					3 FL	PRICE	3 FL	PRICE
$A_1 \begin{smallmatrix} +0°30' \\ -0°30' \end{smallmatrix}$	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$				
<b>1°47'</b>	.200	<b>.625</b> (3x)	1/4	2	912282	61.80	912282-C6	73.00
	.300	<b>.900</b> (3x)	3/8	2-1/2	912286	77.10	912286-C6	89.70
	.400	<b>1.250</b> (3x)	1/2	3	912292	103.70	912292-C6	120.00

Thread Mill Tool #	Thread Size	Tapered End Mill Tool #
70204	1/16, 1/8-27	912282
70214, 790914	1/4, 3/8-18	912282, 912286
70226	1/2, 3/4-14	912286
70232	1, 2-11.5	912292

THREAD MILLING CUTTERS

## THREAD MILLING CUTTERS

Multi-Form – N.P.T.F. Threads



- Cuts internal and external 60° National Pipe Taper - Fuel (N.P.T.F.) threads
- Mills right hand and left hand threads
- Helical flutes
- Solid carbide
- CNC ground in the USA



THREAD SIZE	CUTTER DIAMETER $D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	LENGTH OF CUT $L_2$	FLUTES	SHANK DIAMETER $D_2$	OVERALL LENGTH $L_1$	UNCOATED		AISI COATED	
						TOOL #	PRICE	TOOL #	PRICE
1/16, 1/8-27	.245*	.437	3	1/4	2-1/2	784304	174.00	784304-C3	181.60
1/4, 3/8-18	.305*	.625	4	5/16	3	784314	207.70	784314-C3	214.70
1/2, 3/4-14	.495*	.875	4	1/2	3-1/2	784326	269.50	784326-C3	284.60
1, 2-11.5	.620*	1.125	4	5/8	4	784332	401.00	784332-C3	417.30

\*Major Cutter Diameter

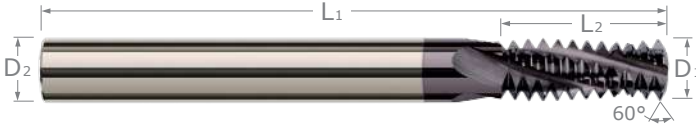


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# THREAD MILLING CUTTERS

## Multi-Form – Metric



- Cuts internal and external 60° metric threads
- Mills right hand and left hand threads
- Able to cut larger threads of the same pitch
- Helical flutes
- Solid carbide
- CNC ground in the USA

THREAD SIZE	CUTTER DIAMETER $D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	LENGTH OF CUT $L_2$	FLUTES	SHANK DIAMETER $D_2$	OVERALL LENGTH $L_1$	UNCOATED		AISI IN COATED	
						TOOL #	PRICE	TOOL #	PRICE
M2-0.40	.059	.126	3	1/8	2	16901	122.60	16901-C3	127.80
M2.5-0.45	.059	.142	3	1/8	2	16902	122.60	16902-C3	127.80
M3-0.50	.085	.178	3	1/8	2	16903	120.30	16903-C3	125.50
M4-0.70	.115	.276	3	1/8	2	16907	120.30	16907-C3	125.50
M4.5-0.75	.120	.250	3	1/8	2	16909	120.30	16909-C3	125.50
M5-0.80	.120	.312	3	1/8	2	16911	120.30	16911-C3	125.50
M6-0.75	.170	.366	3	3/16	2-1/2	16919	148.70	16919-C3	154.30
M6-1.00	.170	.500	3	3/16	2-1/2	16917	145.90	16917-C3	151.50
M8-1.00	.235	.625	3	1/4	2-1/2	16924	159.80	16924-C3	167.40
M8-1.25	.235	.625	3	1/4	2-1/2	16923	156.80	16923-C3	164.40
M10-1.00	.300	.750	4	5/16	3	16930	215.40	16930-C3	224.30
M10-1.50	.300	.750	4	5/16	3	16929	211.40	16929-C3	220.30
M12-1.75	.360	.875	4	3/8	3-1/2	16935	235.20	16935-C3	245.30
M14-1.50	.370	.875	4	3/8	3-1/2	16941	235.20	16941-C3	245.30
M16-2.00	.470	1.250	4	1/2	3-1/2	16947	289.60	16947-C3	304.70
M18-1.50	.490	1.250	4	1/2	3-1/2	16953	289.60	16953-C3	304.70
M20-2.50	.495	1.250	4	1/2	3-1/2	16959	295.20	16959-C3	310.30



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## THREAD MILLING CUTTERS

### Multi-Form – Coolant-Through – UN Threads



- Coolant through design for maximum chip ejection in blind holes
- Mills right hand and left hand 60° UN threads
- Able to cut larger threads of the same pitch
- Helical flutes • Solid carbide • CNC ground in the USA



Coolant-Fed for Chip Removal

THREAD SIZE	CUTTER DIAMETER D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	LENGTH OF CUT L <sub>2</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AISI COATED	
						TOOL #	PRICE	TOOL #	PRICE
10-24	.145	.312	3	3/16	2-3/8	17334	118.10	17334-C3	123.70
10-32	.150	.312	3	3/16	2-3/8	17336	118.10	17336-C3	123.70
1/4-20	.180	.500	3	3/16	2-3/8	17344	141.80	17344-C3	147.40
1/4-28	.180	.500	3	3/16	2-3/8	17346	141.80	17346-C3	147.40
5/16-18	.235	.625	3	1/4	2-3/8	17354	152.70	17354-C3	160.30
5/16-24	.235	.625	3	1/4	2-3/8	17356	178.30	17356-C3	185.90
3/8-16	.285	.750	4	5/16	3	17364	205.80	17364-C3	214.70
3/8-24	.285	.750	4	5/16	3	17366	205.80	17366-C3	214.70
7/16-14	.305	.750	4	5/16	3	17374	205.80	17374-C3	214.70
7/16-20	.335	.875	4	3/8	3	17376	221.70	17376-C3	231.80
1/2-13	.350	.875	4	3/8	3	17384	228.70	17384-C3	238.80

## THREAD MILLING CUTTERS

### Multi-Form – Coolant-Through – Metric



- Coolant through design for maximum chip ejection in blind holes
- Mills right hand and left hand 60° Metric threads
- Able to cut larger threads of the same pitch
- Helical flutes
- Solid carbide
- CNC ground in the USA



Coolant-Fed for Chip Removal

THREAD SIZE	CUTTER DIAMETER D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	LENGTH OF CUT L <sub>2</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AISI COATED	
						TOOL #	PRICE	TOOL #	PRICE
M3-0.50	.085	.1780	3	1/8	2	819624	126.80	819624-C3	132.00
M4-0.70	.115	.2760	3	1/8	2	819626	126.80	819626-C3	132.00
M5-0.80	.120	.3125	3	1/8	2	819628	126.80	819628-C3	132.00
M6-1.00	.170	.5000	3	3/16	2-1/2	819630	154.00	819630-C3	159.60
M8-1.25	.235	.6250	3	1/4	2-1/2	819632	165.40	819632-C3	173.00

# THREAD MILLING CUTTERS

## Multi-Form – Long Flute – UN Threads



Designed for  
 ◀ Deep Threaded Applications!

- Designed for deep threaded applications
- Larger cutter diameter for maximum strength
- Due to increased cutter diameter, tools are designed to achieve 60% threads
- Cuts internal 60° UN threads only
- Mills right hand and left hand threads
- Able to cut larger threads of the same pitch
- Helical flutes
- Solid carbide
- CNC ground in the USA

THREAD SIZE	CUTTER DIAMETER D <sub>1</sub> <sup>+0.0005"</sup> <sub>-.0005"</sub>	LENGTH OF CUT L <sub>2</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITiN COATED		TiB <sub>2</sub> COATED	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
2-56	.069	.215	3	1/8	2	987110	114.60	987110-C3	119.80	987110-C8	122.20
3-48	.079	.250	3	1/8	2	987112	120.30	987112-C3	125.50		
4-40	.089	.275	3	1/8	2	987116	120.30	987116-C3	125.50	987116-C8	127.90
6-32	.110	.375	3	1/8	2	987122	120.30	987122-C3	125.50	987122-C8	127.90
8-32	.131	.407	3	3/16	2-1/2	987128	128.10	987128-C3	133.70	987128-C8	135.70
8-36	.131	.417	3	3/16	2-1/2	987131	134.70	987131-C3	140.30		
10-24	.145	.500	3	3/16	2-1/2	987134	158.00	987134-C3	163.60	987134-C8	165.60
10-32	.150	.500	3	3/16	2-1/2	987136	158.00	987136-C3	163.60	987136-C8	165.60
1/4-20	.195	.750	3	1/4	2-1/2	987144	160.60	987144-C3	168.20	987144-C8	168.80
1/4-28	.195	.750	3	1/4	2-1/2	987146	160.60	987146-C3	168.20	987146-C8	168.80
5/16-18	.245	.944	3	5/16	3	987154	208.50	987154-C3	217.40		
5/16-24	.245	.958	3	5/16	3	987156	214.00	987156-C3	222.90		
3/8-16	.300	1.125	4	3/8	3-1/2	987164	248.60	987164-C3	258.70		
3/8-24	.300	1.125	4	3/8	3-1/2	987166	255.80	987166-C3	265.90		
7/16-20	.350	1.300	4	3/8	3-1/2	987176	255.80	987176-C3	265.90		
1/2-13	.400	1.308	4	1/2	3-1/2	987184	259.50	987184-C3	274.60		
9/16-18	.450	1.500	4	1/2	3-1/2	987194	275.60	987194-C3	290.70		NEW
5/8-11	.490	1.820	4	1/2	4	987100	303.20	987100-C3	318.30		NEW
3/4-16	.580	1.875	4	5/8	4	987103	391.20	987103-C3	407.50		NEW

\*Straight flutes

THREAD MILLING CUTTERS

## THREAD MILLING CUTTERS

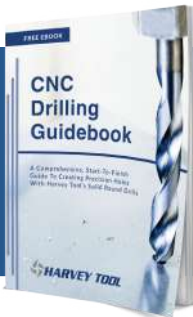
Multi-Form – Long Flute – Metric



Designed for  
Deep Threaded  
Applications!

- Designed for deep threaded applications
- Larger cutter diameter for maximum strength
- Due to increased cutter diameter, tools are designed to achieve 60% threads
- Cuts internal 60° metric threads only
- Mills right hand and left hand threads
- Able to cut larger threads of the same pitch
- Helical flutes
- Solid carbide
- CNC ground in the USA

THREAD SIZE	CUTTER DIAMETER $D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	LENGTH OF CUT $L_2$	FLUTES	SHANK DIAMETER $D_2$	OVERALL LENGTH $L_1$	UNCOATED		A1TiN COATED	
						TOOL #	PRICE	TOOL #	PRICE
M3-0.50	.090	.276	3	1/8	2	842903	141.70	842903-C3	146.90
M4-0.70	.124	.441	3	3/16	2-1/2	842907	145.20	842907-C3	150.80
M5-0.80	.155	.504	3	3/16	2-1/2	842911	142.10	842911-C3	147.70
M6-1.00	.186	.748	3	1/4	2-1/2	842917	168.10	842917-C3	175.70
M8-1.25	.245	.984	3	5/16	2-1/2	842923	216.10	842923-C3	225.00
M10-1.50	.311	1.122	4	3/8	3-1/2	842929	271.20	842929-C3	281.30
M16-2.00	.490	1.890	4	1/2	3-1/2	842947	353.90	842947-C3	369.00



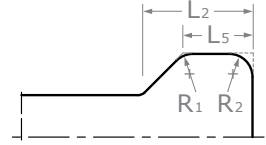
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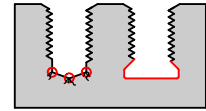
# THREAD MILLING CUTTERS

## Thread Relief Cutter



- Tool designed to relieve stress concentrations at corners of undercut and bottom of last thread to prevent fracture and failure
- Relief is typically done before threading operation to avoid damaging the thread forms
- Chamfer eliminates burrs and partial threads at last thread
- Flattens bottom of hole to achieve maximum thread depth
- Center cutting
- Solid carbide
- CNC ground in the USA

THREADED HOLES



Standard Relieved

CUTTER DIA.	LOC	WIDTH (TSC)	RADIUS 1	RADIUS 2	NECK DIA.	NECK LENGTH	RADIAL DOC	SHANK DIA.	OAL	UNCOATED		AISI COATED	
										4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.002"</sup> / <sub>-0.000"</sub>	L <sub>5</sub>	R <sub>1</sub> <sup>+0.001"</sup> / <sub>-0.001"</sub>	R <sub>2</sub> <sup>+0.001"</sup> / <sub>-0.001"</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE
.066	.029	.015	.000	.005	.036	.172	.014	1/8	1-1/2	896602	60.10	896602-C3	65.30
.075	.030	.015	.000	.005	.042	.187	.015	1/8	1-1/2	877502	57.50	877502-C3	62.70
.084	.038	.020	.000	.005	.045	.218	.018	3/16	2	988804	55.80	988804-C3	61.40
.102	.049	.025	.000	.010	.051	.281	.024	3/16	2	985707	56.90	985707-C3	62.50
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.005"</sup> / <sub>-0.000"</sub>	L <sub>5</sub>	R <sub>1</sub> <sup>+0.001"</sup> / <sub>-0.001"</sub>	R <sub>2</sub> <sup>+0.001"</sup> / <sub>-0.001"</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE
.125	.054	.030	.000	.010	.074	.343	.024	1/4	2-1/2	979609	69.10	979609-C3	76.70
.142	.050	.020	.000	.010	.078	.359	.030	1/4	2-1/2	975405	70.70	975405-C3	78.30
.168	.050	.020	.000	.010	.103	.422	.030	1/4	2-1/2	955305	69.10	955305-C3	76.70
.193	.055	.020	.000	.010	.118	.547	.035	1/4	2-1/2	952505	71.00	952505-C3	78.60
.193	.075	.040	.015	.015	.118	.547	.035	1/4	2-1/2	952516	71.00	952516-C3	78.60
.245	.072	.030	.000	.010	.155	.797	.042	1/4	2-1/2	946009	73.70	946009-C3	81.30
.245	.102	.060	.020	.020	.155	.797	.042	1/4	2-1/2	946027	73.70	946027-C3	81.30
.355	.086	.030	.000	.010	.236	1.078	.056	3/8	2-1/2	942909	114.90	942909-C3	125.00
.355	.116	.060	.020	.020	.236	1.078	.056	3/8	2-1/2	942927	114.90	942927-C3	125.00
.355	.136	.080	.030	.030	.236	1.078	.056	3/8	2-1/2	942931	114.90	942931-C3	125.00

THREAD MILLING CUTTERS




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# TOOL HOLDERS

Browse a fully stocked and expanded offering of Tool Holders and Collets, including Extended Reach Tool Holders, Solid ER Integrated Tool Holders, Saw Arbors, ER Collets, ER Performance Collets, and accompanying nuts and wrenches. When your machine setup includes a Harvey Tool holder and collet, you can rest assured that you'll maximize tool performance and repeatability.

**Tool Holders** ..... 502

Extended Reach Tool Holders & Collets .....  502

Solid ER Integrated Tool Holders .....  503

Solid ER Integrated Tool Holders – Coolant-Through .....  503

Saw Arbors .....  504

**Collets** ..... 505

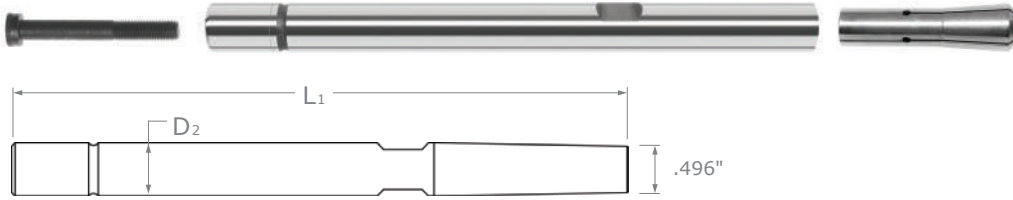
ER Collets **New Sizes!** .....  505

ER Performance Collets .....  506

# TOOL HOLDERS

## Extended Reach Tool Holders & Collets

TOOL HOLDERS



- Center gripping collet with threaded draw screw
- More accurate than traditional single-set screw type holders
- High precision concentricity and rigidity
- Maximum T.I.R. of .0002" from shank to collet pocket
- Quick tool changes
- Coolant through capable
- Allen wrench included
- Collet not included — choose from many sizes
- Two offsetting flats to maintain T.I.R.
- Use with mills, lathes, and grinders



Center Gripping Collet Design.  
Choose from Six Sizes!

### Tool Holders

SHANK DIAMETER	OVERALL LENGTH	TOOL HOLDERS (Collet Not Included)	
		TOOL #	PRICE
D <sub>2</sub>	L <sub>1</sub>		
1/2	3	36730	234.10
1/2	5	36750	251.20
1/2	6	36760	266.20

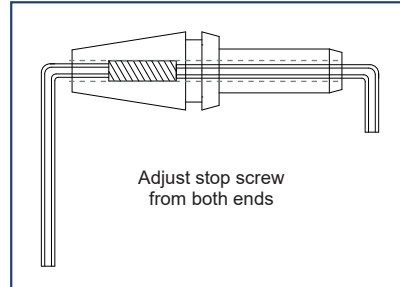
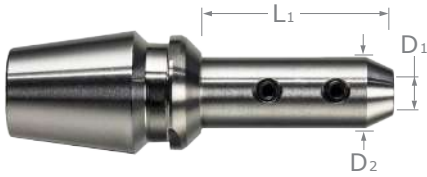
### Collets

COLLET SIZE	TOOL #	PRICE
1/8	36810	79.30
3/16	36820	79.30
1/4	36830	79.30
3 mm	36840	79.30
4 mm	36850	79.30
6 mm	36860	79.30



## TOOL HOLDERS

### Solid ER Integrated Tool Holders



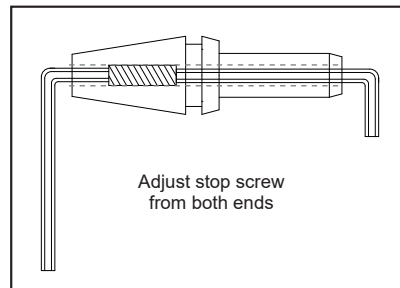
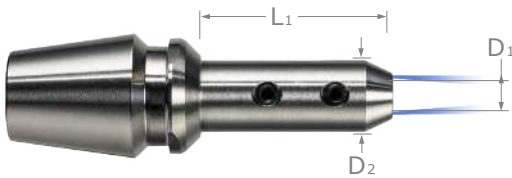
TOOL HOLDERS

- Reached taper integrated holder that eliminates the need for multiple spindle accessories
- Designed for Turn Mill Centers and Machining Centers
- Works with any ER holder or spindle
- Multiple reaches • Maximum T.I.R. of <.0002"
- Capable of quick change with included stop screw
- Stop screw can be adjusted from both ends of holder

BORE DIAMETER	SHAFT DIAMETER	PROJECTION LENGTH	TAPER	TOOL HOLDERS	
				TOOL #	PRICE
D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>			
.1250	9.5 mm	16 mm	ER16	83001	282.40
.1250	9.5 mm	25 mm	ER16	83003	282.40
.1875	9.5 mm	16 mm	ER16	83002	282.40
.1875	9.5 mm	25 mm	ER16	83004	282.40
.2500	12.5 mm	14 mm	ER20	83005	337.20
.2500	12.5 mm	25 mm	ER20	83006	330.90

## TOOL HOLDERS

### Solid ER Integrated Tool Holders – Coolant-Through



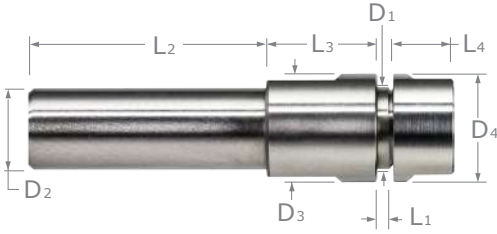
- Reached taper integrated holder that eliminates the need for multiple spindle accessories
- Designed for Turn Mill Centers and Machining Centers
- Works with any ER holder or spindle
- Multiple reaches
- Maximum T.I.R. of <.0002"
- Capable of quick change with included stop screw
- Compatible with coolant through holders
- Stop screw can be adjusted from both ends of holder

BORE DIAMETER	SHAFT DIAMETER	PROJECTION LENGTH	TAPER	TOOL HOLDERS	
				TOOL #	PRICE
D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>			
.1250	9.5 mm	25 mm	ER16	83203	363.20

# SAW ARBORS

## Straight Shank

TOOL HOLDERS



- Maximum T.I.R. of .0001"
- Straight shank allows for chucking at multiple depths
- Key not included

ARBOR DIAMETER	ARBOR LENGTH	SHANK DIAMETER	SHANK LENGTH	FLANGE DIAMETER	FLANGE LENGTH	NUT DIAMETER	NUT LENGTH	THREAD LENGTH (IN FRONT OF ARBOR)	SAW ARBORS	
D <sub>1</sub>	L <sub>1</sub>	D <sub>2</sub>	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub>	D <sub>4</sub>	L <sub>4</sub>		TOOL #	PRICE
.250	.045	.250	1.40	.394	.500	.394	.250	.300	84100	251.70
.375	.050	.375	1.40	.500	.500	.500	.276	.300	84101	251.70
.500	.050	.500	1.40	.625	.500	.625	.276	.300	84102	251.70
1.000	.125	.750	2.00	1.250	1.500	1.250	.437	.500	84103	321.70

For Slitting Saws, see pages 385-387.



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## ER COLLETS



- Maximum T.I.R. of .0004"
- High polished finish helps resist oxidation
- Related nut and wrench sold separately

NEW

NEW

NEW

NEW

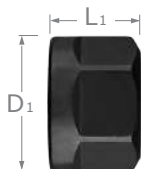
NEW

SIZE	BORE DIAMETER	CLAMP RANGE	ER COLLETS	
			TOOL #	PRICE
	D <sub>1</sub>			
ER11	1/8	.086 - .125	82401	16.30
ER16	1/8	.086 - .125	82402	17.70
ER16	3/16	.148 - .187	82403	17.70
ER16	1/4	.211 - .250	82404	17.70
ER16	3/8	.336 - .375	82405	25.50
ER20	1/4	.211 - .250	82406	27.10
ER32	1/4	.211 - .250	82407	28.70
ER32	3/8	.336 - .375	82408	28.70
ER32	1/2	.461 - .500	82409	28.70

COLLETS

## ER COLLETS

### Nuts



- Special anti-friction coating increases clamping pressure of tool shank

NEW

NEW

SIZE	HEAD DIAMETER	NUT LENGTH	THREAD SIZE	MAX TORQUE	ER NUTS	
					TOOL #	PRICE
	D <sub>1</sub>	L <sub>1</sub>				
ER11	19 mm	12 mm	M14 x 0.75	17 ft. lbs	82461	30.40
ER16	27.5 mm	18 mm	M22 x 1.5	42 ft. lbs	82462	30.40
ER20	34 mm	19 mm	M25 x 1.5	59 ft. lbs	82463	43.10
ER32	50 mm	23 mm	M40 x 1.5	100 ft. lbs	82464	47.80

## ER COLLETS

### Wrenches



NEW

NEW

SIZE	LENGTH	WIDTH	THICKNESS	ER WRENCHES	
				TOOL #	PRICE
ER11	4.80	1.50	0.20	82481	14.50
ER16	5.60	2.00	0.20	82482	14.50
ER20	6.30	2.40	0.20	82483	30.30
ER32	10.00	3.00	0.20	82484	35.90

## ER PERFORMANCE COLLETS



- Specialized, low profile design reduces radial distortion and improves repeatability during tool changeover
- Maximum T.I.R. of .0002"
- Works with any ER holder or spindle
- High polished finish helps resist oxidation
- Related nut and wrench sold separately

SIZE	BORE DIAMETER	CLAMP RANGE	ER PERFORMANCE COLLETS	
			TOOL #	PRICE
	D <sub>1</sub>			
ER11	1/8	.1050 - .1250	85501	38.00
ER16	1/8	.1050 - .1250	85502	38.00
ER16	3/16	.1470 - .1875	85503	38.00
ER16	1/4	.2100 - .2500	85504	38.00

## ER PERFORMANCE COLLETS

### Nuts



- Provides increased clamping pressure on tool shank which reduces vibration and increases tool life
- Allows collet to sit further into the collet pocket, creating a more concentric tool
- Special anti-friction coating increases clamping pressure of tool shank

SIZE	HEAD DIAMETER	NUT LENGTH	THREAD SIZE	MAX TORQUE	ER PERFORMANCE NUTS	
					TOOL #	PRICE
	D <sub>1</sub>	L <sub>1</sub>				
ER11	18 mm	12 mm	M14 x 0.75	25 ft. lbs	85561	37.20
ER16	26 mm	14 mm	M22 x 1.5	42 ft. lbs	85562	37.20

## ER PERFORMANCE COLLETS

### Wrenches



SIZE	LENGTH	WIDTH	THICKNESS	ER PERFORMANCE WRENCHES	
				TOOL #	PRICE
ER11	Please see page 505 for ER11 Wrench size				
ER16	6.50	2.20	0.20	85582	36.20



# IN THE LOUPE

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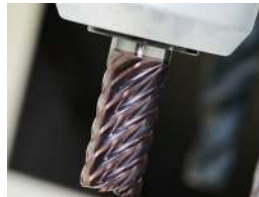
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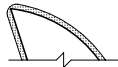


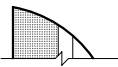
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## COATINGS & SUBSTRATES CHART

Coating/ Substrate:	TiN  Titanium Nitride -C1	AlTiN  Aluminum Titanium Nitride -C3	AlTiN Nano  Aluminum Titanium Nitride Nano -C6
Application/ Benefits:	<ul style="list-style-type: none"> <li>• General purpose coating for machining ferrous materials.</li> </ul>	<ul style="list-style-type: none"> <li>• High performance coating in ferrous materials.</li> <li>• Excellent high temperature resistance and hardness.</li> <li>• Maintains high surface hardness at elevated temperatures improving tool life and allowing faster feed rates.</li> <li>• Produces aluminum oxide layer at high temperature which reduces thermal conductivity, transferring heat into the chip.</li> <li>• Excellent in dry machining, machining titanium alloys, inconel, stainless alloys and cast iron.</li> <li>• Not recommended for use in aluminum and aluminum alloys.</li> </ul>	<ul style="list-style-type: none"> <li>• Premium coating in ferrous materials.</li> <li>• Latest generation AlTiN coating mixed with silicon to produce a unique nanocomposite coating. This structure improves hardness, heat resistance, and toughness over traditional AlTiN coatings.</li> <li>• Superior results, extended tool life and reduced cycle times over traditional AlTiN coatings in demanding applications where setup minimizes runout and vibration.</li> <li>• Not recommended for use in aluminum and aluminum alloys.</li> </ul>
Materials:	<b>Ferrous Materials &amp; Exotic Metals</b>		
	General Purpose Ferrous Materials	Alloy steels, stainless steels, tool steels, titanium, inconel, nickel and other aerospace materials	Hardened steels, hardened stainless, nickel based alloys, tool steels, titanium alloys, inconel and other aerospace materials
Color:	Gold	Dark Gray / Black	Blue / Black
Structure:	Mono-layer	Multi-layer	Nano Composite Multi-layer
Hardness (HV 0.05):	2447 (24 GPa)	3569 (35 GPa)	4181 (41 GPa)
Coefficient of Friction:	.40	.70	.40
Coating Thickness (microns):	2 - 5	2 - 5	1 - 4
Max. Working Temp:	1000° F	1400° F	2100° F

PLEASE NOTE: Information and test results were compiled from multiple sources and testing methods. Data presented is intended to be a general application guideline for comparing various coatings / substrates.

## COATINGS & SUBSTRATES CHART

ZrN  Zirconium Nitride -C7	TiB <sub>2</sub>  Titanium Diboride -C8	Amorphous Diamond  Diamond-Like Coating -C4	CVD Diamond (4 μm)  Crystalline CVD Diamond	CVD Diamond (9 μm)  Crystalline CVD Diamond	PCD Diamond  Polycrystalline Diamond
<ul style="list-style-type: none"> <li>High hardness, lubricity and abrasion resistance.</li> <li>Improves performance over uncoated carbide in a wide variety of non-ferrous materials.</li> <li>Less expensive alternative to diamond.</li> </ul>	<ul style="list-style-type: none"> <li>Primary benefit over other non-ferrous coatings is <b>extremely</b> low affinity to aluminum.</li> <li>Prevents build-up on cutting edge, chip packing and extends tool life.</li> <li>Recommended in Aluminum Alloys and Magnesium Alloys.</li> <li>Not ideally suited for abrasive varieties of these alloys.</li> </ul>	<ul style="list-style-type: none"> <li>A PVD amorphous diamond coating which improves lubricity and wear resistance in non-ferrous materials.</li> <li>Coating is thin relative to CVD diamond, preventing edge rounding.</li> <li>Sharp edges improve results (performance and finish) over CVD in certain abrasive, non-ferrous materials (copper, brass, high silicon aluminum).</li> <li>Low temperature threshold makes diamond unsuitable for ferrous applications.</li> </ul>  <p>Thin coating maintains sharper edge.</p>	<ul style="list-style-type: none"> <li>True Crystalline CVD diamond is grown directly into a carbide end mill.</li> <li>Dramatically improves hardness.</li> <li>Hardness improves abrasion resistance and allows higher feed rates than uncoated carbide.</li> <li>Ideal for machining Graphite, Composites, Green Carbide, and Green Ceramics.</li> <li>Thinner CVD layer yields a sharper cutting edge compared to the standard CVD coating and leaves a smoother finish on non-ferrous materials</li> <li>Low temperature threshold makes diamond unsuitable for ferrous applications.</li> </ul>  <p>4 μm CVD diamond layer for a balance between wear resistance and edge sharpness.</p>	<ul style="list-style-type: none"> <li>True Crystalline CVD diamond is grown directly into a carbide end mill.</li> <li>Dramatically improves hardness.</li> <li>Hardness improves abrasion resistance and allows higher feed rates than uncoated carbide.</li> <li>Ideal for machining Graphite, Composites, Green Carbide, and Green Ceramics.</li> <li>Diamond layer approx 5 times thicker than Amorphous Diamond, improving wear resistance.</li> <li>Low temperature threshold makes diamond unsuitable for ferrous applications.</li> </ul>  <p>9 μm diamond layer for increased wear resistance.</p>	<ul style="list-style-type: none"> <li>PCD diamond is manufactured as a carbide backed flat wafer. The wafer is brazed to a carbide body to form an end mill.</li> <li>PCD has excellent hardness and abrasion resistance, and is the thickest diamond layer we offer.</li> <li>Sharply ground cutting edges and thick diamond layer combine the sharp edge benefits of Amorphous Diamond with the abrasion resistance of CVD Diamond.</li> <li>Low temperature threshold makes diamond unsuitable for ferrous applications.</li> </ul>  <p>Thickest diamond layer ground to sharp edge.</p>
Non-Ferrous & Non-Metallic Materials					
Abrasive non-ferrous alloys such as Brass, Bronze, Copper and Abrasive Aluminum Alloys	Aluminum Alloys, Magnesium Alloys	Abrasive Plastics, Graphite, Carbon Fiber Materials, Composites, Aluminum, Copper, Brass, Bronze, Carbon, Gold, Silver, Magnesium, Zinc	Graphite, Composites, Green Carbide, Green Ceramics	Graphite, Composites, Green Carbide, Green Ceramics	Abrasive Plastics, Graphite, Carbon Fiber Materials, Composites, Aluminum, Copper, Brass, Bronze, Carbon, Gold, Silver, Magnesium, Zinc, Green Carbide, Green Ceramics
Light Gold / Champagne	Light Gray / Silver	Charcoal / Gray	Gray	Gray	Gray / Black
Mono-layer	Mono-layer	Mono-layer	True Crystalline CVD Multi-Layer	True Crystalline CVD Multi-Layer	Polycrystalline Diamond (Carbide Backed)
2243 (22 GPa)	2804 (27.5 GPa)	7954 - 8973 (78 - 88 GPa)	8973 - 9993 (88 - 98 GPa)	8973 - 9993 (88 - 98 GPa)	8973 - 9993 (88 - 98 GPa)
.40	.35	.10	.05 - .30	.05 - .30	.05 - .20
2 - 5	1 - 3	.5 - 2.5	3 - 5	8 - 10	.010" - .030" Solid PCD Layer
1100° F	900° F	750° F	1100° F	1100° F	1100° F

PLEASE NOTE: Information and test results were compiled from multiple sources and testing methods. Data presented is intended to be a general application guideline for comparing various coatings / substrates.

## INDEX BY SERIES ID

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
10000	39	16700	407	21300	63	25500	481	30600	118	34900	18
10100	40	16800	408	21400	63	25600	482	30700	119	35000	23
10200	65	16900	496	21500	95	26300	68	30800	38	35100	48
10300	65	17000	389	21600	95	26400	354	30900	38	35200	50
10800	72	17100	394	21700	95	26500	288	31000	118	35300	96
11000	482	17200	394	21800	95	26600	38	31100	119	35400	29
11400	466	17300	497	21900	95	26700	38	31200	38	35500	35
11500	467	17400	38	22100	355	26800	346	31300	38	35600	56
11600	468	17500	38	22200	356	26900	329	31400	112	35700	61
11700	468	17600	89	22300	357	27000	404	31500	114	35800	18
12000	230	17700	63	22400	359	27100	92	31600	389	35900	23
12100	229	17800	63	22500	360	27200	68	31700	394	36000	48
12200	230	17900	482	22600	361	27300	354	31800	18	36100	51
12500	19	18000	311	22700	275	27400	289	31900	23	36200	75
12600	51	18100	311	22800	275	27500	344	32000	112	36300	220
12700	18	18200	329	22900	275	27600	329	32100	114	36400	220
12800	48	18300	294	23100	270	27800	215	32200	48	36500	225
12900	291	18400	293	23200	270	27900	215	32300	50	36600	225
13600	39	18500	293	23300	479	28000	93	32400	73	36700	502
13700	40	18600	300	23400	479	28100	69	32600	96	36800	502
13800	65	18700	293	23500	371	28200	354	32800	388	36900	170
13900	10	18800	63	23600	339	28300	38	32900	384	37100	82
14000	10	18900	63	23700	339	28400	38	33000	118	37200	85
14100	232	19000	169	23800	410	28500	406	33100	119	37300	170
14200	232	19100	345	23900	411	28600	71	33200	29	37400	170
14300	292	19200	346	24000	88	29000	401	33300	35	37500	467
14600	256	19500	346	24100	213	29100	401	33400	56	37700	170
14800	65	20000	462	24200	213	29200	401	33500	61	37800	112
14900	66	20100	462	24300	178	29300	401	33600	18	37900	114
15100	15	20200	463	24400	180	29400	94	33700	23	38000	29
15200	15	20300	464	24500	43	29500	272	33800	112	38100	36
15300	287	20400	465	24600	43	29600	339	33900	114	38200	468
15300-2	284	20500	91	24700	67	29700	343	34000	48	38300	82
15400	287	20600	91	24800	63	29800	63	34100	50	38400	85
16000	399	20700	91	24900	63	30000	322	34200	56	38500	170
16100	400	20800	92	25000	321	30100	322	34300	61	38700	112
16200	344	20900	92	25100	321	30200	329	34400	96	38800	114
16400	405	21000	389	25200	328	30300	329	34600	29	38900	170
16500	406	21100	394	25300	328	30400	322	34700	35	39000	171
16600	407	21200	394	25400	481	30500	322	34800	74	39100	348

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
39200	171	43500	355	47700	338	52000	368	56100	134	60300	237
39300	171	43600	380	47800	29	52100	306	56200	136	60400	399
39400	82	43700	356	47900	56	52200	137	56300	410	60500	325
39500	85	43800	380	48100	325	52300	141	56400	247	60600	399
39700	270	43900	357	48300	339	52400	232	56500	413	60700	25
39800	468	44000	395	48400	326	52500	232	56600	167	60800	25
39900	469	44100	396	48500	293	52600	172	56700	168	60900	399
40000	171	44200	396	48600	236	52700	174	56800	306	61000	223
40100	56	44300	381	48700	237	52800	270	56900	397	61100	224
40200	118	44400	380	48800	325	52900	272	57000	353	61500	404
40300	119	44500	380	48900	29	53000	204	57100	353	61600	227
40400	171	44600	381	49000	35	53100	206	57200	306	61700	204
40500	171	44700	68	49100	326	53300	178	57300	397	61800	206
40600	118	44800	72	49200	56	53400	180	57400	397	61900	227
40700	119	44900	234	49300	61	53500	306	57500	397	62000	223
40800	171	45000	398	49400	325	53600	137	57600	325	62100	224
40900	171	45100	345	49500	244	53700	141	57700	399	62200	227
41000	469	45200	68	49600	244	53800	172	57800	149	62300	405
41100	94	45300	389	49700	325	53900	174	57900	152	62400	176
41300	271	45400	68	49800	236	54000	247	58000	399	62500	177
41400	484	45500	69	49900	237	54100	247	58100	310	62600	149
41500	82	45600	73	50000	204	54200	484	58200	325	62700	152
41600	85	45700	174	50100	206	54300	397	58300	29	62800	178
41700	82	45800	350	50200	14	54400	201	58400	36	62900	227
41800	85	45900	388	50300	14	54500	201	58500	399	63000	145
41900	82	46000	395	50400	339	54600	270	58600	325	63100	148
42000	85	46100	396	50600	293	54700	306	58700	399	63200	227
42100	85	46200	396	50700	329	54800	145	58900	325	63300	228
42200	86	46300	396	50800	326	54900	147	59000	149	63400	406
42300	85	46400	73	50900	46	55000	176	59100	152	63500	180
42400	86	46500	290	51000	46	55100	177	59200	399	63600	134
42600	86	46600	350	51100	232	55200	270	59300	325	63700	136
42700	83	46700	74	51200	232	55300	397	59400	56	63800	176
42800	85	46800	137	51300	70	55400	247	59500	61	63900	177
42900	83	46900	141	51400	232	55500	247	59700	399	64000	224
43000	85	47200	68	51500	232	55600	306	59800	399	64100	227
43100	83	47300	72	51600	70	55700	397	59900	326	64200	167
43200	85	47400	75	51700	325	55800	467	60000	312	64300	168
43300	382	47500	325	51800	232	55900	369	60100	399	64400	145
43400	383	47600	293	51900	232	56000	397	60200	236	64500	147

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
64600	406	68600	181	72600	346	742000	16	747300	125	752800	301
64700	228	68700	151	72700	325	742100	16	747400	213	752900	143
64800	134	68800	153	72800	76	742200	298	747500	214	753000	59
64900	136	68900	179	72900	72	742700	297	747700	226	753300	36
65000	227	69000	181	73000	10	742800	364	747900	159	753400	54
65100	407	69100	150	73100	14	74300	43	748100	243	753600	33
65200	223	69200	153	731200	262	743100	297	748200	365	753700	36
65300	224	69300	247	736600	27	743200	327	748400	226	753800	54
65400	167	69400	356	736700	251	743300	338	748500	159	754000	198
65500	168	69500	256	736800	251	743400	17	748600	390	754100	49
65600	228	69600	256	737600	487	743700	297	748700	159	754300	59
65700	353	69700	359	737800	469	743800	327	748800	278	754500	301
65800	353	69800	247	737900	409	743900	364	748900	278	754900	347
65900	227	69900	247	738000	408	74400	46	749000	390	75500	72
66000	343	70000	492	738100	342	744000	366	749100	159	755000	54
66100	343	70100	492	738600	268	744300	365	749200	135	755200	350
66200	228	70200	494	738800	268	744400	297	749400	143	755400	168
66300	408	70300	360	73900	72	744500	327	749700	355	755500	168
66400	228	70400	256	739000	268	744600	338	749800	108	755600	40
66500	227	70500	256	739100	248	744700	365	749900	108	755700	40
66600	170	70600	247	739200	229	744800	378	75000	316	755900	346
66700	211	70700	247	739400	16	744900	207	750000	104	756000	198
66800	212	70800	357	739500	16	74500	76	750300	51	756600	334
66900	170	70900	363	739600	47	745000	226	750400	65	756800	262
67000	170	71000	484	739700	79	745200	216	750700	120	756900	391
67100	211	71100	360	739800	78	745300	216	750800	105	757600	49
67200	212	71200	361	739900	35	745400	278	750900	105	75800	72
67300	170	71300	244	74000	43	745600	237	75100	317	758000	18
67400	389	71400	244	740100	129	745700	237	751100	90	758200	44
67500	382	71500	361	740300	21	745800	225	751200	49	758300	46
67600	389	71600	345	740700	17	745900	225	751600	262	758400	270
67700	382	71700	346	740800	17	74600	46	751700	262	758500	272
67800	391	71800	361	74100	46	746000	192	751900	61	758600	72
67900	382	71900	74	741000	47	746100	194	75200	74	758700	74
68000	389	72000	10	741200	47	746200	220	752000	30	759000	72
68100	394	72100	14	741300	47	746300	220	752200	60	759300	80
68200	394	72200	284	741400	17	746400	278	752400	143	759400	81
68300	382	72300	285	741700	370	746600	364	752500	469	759500	378
68400	382	72400	293	741900	218	746800	226	752600	469	759600	173
68500	178	72500	293	74200	72	747100	125	752700	214	759900	346



## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
76000	223	764000	298	769100	191	773500	379	778100	63	784000	119
760000	229	764100	307	769200	58	773600	303	778300	179	784100	119
760100	414	764200	297	769300	61	773700	276	778500	179	784300	495
760200	398	764300	80	769500	272	773900	171	778700	174	784400	310
760400	104	764400	81	769600	249	774000	159	778800	131	784500	286
760600	41	764500	297	769700	249	774100	160	779000	331	784600	244
760700	41	764600	316	769800	251	774200	271	779100	403	784700	244
760800	94	764700	331	769900	251	774400	276	779400	403	784800	286
760900	141	764800	297	77000	24	774600	171	779500	402	784900	305
761000	209	76500	28	770000	194	774700	159	779600	402	785000	305
761100	210	765000	303	770200	249	774900	342	779700	403	785200	260
761300	105	765100	298	770300	249	775000	336	780000	403	785400	148
761400	487	765300	303	770500	390	775100	352	780100	402	785600	148
761500	107	765400	298	770600	231	775200	63	780200	402	785800	275
761600	107	765500	306	770700	231	775300	63	780300	403	785900	96
761700	41	765700	86	770800	21	775400	271	780600	403	786000	103
761800	41	765800	85	77100	51	775600	159	780700	402	786100	103
761900	92	76600	53	771000	346	775800	242	780800	402	786200	103
76200	26	766000	85	771100	379	775900	242	780900	403	786300	103
762000	80	766300	89	771200	318	776000	39	781200	403	786400	140
762100	81	766500	86	771300	10	776100	40	781300	402	786600	137
762200	79	766600	267	771400	14	776200	63	781400	402	786900	273
762300	344	766800	83	771500	297	776300	63	781600	105	787000	307
762400	335	766900	85	771600	490	776400	374	781800	119	787100	131
762500	336	76700	54	771700	488	776500	373	781900	119	787300	77
762600	78	767100	248	771800	484	776600	352	782000	119	787500	77
762700	80	767300	174	771900	345	776700	373	782100	119	787700	467
762800	81	767500	247	772000	308	776800	373	782300	119	787900	272
762900	335	767700	248	772100	308	776900	181	782400	119	788000	301
76300	28	767800	267	772200	318	777000	375	782500	119	788100	310
763000	79	76800	53	772300	346	777100	373	782700	119	788200	282
763200	143	768000	58	772400	379	777200	63	782800	119	788300	307
763300	334	768100	61	772500	307	777300	63	782900	119	788400	306
763400	109	768200	226	772700	490	777400	354	783100	119	788500	307
763500	109	768400	83	772800	347	777500	297	783200	119	788600	307
763600	298	768500	85	772900	484	777600	297	783300	119	788700	307
763700	107	768700	247	773000	152	777800	99	783500	119	789000	303
763800	107	768900	247	773200	488	777900	349	783600	119	789100	31
763900	336	76900	54	773300	344	77800	394	783700	119	789200	36
76400	26	769000	191	773400	318	778000	352	783900	119	789300	42

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
789400	102	794000	306	799400	94	804400	143	808900	264	813800	160
789500	102	794100	297	799500	221	804500	69	809000	264	813900	196
789600	213	794200	301	799600	222	804800	90	809100	264	814000	197
789800	271	794300	271	799700	217	804900	90	809200	264	814100	196
789900	273	794400	272	799800	218	805000	90	809300	263	814200	197
790000	301	794600	268	800000	85	805100	90	809400	263	814300	196
790100	130	794700	262	800200	85	805200	90	809500	263	814400	197
790200	297	794800	262	800300	82	805300	60	809600	263	814500	130
790300	297	794900	223	800500	82	805400	61	809700	297	814700	331
790400	494	795000	224	800700	106	805500	53	809900	280	814800	161
790500	123	795100	223	800800	79	805600	54	810000	462	814900	162
790700	122	795200	224	800900	77	805700	53	810100	462	815300	464
790900	297	795300	196	801100	77	805800	54	810200	463	815400	465
791000	345	795400	181	801300	56	805900	394	810300	19	815600	177
791100	199	795500	138	801400	61	806000	392	810400	23	815700	177
791200	200	795800	148	801500	48	806100	389	810500	74	815800	468
791300	126	795900	146	801600	51	806200	362	810600	70	815900	469
791500	258	796100	145	801700	31	806300	360	810800	75	816000	466
791600	258	796400	142	801800	36	806400	358	810900	73	816100	467
791700	297	796500	139	801900	258	806500	357	811000	53	816200	144
791800	320	796700	138	802000	258	806600	355	811200	130	816400	142
791900	346	796900	138	802100	96	806700	412	811300	132	816500	177
792000	345	797100	139	802300	28	806800	412	811400	407	816600	177
792100	192	797300	140	802400	26	806900	346	811500	336	816800	175
792200	194	797500	134	802500	28	807000	345	811600	336	817000	326
792300	174	797600	136	802600	21	807100	345	811700	336	817100	325
792500	156	797700	108	802700	23	807200	346	811800	146	817200	289
792600	157	797800	108	802800	295	807300	346	81200	312	817300	177
792700	320	798000	105	803000	258	807400	345	812100	145	817400	337
792800	375	798100	102	803100	56	807600	345	812300	126	817500	336
792900	345	798200	102	803200	61	807800	346	812500	107	817600	336
793000	329	798400	259	803300	65	807900	346	812600	107	817700	337
793200	237	798500	259	803500	65	808000	344	812700	107	817900	336
793300	319	798600	231	803700	258	808100	301	812800	107	818000	21
793400	396	798700	231	803800	258	808200	301	812900	112	818100	23
793500	396	798800	262	803900	467	808300	279	813000	114	818200	330
793600	79	798900	262	804000	468	808500	277	813100	112	818300	327
793700	374	799000	260	804100	469	808600	276	813200	114	818500	258
793800	130	799200	94	804200	67	808700	255	813500	104	818600	221
793900	375	799300	94	804300	76	808800	255	813600	105	818700	222

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
818800	330	823800	286	828700	330	832900	73	837100	335	841400	333
818900	327	823900	288	828800	327	833000	75	837200	372	841500	376
819000	101	824000	505	828900	327	833100	293	837300	276	841600	121
819100	101	824000	288	829000	89	833200	74	837500	334	841800	223
819300	226	824200	288	829100	26	833300	73	837600	372	841900	224
819400	330	824400	289	829200	28	833400	73	837700	297	842000	327
819600	497	824600	287	829300	330	833500	347	837800	19	842100	141
819800	278	824700	331	829400	211	833600	301	837900	23	842200	235
819900	278	824900	98	829500	212	833800	275	838000	375	842300	235
820000	330	825000	99	829700	206	833900	409	838100	335	842400	301
820100	327	825100	256	829800	330	834000	324	838200	206	842500	140
820200	295	825200	256	829900	327	834100	18	838300	206	842600	71
820300	484	825300	101	830000	503	834200	23	838400	306	842800	324
820400	226	825400	101	830000	314	834300	330	838500	377	842900	499
820600	483	825500	334	830100	69	834400	327	838600	26	843000	307
820700	122	825600	307	830300	70	834600	268	838700	28	843200	267
820800	335	825700	334	830500	348	834700	327	838800	345	843300	138
820900	335	825800	334	830600	307	834800	207	838900	332	843400	102
821000	334	825900	335	830700	340	834900	330	839000	332	843500	102
821100	335	826000	348	830800	79	835000	327	839100	377	843600	316
821200	334	826200	283	830900	79	835100	108	839200	294	843700	334
821300	122	826300	242	831000	350	835200	108	839300	34	843800	326
821400	484	826400	242	831100	206	835300	178	839400	36	843900	70
821800	346	826500	487	831200	206	835400	181	839500	468	844000	142
821900	306	826700	275	831300	302	835500	330	839600	468	844100	307
822000	324	826800	18	831400	340	835600	96	839700	376	844200	332
822100	345	826900	23	831500	278	835700	161	839900	86	844400	56
822200	347	827100	86	831600	278	835800	162	840000	297	844500	61
822400	347	827200	332	831700	76	835900	43	840200	86	844600	302
822500	482	827300	332	831800	75	836000	46	840300	376	844700	326
822600	346	827400	240	831900	74	836100	327	840400	96	844800	339
822700	484	827500	241	832000	503	836200	330	840500	140	844900	89
823000	10	827600	239	832000	74	836300	10	840600	142	845000	325
823100	14	827700	239	832100	73	836400	14	840700	205	845100	407
823200	278	827800	295	832300	408	836500	152	840800	206	845200	110
823300	278	827900	408	832400	345	836600	152	840900	376	845300	110
823400	43	828100	330	832500	302	836700	493	841000	504	845400	143
823500	46	828200	327	832600	333	836800	374	841000	48	845500	48
823600	329	828400	272	832700	333	836900	18	841100	51	845600	50
823700	286	828500	333	832800	94	837000	23	841300	333	845700	489

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
845800	335	849900	414	854600	251	859000	188	863700	276	868100	336
845900	192	850000	199	854700	251	859100	188	863800	297	868200	56
846000	307	850100	200	854800	108	859200	315	863900	75	868300	61
846100	26	850200	31	854900	108	859300	334	864000	414	868400	337
846200	28	850300	36	855000	506	859400	98	864100	80	868500	150
846300	353	850400	384	855000	323	859500	99	864200	81	868600	153
846400	353	850500	110	855200	226	859600	281	864300	254	868700	370
846600	272	850600	110	855300	74	859700	303	864400	254	868800	297
846700	150	850700	138	855400	306	859800	187	864500	143	868900	325
846800	30	850800	119	855500	322	860000	335	864600	70	869000	139
846900	36	850900	119	855600	364	860100	364	864800	315	869100	142
847000	468	851000	53	855700	345	860200	140	864900	80	869300	250
847100	342	851100	55	855800	234	860400	381	865000	81	869400	335
847200	325	851200	334	855900	234	860500	303	865100	69	869500	235
847300	230	851300	201	856000	68	860600	56	865300	337	869600	235
847400	346	851400	302	856300	51	860700	61	865400	283	869700	307
847500	147	851500	126	856400	138	860800	69	865500	414	869800	138
847600	148	851700	104	856500	317	861000	209	865600	75	869900	142
847700	281	851800	105	856600	187	861100	210	865700	80	870200	289
847800	138	852000	252	856700	188	861200	53	865800	81	870300	119
847900	142	852100	104	856900	212	861300	55	865900	414	870500	78
848000	121	852200	105	857000	323	861400	48	866000	86	870600	140
848100	130	852400	206	857100	73	861500	51	866100	293	870700	142
848200	132	852700	105	857200	192	861600	29	866200	239	870800	306
848300	68	852800	105	857300	194	861700	35	866300	239	870900	73
848400	138	852900	121	857400	187	861800	247	866400	349	871000	298
848500	142	853100	335	857500	334	861900	247	866500	80	871100	304
848600	384	853200	105	857600	143	862100	226	866600	80	871200	217
848700	293	853300	105	857700	70	862200	119	866700	336	871300	218
848800	140	853400	72	857800	345	862400	247	866800	147	871400	141
848900	142	853500	321	857900	374	862500	247	866900	148	871500	142
849000	335	853600	138	858000	112	862600	315	867000	39	871600	249
849100	290	853700	142	858100	114	862700	306	867200	69	871700	249
849200	78	853800	96	858200	187	862800	156	867300	378	871800	295
849300	368	853900	307	858300	334	862900	157	867400	364	871900	345
849400	307	854000	323	858400	192	863100	247	867500	310	872000	72
849500	482	854100	68	858500	198	863200	112	867600	304	872100	304
849600	26	854200	68	858600	198	863300	114	867700	270	872300	160
849700	28	854400	342	858700	72	863400	304	867800	317	872400	130
849800	366	854500	323	858900	230	863500	75	868000	111	872500	281

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
872600	83	876700	40	881100	282	886100	280	891200	404	895600	128
872700	104	876800	80	881200	298	886200	121	891300	365	895700	48
872800	105	876900	81	881300	150	886300	125	891400	326	895800	51
872900	381	877000	325	881400	153	886400	163	891500	217	896200	198
873000	159	877100	48	881500	112	886500	238	891600	218	896300	198
873100	160	877200	51	881600	114	886600	78	891700	367	896400	491
873200	295	877300	335	881700	113	886800	209	891800	209	896500	407
873300	334	877400	414	881800	173	886900	210	891900	210	896600	500
873400	405	877500	500	881900	174	887000	370	892000	232	896700	336
873500	192	877600	80	882000	336	887100	163	892100	52	896800	26
873600	194	877700	81	882100	487	887200	134	892200	52	897100	300
873800	254	877900	268	882300	110	887300	136	892300	336	897200	303
873900	301	878100	253	882400	178	887400	77	892400	72	897300	232
874000	73	878200	232	882500	181	887600	215	892500	336	897400	232
874100	29	878300	232	882600	159	887700	215	892700	160	897500	377
874200	36	878400	297	882700	160	888000	121	892800	206	897700	276
874300	307	878500	205	882800	169	888100	124	892900	361	897800	98
874400	315	878600	206	882900	113	888200	77	893000	130	897900	18
874500	406	878700	236	883100	233	888400	18	893100	119	898000	23
874600	159	878800	237	883200	279	888500	23	893200	119	898100	239
874700	160	878900	378	883300	280	888600	165	893300	355	898200	239
874800	237	879100	110	883500	110	888700	166	893500	276	898300	310
874900	237	879200	196	883600	404	888800	304	893600	469	898400	350
875000	304	879300	197	883800	233	889000	78	893700	469	898500	383
875100	336	879400	201	883900	165	889200	262	893800	206	898600	322
875200	80	879500	201	884000	166	889400	206	893900	206	898700	27
875300	81	879600	336	884100	322	889500	206	894000	376	898900	488
875400	121	879700	310	884200	77	889600	336	894100	351	899000	303
875500	124	879800	95	884400	146	889700	303	894200	18	899100	414
875600	314	879900	370	884600	414	889800	78	894300	23	899200	282
875700	267	880100	160	884700	298	890100	149	894500	260	899500	297
875800	267	880200	95	884900	258	890200	153	894600	104	899600	279
875900	364	880300	295	885000	77	890300	487	894700	364	899700	280
876000	80	880400	253	885200	98	890500	160	894800	215	899800	368
876100	81	880500	253	885300	99	890600	369	894900	215	899900	491
876200	209	880600	96	885400	159	890700	350	895000	378	900000	373
876300	210	880700	126	885500	160	890800	279	895100	293	900100	303
876400	293	880800	128	885600	143	890900	280	895200	382	900200	295
876500	337	880900	337	885700	414	891000	300	895300	279	900300	356
876600	39	881000	96	885800	78	891100	310	895500	126	900400	192

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
900500	183	905200	376	909700	340	914300	340	918800	257	923700	142
900600	183	905300	79	909900	343	914400	221	919000	307	923800	376
900700	251	905400	79	910000	376	914500	222	919100	112	923900	338
900800	251	905600	343	910100	147	914600	339	919200	114	924000	307
901000	374	905700	339	910200	148	914700	227	919300	196	924100	119
901100	354	905800	300	910300	308	914800	414	919400	197	924200	119
901200	484	905900	374	910400	308	914900	369	919500	94	924300	86
901300	126	906000	308	910500	122	915000	184	919700	86	924400	382
901400	128	906100	308	910600	372	915100	185	919800	146	924500	196
901500	204	906200	226	910700	348	915200	76	919900	148	924600	197
901600	207	906300	226	910800	110	915300	146	920100	257	924700	156
901800	187	906400	147	910900	110	915400	148	920200	184	925000	202
901900	83	906500	148	911000	306	915500	211	920300	185	925100	201
902100	251	906600	307	911100	375	915600	249	920400	104	925200	201
902200	251	907000	378	911200	350	915700	249	920500	105	925300	414
902300	300	907100	211	911300	130	915800	378	920600	42	925500	344
902400	93	907200	172	911400	126	915900	98	920800	345	925600	82
902500	372	907300	174	911500	186	916000	99	920900	260	925700	85
902600	147	907400	98	911600	186	916100	96	921000	260	925800	205
902800	307	907500	99	911700	373	916300	227	921100	373	925900	206
902900	341	907600	209	911900	268	916400	189	921200	341	926000	183
903100	110	907700	141	912000	147	916500	303	921300	381	926100	375
903200	110	907800	42	912200	92	916600	373	921400	85	926200	407
903300	374	907900	359	912300	205	916700	73	921500	86	926300	340
903400	173	908000	261	912400	206	916800	374	921700	343	926400	279
903600	348	908100	261	912500	79	917000	343	921900	189	926500	280
903700	93	908300	199	912600	79	917100	79	922000	354	926600	375
903800	53	908400	303	912700	82	917200	171	922200	223	926800	267
903900	375	908500	375	912800	85	917300	145	922300	171	926900	268
904100	206	908600	145	912900	138	917400	148	922500	350	927100	196
904200	206	908700	148	913000	142	917500	367	922600	93	927200	197
904300	93	908800	139	913100	38	917600	211	922700	57	927300	184
904400	53	908900	142	913200	38	917700	212	922800	61	927400	185
904500	373	909000	271	913300	307	917800	82	922900	272	927500	169
904600	204	909100	372	913400	374	917900	85	923000	192	927600	273
904700	206	909200	366	913500	83	918100	343	923100	194	927700	373
904800	70	909300	82	913700	68	918200	306	923200	83	927800	174
904900	378	909400	85	913800	73	918400	340	923300	86	927900	174
905000	126	909500	184	913900	174	918500	376	923500	351	928000	395
905100	271	909600	185	914100	229	918600	341	923600	138	928100	396

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
928200	398	932600	148	936900	72	941100	75	945600	35	949800	77
928400	406	932700	466	937000	29	941200	251	945700	183	949900	372
928500	285	932800	466	937100	35	941300	251	945800	183	950000	186
928700	350	932900	484	937200	322	941400	72	945900	161	950100	186
928800	276	933000	267	937300	384	941500	390	946000	500	950200	53
928900	356	933100	362	937500	344	941600	394	946100	149	950300	55
929000	134	933200	104	937600	72	941700	321	946300	119	950500	291
929100	136	933300	105	937700	372	941800	149	946400	119	950600	363
929200	165	933400	398	937800	321	941900	153	946500	325	950700	138
929300	141	933500	398	937900	74	942000	226	946600	391	950800	142
929400	141	933600	77	938000	77	942200	192	946700	394	950900	79
929500	375	933700	374	938100	79	942300	194	946800	345	951100	276
929600	272	933800	163	938200	308	942400	118	946900	346	951200	276
929700	234	933900	164	938300	150	942600	384	947000	201	951300	18
929800	234	934000	300	938400	323	942700	383	947100	201	951400	118
929900	395	934100	276	938500	226	942800	121	947200	340	951500	119
930000	396	934300	343	938600	226	942900	500	947300	326	951600	23
930200	86	934400	120	938700	118	943000	219	947400	266	951700	380
930300	488	934500	317	938800	119	943100	219	947500	357	951800	156
930500	350	934700	350	938900	236	943200	42	947600	145	951900	157
930600	130	934800	29	939000	237	943300	308	947700	148	952000	26
930700	132	934900	35	939100	326	943400	308	947800	82	952100	28
930800	196	935000	72	939200	120	943500	380	947900	85	952300	268
930900	197	935100	189	939300	84	943600	267	948000	325	952400	183
931000	414	935200	190	939400	85	943700	326	948100	339	952500	500
931100	163	935300	234	939500	223	943800	141	948200	39	952600	161
931200	164	935400	234	939600	224	943900	141	948300	40	952700	162
931300	173	935500	213	939700	339	944100	224	948400	394	952800	294
931400	174	935600	214	939800	183	944200	130	948500	306	952900	325
931500	270	935700	126	939900	183	944300	132	948600	53	953000	68
931600	373	935800	128	940000	267	944400	382	948700	54	953100	119
931700	139	935900	178	940100	268	944500	26	948800	211	953300	134
931800	141	936000	180	940200	306	944600	28	948900	212	953500	83
931900	350	936100	163	940400	325	944700	262	949100	86	953600	86
932000	213	936200	164	940500	126	944800	262	949200	383	953700	82
932100	214	936300	316	940600	128	944900	84	949300	294	953800	85
932200	395	936400	137	940700	156	945100	75	949400	284	953900	382
932300	404	936500	141	940800	157	945300	163	949500	469	954000	338
932400	79	936600	217	940900	221	945400	164	949600	209	954100	329
932500	145	936700	218	941000	222	945500	29	949700	210	954200	137

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
954300	142	958600	162	963100	166	967300	325	971500	145	975600	138
954500	121	958700	340	963200	341	967400	341	971600	275	975700	361
954600	323	958800	71	963300	119	967500	343	971700	322	975800	467
954700	372	958900	360	963400	119	967600	149	971800	165	975900	467
954800	74	959100	61	963500	325	967700	354	971900	166	976000	374
954900	340	959200	139	963600	345	967800	189	972000	30	976100	149
955000	329	959300	141	963700	346	967900	190	972100	378	976200	246
955100	354	959400	359	964000	71	968000	130	972200	26	976300	246
955200	313	959500	488	964100	138	968100	339	972300	28	976400	301
955300	500	959600	77	964200	141	968200	82	972400	189	976500	134
955400	226	959700	79	964300	77	968400	373	972500	190	976600	338
955500	226	959800	326	964400	79	968500	382	972600	373	976700	381
955600	378	959900	409	964500	246	968600	293	972700	82	976800	172
955700	244	960100	152	964600	246	968700	192	972900	363	976900	382
955800	244	960200	219	964700	358	968800	194	973000	398	977000	293
955900	467	960300	219	964800	326	968900	145	973100	407	977100	226
956000	325	960400	294	964900	161	969100	375	973200	112	977200	226
956100	266	960500	41	965000	162	969200	258	973300	114	977300	29
956200	356	960600	272	965100	372	969300	258	973400	359	977400	35
956300	39	960700	372	965200	466	969400	187	973500	204	977500	199
956400	40	960800	26	965300	382	969500	188	973600	36	977600	300
956500	209	960900	28	965400	384	969600	30	973700	121	977700	178
956600	209	961000	369	965500	344	969700	36	973800	124	977800	406
956700	27	961100	469	965600	83	969800	378	973900	370	977900	219
956800	26	961200	469	965700	85	969900	348	974000	134	978000	176
956900	28	961300	209	965800	137	970000	374	974100	339	978100	293
957100	71	961400	209	965900	313	970100	83	974200	270	978200	126
957200	48	961500	243	966000	56	970200	86	974300	272	978300	127
957300	51	961600	243	966100	61	970300	366	974400	344	978400	35
957400	118	961800	86	966200	240	970400	276	974500	149	978500	61
957600	236	961900	340	966300	241	970500	130	974600	219	978600	321
957700	237	962000	370	966400	70	970600	132	974700	219	978800	86
957800	339	962100	156	966500	276	970700	56	974800	165	978900	240
957900	325	962200	157	966600	301	970800	61	974900	325	979000	241
958000	380	962300	244	966700	73	970900	380	975000	145	979100	267
958100	199	962400	244	966800	340	971000	167	975100	323	979200	267
958200	200	962700	217	966900	69	971100	313	975200	367	979300	137
958300	112	962800	218	967000	121	971200	187	975300	130	979400	405
958400	114	962900	366	967100	124	971300	188	975400	500	979500	167
958500	161	963000	165	967200	380	971400	382	975500	176	979600	500



## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
979700	243	983800	321	987800	341	992000	408	996300	118	AVA	439
979800	243	983900	267	987900	466	992100	93	996400	119	AWS	453
979900	317	984000	267	988000	467	992200	397	996500	321	BAA	453
980000	356	984100	137	988100	289	992300	249	996600	203	BAF	439
980100	178	984200	358	988200	94	992400	249	996700	338	BCF	451
980200	73	984300	367	988300	167	992500	26	996800	306	BGN	416
980300	187	984400	344	988400	300	992600	28	996900	306	BSW	455
980400	188	984500	368	988600	350	992700	91	997000	91	BSX	456
980500	279	984600	301	988700	134	992800	399	997100	276	BVT	426
980600	280	984700	167	988800	500	992900	400	997200	307	CBG	439
980700	145	984800	404	988900	367	993000	328	997300	321	CHT	426
980800	313	984900	343	989000	243	993100	488	997400	117	CSG	416
981000	344	985000	400	989100	243	993200	341	997500	306	CXZ	460
981100	373	985100	400	989200	404	993300	93	997700	257	DDA	452
981200	293	985200	362	989300	325	993700	257	997800	202	DHE	426
981300	134	985300	126	989400	348	993800	68	997900	69	DQW	439
981400	77	985400	127	989500	267	993900	484	998000	366	DXT	416
981500	321	985500	285	989600	92	994000	310	998100	321	EFG	416
981600	374	985600	172	989700	199	994100	243	998200	306	ERY	439
981700	178	985700	500	989800	200	994200	243	998300	300	EXP	426
981800	340	985800	344	989900	380	994300	257	998400	321	FBD	457
981900	79	985900	372	990000	328	994400	257	998500	240	FBF	457
982000	369	986000	405	990100	404	994500	68	998600	241	RRH	477
982100	29	986100	357	990200	38	994600	397	998700	116	RSB	470
982200	35	986200	204	990300	374	994700	276	998800	339	SAA	385
982300	176	986300	72	990400	92	994800	306	998900	306	SAB	385
982400	298	986400	249	990500	322	994900	117	999000	118	SAC	385
982500	355	986500	249	990600	267	995000	257	999100	119	SAD	386
982600	118	986600	488	990700	121	995100	257	999200	306	SAE	386
982700	119	986700	176	990800	124	995200	407	999300	221	SAF	386
982800	53	986800	326	990900	397	995300	306	999400	221	SAG	385
982900	54	986900	293	991000	92	995400	93	999500	307	SAW	386
983000	383	987000	328	991100	53	995500	338	999600	307	SNA	387
983100	466	987100	498	991200	55	995600	203	999700	321	SNB	387
983200	466	987200	374	991300	360	995700	217	999800	240	SNC	387
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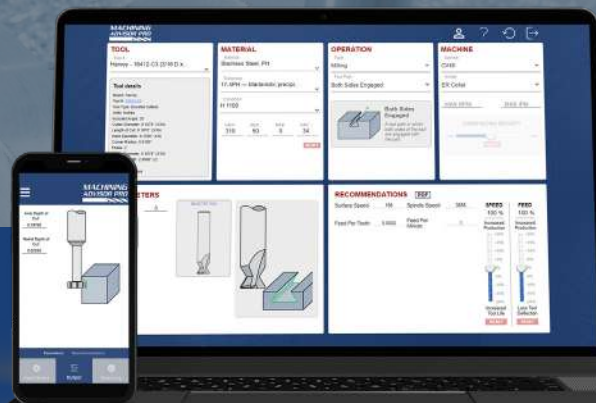
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